

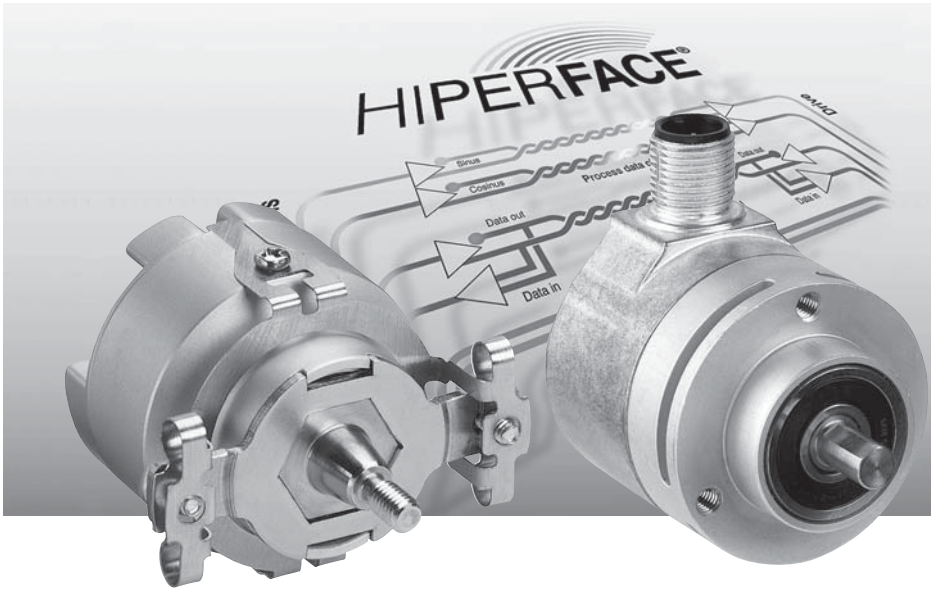


Encoders

Rotary Encoders Incremental/Absolute
Linear Encoders
Motor Feedback Systems

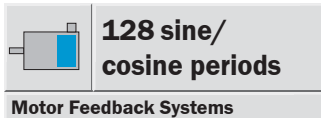
SICK
Sensor Intelligence.

SinCos® SKS36, SKM36, SKS36 Standalone, SKM36 Standalone: Motor Feedback Systems with HIPERFACE®- Interface for Servo Motors



In doing so, the system compensates for eccentricity errors of code disc, ball bearing and shaft which are inevitably found in conventional systems.

By arranging the code disc in the middle of the rotational axis, high angular velocities are no longer limited by the code disc. The encoder size is essentially determined by the mechanical and electrical interfaces. Technologies such as "Chip On Board" are used to achieve this. The number of components is reduced to a minimum.



**128 sine/
cosine periods**

Motor Feedback Systems

HIPERFACE®
by SICK | STEGMANN

The SKS/SKM36 encoder is the first member of a new generation of optical encoders within the SinCos product range.

They all share the new Mini-Disc (MiDi) technology.

The special feature of this generation: a very small code disc of only 2 mm code track radius employs holistic (full) scanning.

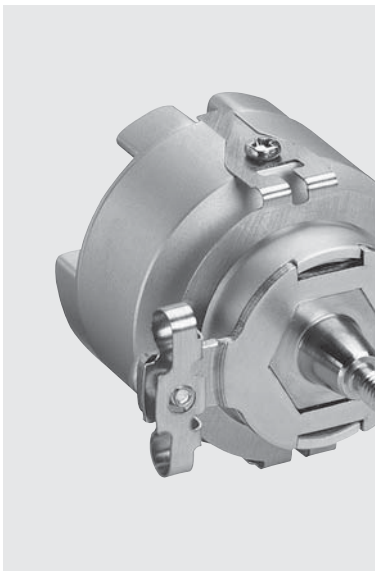
The small size of the SinCos SKS/SKM36 enables manufacturers of miniature and subminiature motors to significantly shorten their motors.

The standalone version is also ideally suited as master resp. slave encoder.

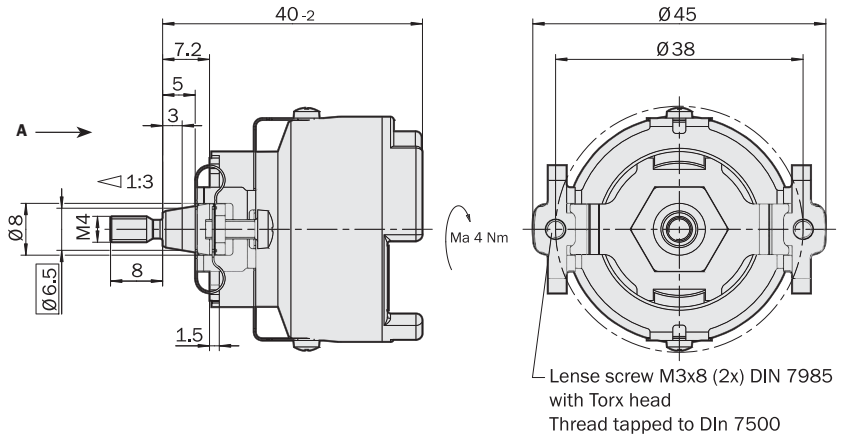
128 sine/cosine periods

Motor Feedback Systems

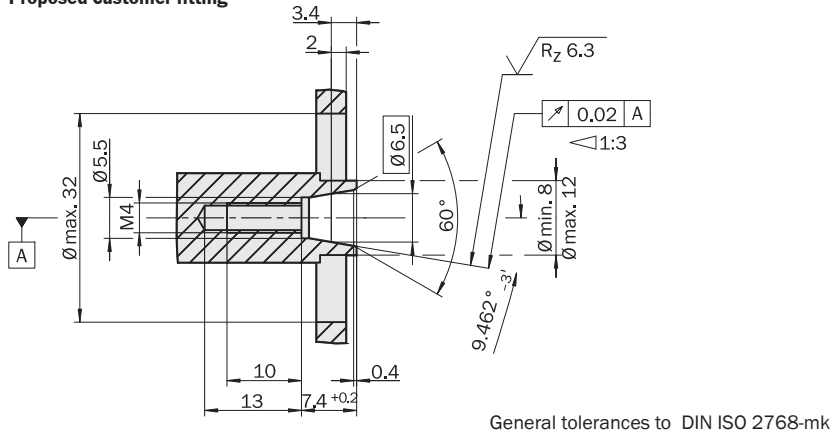
- 128 sine/cosine periods per revolution
- Absolute position with a resolution of 4,096 steps per revolution
- 4,096 revolutions can be measured (Multiturn)
- Programming of the positional value
- Electronic type label



Dimensional drawing SKS/SKM36



Proposed customer fitting



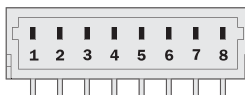
PIN and wire allocation

PIN	Signal	Colour of Wires	Explanation
1	U _s	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	RS-485-parameter channel
8	Data -	green or purple	RS-485-parameter channel

The housing is electrically connected to the motor housing, via the stator coupling.
The GND (0 V) connection of the supply voltage has no connection to the housing.

Accessories

Connection systems (page 322)
Mounting systems (page 325)
Programming tool (page 322)



View of the plug-in face

Technical data to DIN 32878		Tapered shaft SKS/SKM36	SKS	SKM								
Number of sine/cosine periods per revolution		128										
Number of the absolute ascertainable revolutions												
	Single SKS	1										
	Multi SKM	4,096										
Dimensions		mm (see dimensional drawing)										
Mass		0.07 kg										
Inertial rotor moment		4.5 gcm ²										
Code type for the absolute value		Binary										
Code sequence for clockwise shaft rotation, looking in direction "A" (see dimensional drawing)		Increasing										
Measurement step at interpolation of the sine/cosine signals with e. g. 12 bits		2.5 angular seconds										
Error limits for the digital absolute value via RS 485		± 320 angular seconds										
Error limits for evaluating the "128" signals, integral non-linearity		± 80 angular seconds										
Non-linearity within a sine/cosine period differential non-linearity		± 40 angular seconds										
Output frequency for sine/cosine signals		0 ... 65 kHz										
Operating speed	SKS	12,000 min ⁻¹										
	SKM	9,000 min ⁻¹										
Max. angular acceleration		5 x 10 ⁵ rad/s ²										
Operating torque		0.2 Ncm										
Starting torque		0.3 Ncm										
Permissible shaft movement static		radial/axial ± 0.1 mm/± 0.2 mm										
dynamic		radial/axial ± 0.05 mm/± 0.1 mm										
Life of ball bearings		3.6 x 10 ⁹ revolutions										
Working temperature range		-20 ... +110 °C										
Storage temperature range ¹⁾		-40 ... +125 °C										
Permissible relative humidity ²⁾		90 %										
Resistance to shocks ³⁾		100/6 g/ms										
to vibration ⁴⁾		50/10 ... 2000 g/Hz										
Protection to IEC 60529 ⁵⁾		IP 50										
EMC ⁶⁾												
Operating voltage range		7 ... 12 V										
Recommended supply voltage		8 V										
Max. operating current, no load		60 mA										
Available memory area within EEPROM ⁷⁾		1,792 bytes										
Interface signals												
Process data channel = SIN, REFSIN, COS, REFCOS		Analogue, differential										
Parameter channel = RS 485		Digital										

¹⁾ Without packaging

²⁾ Condensation not permissible

³⁾ To DIN EN 60068-2-27

⁴⁾ To DIN EN 60068-2-6

⁵⁾ With mating connector inserted and closed cover

⁶⁾ To DIN EN 61000-6-2 and DIN EN 61000-6-3

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 screen. This is also where the GND (0 V) connection of the supply voltage is linked to earth.

Users must perform their own tests when other screen designs are used.

⁷⁾ If applying the electronic type label, in connection with numeric controllers, attention should be paid to Patent EP 425 912 B 2; Application of the electronic type label in connection with speed regulation is exempt.

Ordering information

SKS/SKM36 Tapered shaft

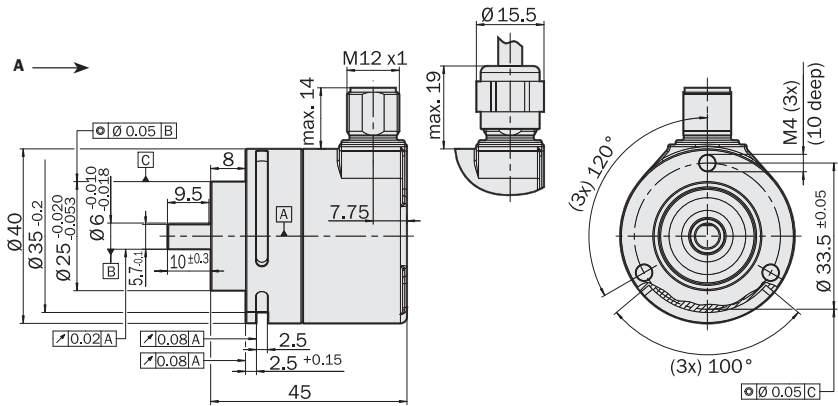
Type	Part no.	Description
SKS36-HFAO-K02	1034095	Singleturn
SKM36-HFAO-K02	1034094	Multiturn

128 sine/cosine periods

Motor Feedback Systems

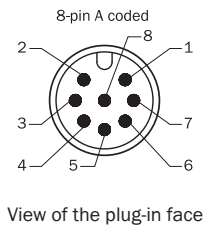
- 128 sine/cosine periods per revolution
- Absolute position with a resolution of 4,096 steps per revolution
- 4,096 revolutions can be measured (multiturn)
- Programming of the positional value
- Electronic type label

Dimensional drawing SKS/SKM36 Standalone, Servo/Face Mount flange



General tolerances to DIN ISO 2768-mk

PIN and wire allocation

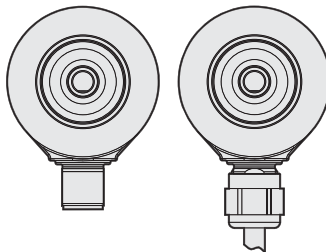


PIN	Colour of wires	Signal	Explanation
1	brown	REFSIN	Process data channel
2	white	+ SIN	Process data channel
3	black	REFCOS	Process data channel
4	pink	+ COS	Process data channel
5	grey or yellow	Daten +	RS-485 Parameter channel
6	green or purple	Daten -	RS-485 Parameter channel
7	blue	GND	Ground connection
8	red	+ U _s	Encoder Supply voltage
	Screen		Housing potential



Connection type

- Connector radial Cable radial



Accessories

Connection systems (page 322)

Mounting systems (page 325)

Programming tool (page 322)

Technical data to DIN 32878		Solid shaft 6 mm SKS/SKM36		SKS	SKM								
Number of sine/cosine periods per revolution	128												
Number of the absolute ascertainable revolutions													
	Single SKS	1											
	Multi SKM	4,096											
Dimensions	mm (see dimensional drawing)												
Mass	0.14 kg												
Inertial rotor moment	6 g/cm ²												
Code type for the absolute value	Binary												
Code sequence for clockwise shaft rotation, looking in direction "A" (see dimensional drawing)	Increasing												
Measurement step at interpolation of the sine/cosine signals with e. g. 12 bits	2.5 angular seconds												
Error limits for the digital absolute value													
via RS 485	± 320 angular seconds												
Error limits for evaluating the "128" signals,													
Non-linearity	± 120 angular seconds												
Output frequency for sine/cosine signals	0 ... 65 kHz												
Operating speed	6,000 min ⁻¹												
Max. angular acceleration	5 x 10 ⁵ rad/s ²												
Operating torque	0.6 Ncm												
Starting torque	0.9 Ncm												
Load capacity of shaft													
radial/axial	10 Nm/5 Nm												
Life of ball bearings	2 x 10 ⁹ revolutions												
Working temperature range	-20 ... +100 °C												
Storage temperature range ¹⁾	-40 ... +125 °C												
Permissible relative humidity ²⁾	90 %												
Resistance													
to shocks ³⁾	100 g / 6 ms												
to vibration ⁴⁾	50 g / 10 ... 2000 Hz												
Protection to IEC 60529 ⁵⁾	IP 65												
EMC ⁶⁾													
Operating voltage range	7 ... 12 V												
Recommended supply voltage	8 V												
Max. operating current, no load	60 mA												
Available memory area within EEPROM ⁷⁾	1,792 bytes												
Interface signals													
Process data channel = SIN, REFSIN, COS, REFCOS	Analogue, differential												
Parameter channel = RS 485	Digital												

¹⁾ Without packaging

²⁾ Condensation not permissible

³⁾ To DIN EN 60068-2-27

⁴⁾ To DIN EN 60068-2-6

⁵⁾ With mating connector inserted

⁶⁾ To DIN EN 61000-6-2 and DIN EN 61000-6-3

⁷⁾ If applying the electronic type label, in connection with numeric controllers, attention should be paid to Patent EP 425 912 B 2; Application of the electronic type label in connection with speed regulation is exempt.

Ordering information

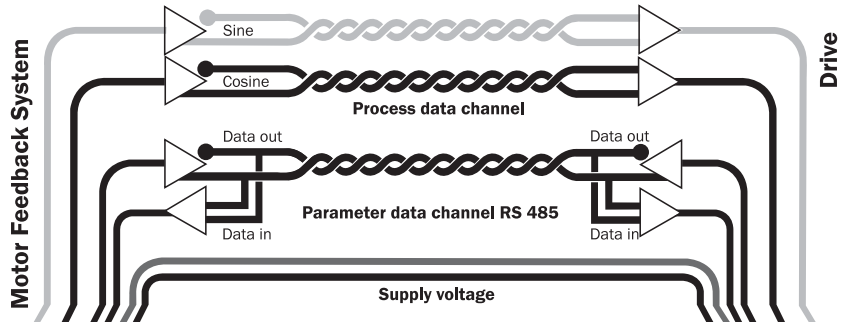
SKS/SKM36, Standalone; Solid shaft 6 mm; Servo/Face Mount Flange

Type	Part no.	Description
SKS36-HVA0-K02	1035603	Singleturn; EEPROM 2048; Connector
SKS36-HVV0-K02	1035604	Singleturn; EEPROM 2048; Cable 1.5 m
SKM36-HVA0-K02	1035601	Multiturn; EEPROM 2048; Connector
SKM36-HVV0-K02	1035602	Multiturn; EEPROM 2048; Cable 1.5 m



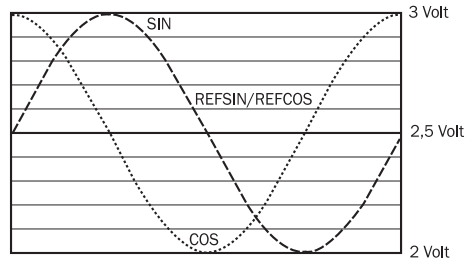
Electrical interface

- Safe data transmission
- High information content
- Electronic type label
- Only 8 leads
- Bus-enabled parameter channel
- Process data channel in real time



Signal specification of the process data channel

Signal diagram for clockwise rotation of the shaft, looking in direction "A"



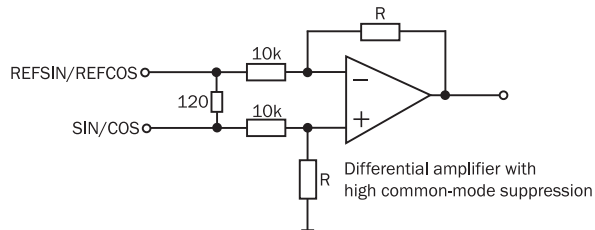
Access to the process data used for speed control, i.e. to the sine and cosine signals, is practically always "online". When the supply voltage is applied, the speed controller has access to this information at any time.

Sophisticated technology guarantees stable amplitudes of the analogue signals across all specified environmental conditions, with a maximum variation of only 30 %.

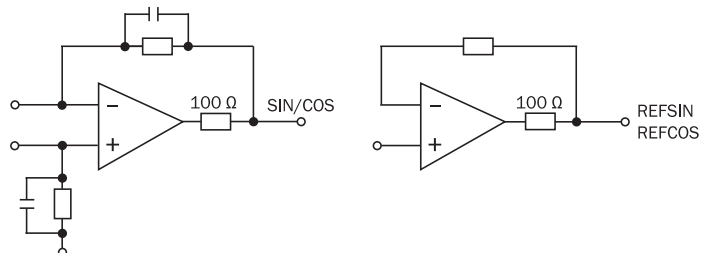
Characteristics applicable to all permissible environmental conditions

Signal	Value/Units
Signal peak, peak V_{SS} of SIN, COS	0.8 ... 1.1 V
Signal offset REFSIN, REFCOS	2.2 ... 2.8 V

Recommended receiver circuit for sine and cosine signals



The output circuit of the process data channel within the SinCos encoder





Type-specific settings	SKS	SKM
Type ID (command 52h)	32h	37h
Free EEPROM [bytes]	1,792	1,792
Address	40h	40h
Mode_485	E4h	E4h
Codes 0 ... 3	55h	55h
Counter	0	0

Overview of commands supported			SKS	SKM
Command byte	Function	Code 0 ¹⁾	Comments	Comments
42h	Read position			
43h	Set position	•		
44h	Read analogue value		Channel number 48h Temperature [°C]	Channel number 48h Temperature [°C]
46h	Read counter			
47h	Increase counter			
49h	Reset counter	•		
4Ah	Read data			
4Bh	Save 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 name plate		Encoder type = 32h	Encoder type = 37h
53h	Encoder reset			
55h	Allocate encoder address	•		
56h	Read serial number and program version			
57h	Configure serial interface	•		

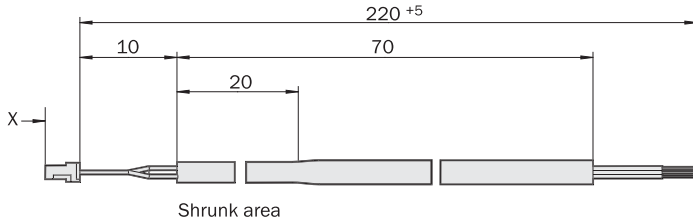
¹⁾ The commands thus labelled include the parameter "Code 0". Code 0 is a byte inserted into the protocol, for additional safeguarding of vital system parameters against accidental overwriting. When shipped, "Code 0" = 55h.

Overview of status messages				
Error type	Status code	Description	SKS	SKM
	00h	The encoder has recognised no error	•	•
Initialisation	01h	Faulty compensating data	•	•
	02h	Faulty internal angular offset	•	•
	03h	Data field partitioning table damaged	•	•
	04h	Analogue limit values not available	•	•
	05h	Internal I ² C bus not operational	•	•
	06h	Internal checksum error	•	•
Protocol	07h	Encoder reset occurred as a result of program monitoring	•	•
	09h	Parity error	•	•
	0Ah	Checksum of the data transmitted is incorrect	•	•
	0Bh	Unknown command code	•	•
	0Ch	Number of data transmitted is incorrect	•	•
	0Dh	Command argument transmitted is not allowed	•	•
Data	0Eh	The selected data field must not be written to	•	•
	0Fh	Incorrect access code	•	•
	10h	Size of data field stated cannot be changed	•	•
	11h	Word address stated, is outside data field	•	•
	12h	Access to non-existent data field	•	•
	Position	01h	Analogue signals outside specification	
1Fh		Speed too high, no position formation possible		
20h		Singleturn position unreliable	•	•
21h		Positional error Multiturn		•
22h		Positional error Multiturn		•
23h		Positional error Multiturn		•
Other	1Ch	Monitoring the value of the analogue signals (process data)		
	1Dh	LED current critical (dirt, LED breakage)	•	•
	1Eh	Encoder temperature critical	•	•
	08h	Counter overflow	•	•

Dimensional drawings and ordering information

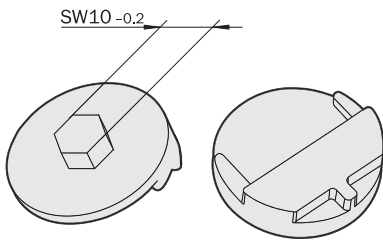
Stranded cable/connector, straight, 8 wires, 8 x 0.15 mm²

Type	Part no.	Contacts	Wire length
DOL-0J08-G0M2XB6	2031086	8	0.2 m



Assembly tool

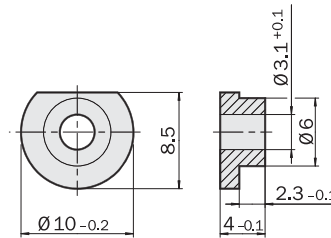
Type	Part no.	Description
BEF-MW-SKX36	2031079	Assembly tool SKX36



General tolerances according to DIN ISO 2768-mk

Servo clamps, Set (comprises 3 pieces)

Type	Part no.	Description
BEF-WK-RESOL	2039082	Servo clamp



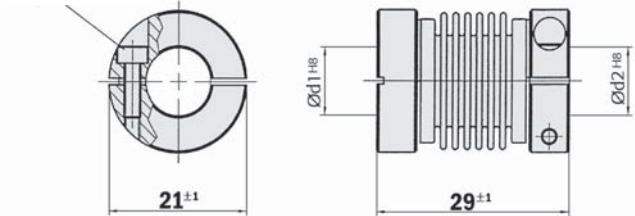
General tolerances according to DIN ISO 2768-mk

Couplings

Bellows coupling, max. shaft offset radial ± 0.3 mm, axial 0.4 mm, angle ± 4 degrees, torsion spring stiffness 120 Nm/rad, bellows of stainless steel, hubs of aluminium

Type	Part no.	Shaft diameter
KUP-0606-B	5312981	6 mm ... 6 mm
KUP-0610-B	5312982	6 mm ... 10 mm

Cheese-head screw
M2.5x8 DIN912 A2



Programming tool for HIPERFACE® devices

Type	Part no.	Motor Feedback System
PGT-03-S	1034252	SKS/SKM36

Dimensional drawings and ordering information

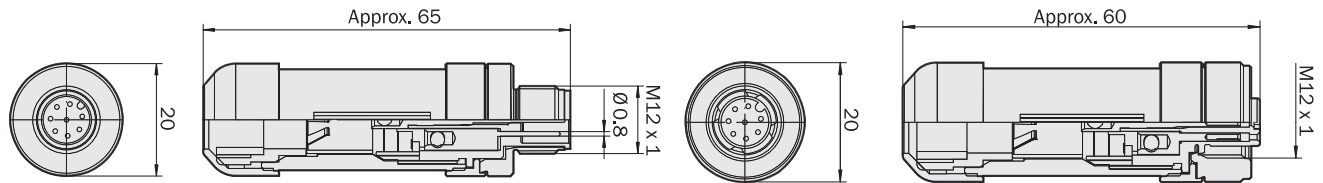
Round screw system M12

Loose male connector M12, 8-pin, straight, screened,
for field assembly (adapter side)

Type	Part no.	Contacts/cable diameter
STE-1208-GA	6028370	8 / 4 ... 8 mm

Loose female connector M12, 8-pin, straight, screened,
for field assembly (encoder side)

Type	Part no.	Contacts/cable diameter
DOS-1208-GA	6028369	8 / 4 ... 8 mm

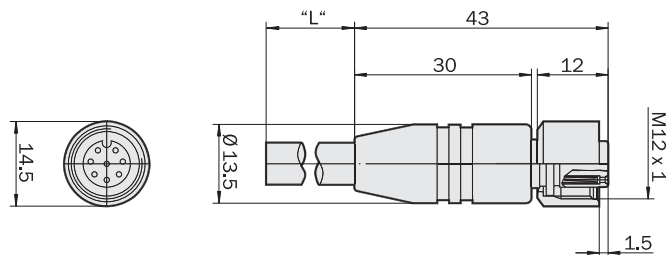
Cable HIPERFACE®, 8-wire, per metre 4 x 2 x 0.15 mm²

Type	Part no.	Wires
LTG-2708-MW	6028361	8

Female connector M12, 8-pin, straight, pre-wired with cable

8-wire, 4 x 2 x 0.25 mm², screened, flexible (adapter side)

Type	Part no.	Contacts	Cable length
DOL-1208-G02MAC1	6032866	8	2.0 m
DOL-1208-G05MAC1	6032867	8	5.0 m
DOL-1208-G10MAC1	6032868	8	10.0 m
DOL-1208-G20MAC1	6032869	8	20.0 m

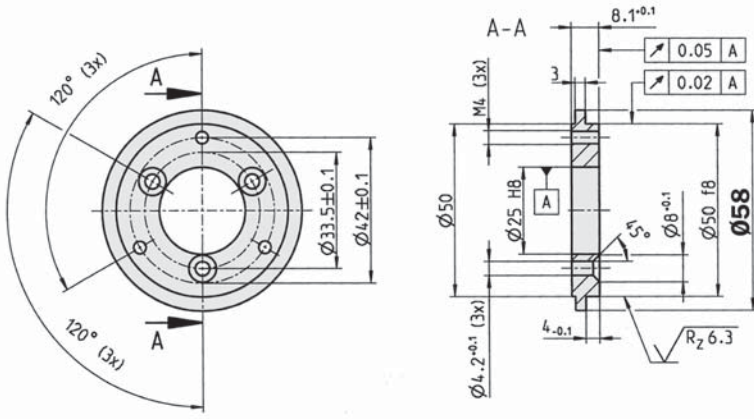


Dimensional drawings and ordering information

Mechanical Adapters

Adapter flange of aluminium for face mount flange, spigot 25 mm

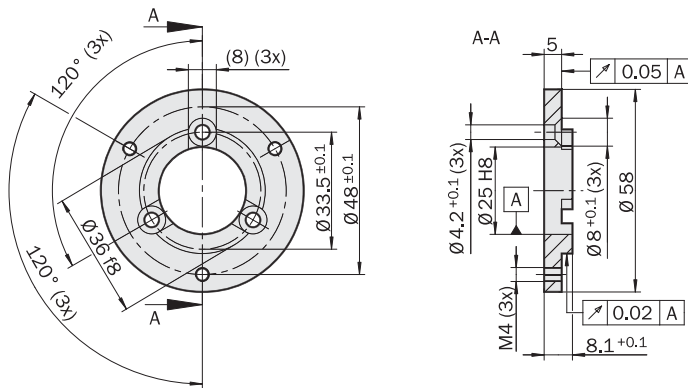
Type	Part no.	Adaption
BEF-FA-025-050	2032622	To 50 mm servo flange



General tolerances according to DIN ISO 2768-mk

Adapter flange of aluminium for face mount flange, spigot 25 mm

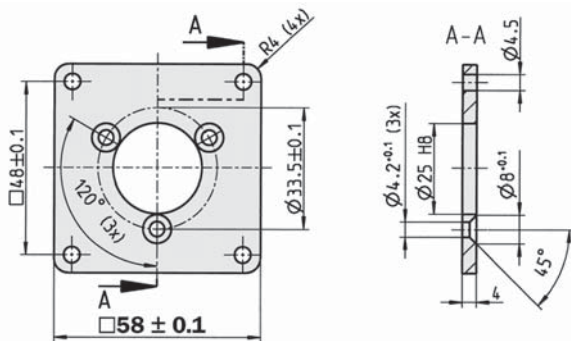
Type	Part no.	Adaption
BEF-FA-025-036	2034226	To 36 mm face mount flange



General tolerances according to DIN ISO 2768-mk

Adapter flange of aluminium for face mount flange, spigot 25 mm

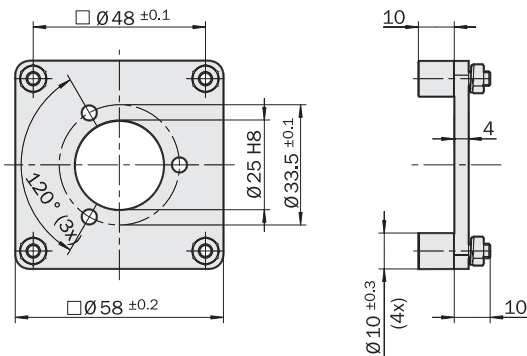
Type	Part no.	Adaption
BEF-FA-025-060RCA	2032623	To 60 mm square mounting plate



General tolerances according to DIN ISO 2768-mk

Adapter flange of aluminium for face mount flange, spigot 25 mm

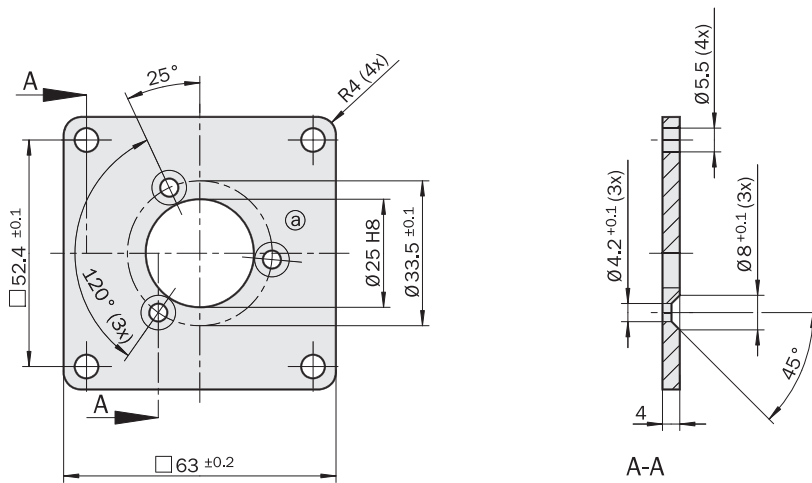
Type	Part no.	Adaption
BEF-FA-025-060RSA	2032624	To 60 mm square mounting plate with shock absorbers



General tolerances according to DIN ISO 2768-mk

Adapter flange of aluminium for face mount flange, spigot 25 mm

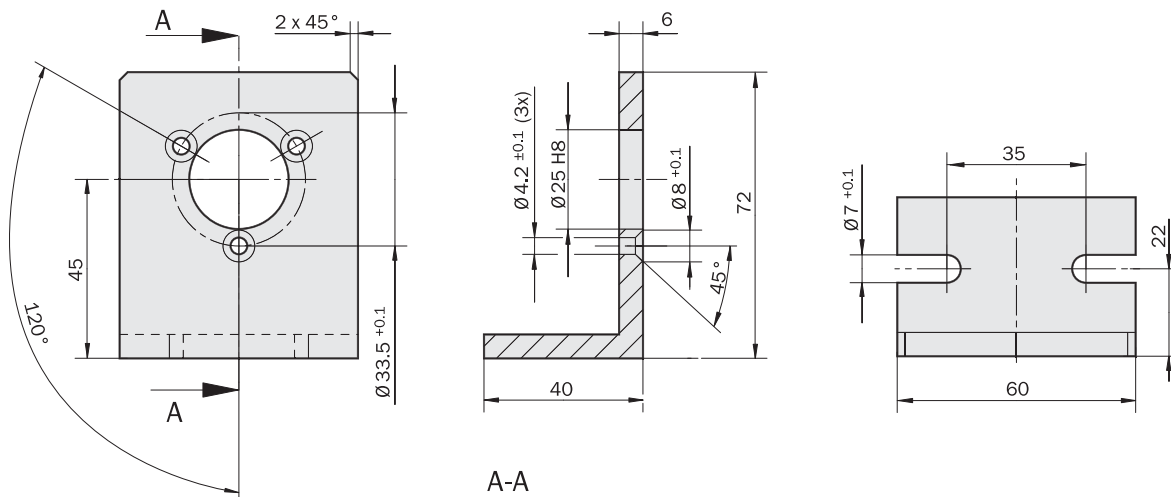
Type	Part no.	Adaption
BEF-FA-025-063REC	2033631	To 63 mm square mounting plate



General tolerances according to DIN ISO 2768-mk

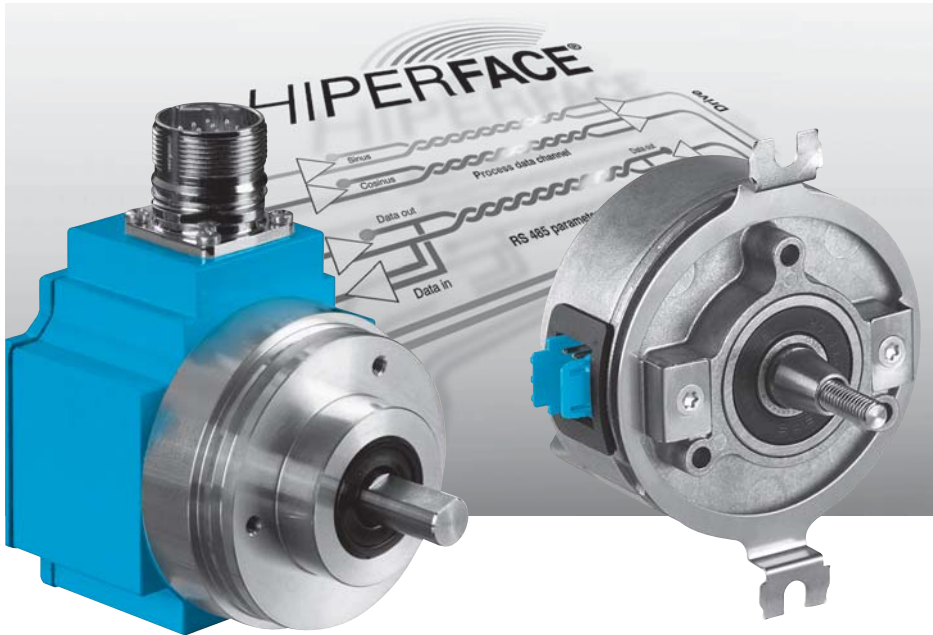
Mounting angle incl. fixing set for encoder with face mount flange

Type	Part no.	Flange spigot
BEF-WF-25	2032621	Diameter 25 mm






SinCos® SRS50, SRM50, SRS50 Standalone, SRM50 Standalone Generation 2: Motor Feedback Systems with HIPERFACE® interface for Servo Motors



Writing motor-specific data to the electronic type label and programming are important features of these series.

Features of Generation 2:


- Shorter body reduces the encoder's installation depth
- Higher precision due to widely spaced bearings
- RoHS-compliant product range
- Reverse polarity protected

	1,024 sine/ cosine periods
Motor Feedback Systems	

SRS/SRM series of Motor Feedback Systems are used worldwide in many different applications and environments.

Absolute positioning with 32,768 steps per revolution and a maximum of 4,096 revolutions give a total resolution of 134,217,728 steps.

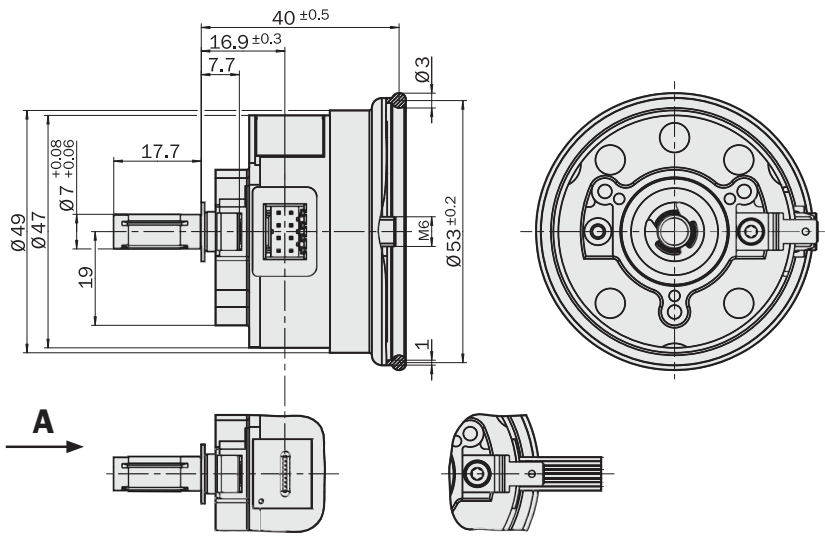


 **1,024 sine/cosine periods**

Motor Feedback Systems

- 1,024 sine/cosine periods per revolution
- Absolute position with a resolution of 32,768 steps per revolution
- 4,096 revolutions measurable (Multiturn)
- Programming of the positional value
- Electronic type label

Dimensional drawing SRS/SRM50, rubber support Ø 50

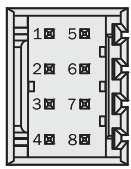
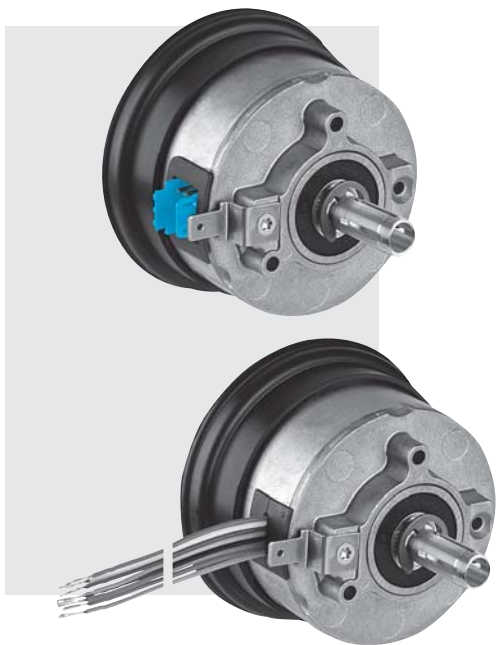


General tolerances according to DIN ISO 2768-mk

PIN and wire allocation

PIN	Signal	Colour of Wires	Explanation
1	Us	red	Supply voltage 7 ... 12 V
2	GND	blue	Ground connection
3	REFSIN	brown	Process data channel
4	REFCOS	black	Process data channel
5	Data +	grey or yellow	RS-485-parameter channel
6	Data -	green or purple	RS-485-parameter channel
7	+ SIN	white	Process data channel
8	+ COS	pink	Process data channel

Caution: To ensure proper function, the screen connection strand (200 mm) MUST be connected. It is included in the supply.



Accessories

Connection systems (page 346)
Mounting systems (page 346)
Programming tool (page 346)

Technical data to DIN 32878		Plug-in shaft SRS/SRM50	SRS	SRM								
Number of sine/cosine periods per revolution		1,024										
Number of the absolute ascertainable revolutions	Single SRS	1										
	Multi SRM	4,096										
Dimensions		mm (see dimensional drawing)										
Mass		0.20 kg										
Moment of inertia to the rotor		10 gcm ²										
Code type for the absolut value		Binary										
Code sequence for clockwise shaft rotation, looking in direction "A" (see dimensional drawing)		Increasing										
Measurement step at interpolation of the sine/cosine signals with e. g. 12 bits		0.3 angular seconds										
Error limits for evaluating the sine/cosine signals												
integral non-linearity		± 45 angular seconds ¹⁾										
Non-linearity within 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 produced		6,000 min ⁻¹										
Max. operating speed		12,000 min ⁻¹										
Max. angular acceleration		0.2 x 10 ⁶ rad/s ²										
Operating torque		0.2 Ncm										
Starting torque		0.4 Ncm										
Permissible shaft movement												
static	radial/axial	± 0.5 mm/± 0.75 mm										
dynamic	radial/axial	± 0.1 mm/± 0.2 mm										
Angular motion, perpendicular to the rotational axis												
static		± 0.005 mm/mm										
dynamic		± 0.0025 mm/mm										
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 ²⁾		90 %										
Resistance												
To shocks ³⁾		100 g/10 ms										
To vibration ⁴⁾		20 g/10 ... 2000 Hz										
Protection class to IEC 60529 ⁵⁾		IP 40										
EMC ⁶⁾												
Operating voltage range		7 ... 12 V										
Recommended supply voltage		8 V										
Max. operating current, no load		80 mA										
Available memory area												
Within EEPROM 512 ⁷⁾		128 bytes										
Within EEPROM 2048 ⁷⁾		1,792 bytes										
Interface signals												
Process data channel = SIN, REFSIN, COS, REFCOS	Analogue, differential											
Parameter channel = RS 485	Digital											

¹⁾ Without mechanical tension of the stator coupling

²⁾ Condensation not permitted

³⁾ To EN 60068-2-27

⁴⁾ To EN 60068-2-6

⁵⁾ With mating connector inserted

⁶⁾ To EN 61000-6-2 and EN 61000-6-3

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 screen. This is also where the GND (0 V) connection of the supply voltage is linked to earth. Users must perform their own tests when other screen designs are used.

⁷⁾ If applying the electronic type label, in connection with numeric controllers, attention should be paid to Patent EP 425 912 B 2; Application of the electronic type label in connection with speed regulation is exempt.

Ordering information

SRS/SRM50; plug-in shaft Ø 7mm; rubber support

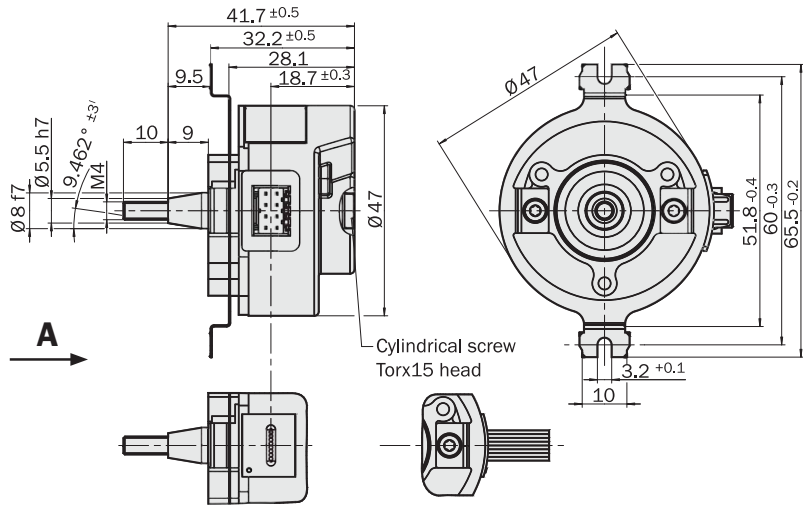
Type	Part no.	Description
SRS50-HAA0-K21	1037059	Single, 512 EEprom, connector
SRS50-HAV0-K21	1037061	Single, 512 EEprom, stranded cable
SRS50-HAA0-K22	1037060	Single, 2048 EEprom, connector
SRS50-HAV0-K22	1037062	Single, 2048 EEprom, stranded cable
SRM50-HAA0-K21	1037063	Multi, 512 EEprom, connector
SRM50-HAV0-K21	1037065	Multi, 512 EEprom, stranded cable
SRM50-HAA0-K22	1037064	Multi, 2048 EEprom, connector
SRM50-HAV0-K22	1037066	Multi, 2048 EEprom, stranded cable

1,024 sine/cosine periods

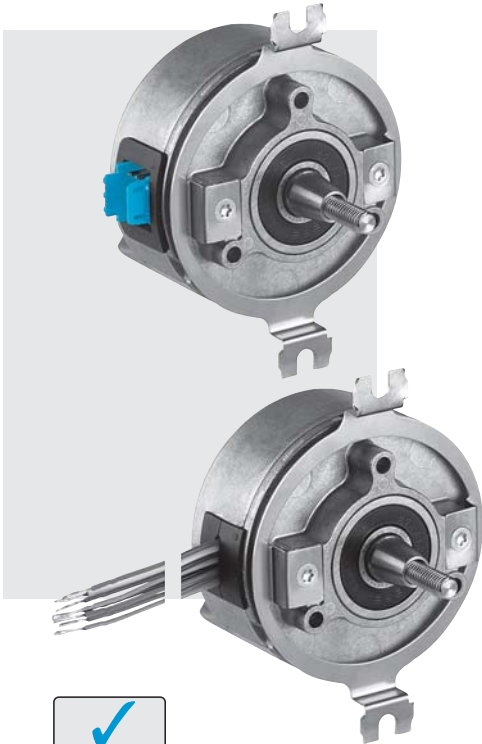
Motor Feedback Systems

- 1,024 sine/cosine periods per revolution
- Absolute position with a resolution of 32,768 steps per revolution
- 4,096 revolutions measurable (Multiturn)
- Programming of the positional value
- Electronic type label

Dimensional drawing SRS/SRM50, spring mounting plate Ø 66

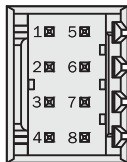


General tolerances according to DIN ISO 2768-mk



PIN and wire allocation

PIN	Signal	Colour of Wires	Explanation
1	Us	red	Supply voltage 7 ... 12 V
2	GND	blue	Ground connection
3	REFSIN	brown	Process data channel
4	REFCOS	black	Process data channel
5	Data +	grey or yellow	RS-485-parameter channel
6	Data -	green or purple	RS-485-parameter channel
7	+ SIN	white	Process data channel
8	+ COS	pink	Process data channel



Shielding:

The encoder housing for the integrated encoder is connected to the motor, via the torque support. The connection space is thus screened via the motor housing such that, within the connection space, unshielded connection strands can be used.

Accessories

Connection systems (page 346)
Mounting systems (page 346)
Programming tool (page 346)

Technical data to DIN 32878		Tapered shaft SRS/SRM50	SRS	SRM								
Number of sine/cosine periods per revolution		1,024										
Number of the absolute ascertainable revolutions	Single SRS	1										
	Multi SRM	4,096										
Dimensions		mm (see dimensional drawing)										
Mass		0.20 kg										
Moment of inertia to the rotor		10 gcm ²										
Code type for the absolut value		Binary										
Code sequence for clockwise shaft rotation, looking in direction "A" (see dimensional drawing)		Increasing										
Measurement step at interpolation of the sine/cosine signals with e. g. 12 bits		0.3 angular seconds										
Error limits for evaluating the sine/cosine signals												
integral non-linearity		± 45 angular seconds ¹⁾										
Non-linearity within 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 produced		6,000 min ⁻¹										
Max. operating speed		12,000 min ⁻¹										
Max. angular acceleration		0.2 x 10 ⁶ rad/s ²										
Operating torque		0.2 Ncm										
Starting torque		0.4 Ncm										
Permissible shaft movement												
static	radial/axial	± 0.5 mm/± 0.75 mm										
dynamic	radial/axial	± 0.1 mm/± 0.2 mm										
Angular motion, perpendicular to the rotational axis												
static		± 0.005 mm/mm										
dynamic		± 0.0025 mm/mm										
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 ²⁾		90 %										
Resistance												
To shocks ³⁾		100 g/10 ms										
To vibration ⁴⁾		20 g/10 ... 2000 Hz										
Protection class to IEC 60529 ⁵⁾		IP 40										
EMC ⁶⁾												
Operating voltage range		7 ... 12 V										
Recommended supply voltage		8 V										
Max. operating current, no load		80 mA										
Available memory area												
Within EEPROM 512 ⁷⁾		128 bytes										
Within EEPROM 2048 ⁷⁾		1,792 bytes										
Interface signals												
Process data channel = SIN, REFSIN, COS, REFCOS	Analogue, differential											
Parameter channel = RS 485	Digital											

¹⁾ Without mechanical tension of the stator coupling

²⁾ Condensation not permitted

³⁾ To EN 60068-2-27

⁴⁾ To EN 60068-2-6

⁵⁾ With mating connector inserted

⁶⁾ To EN 61000-6-2 and EN 61000-6-3

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 screen. This is also where the GND (0 V) connection of the supply voltage is linked to earth. Users must perform their own tests when other screen designs are used.

⁷⁾ If applying the electronic type label, in connection with numeric controllers, attention should be paid to Patent EP 425 912 B 2; Application of the electronic type label in connection with speed regulation is exempt.

Ordering information

SRS/SRM50; tapered shaft; spring mounting plate

Type	Part no.	Description
SRS50-HFA0-K21	1037067	Single, 512 EEprom, connector
SRS50-HFV0-K21	1037069	Single, 512 EEprom, stranded cable
SRS50-HFA0-K22	1037068	Single, 2048 EEprom, connector
SRS50-HFV0-K22	1037070	Single, 2048 EEprom, stranded cable
SRM50-HFA0-K21	1037071	Multi, 512 EEprom, connector
SRM50-HFV0-K21	1037073	Multi, 512 EEprom, stranded cable
SRM50-HFA0-K22	1037072	Multi, 2048 EEprom, connector
SRM50-HFV0-K22	1037074	Multi, 2048 EEprom, stranded cable

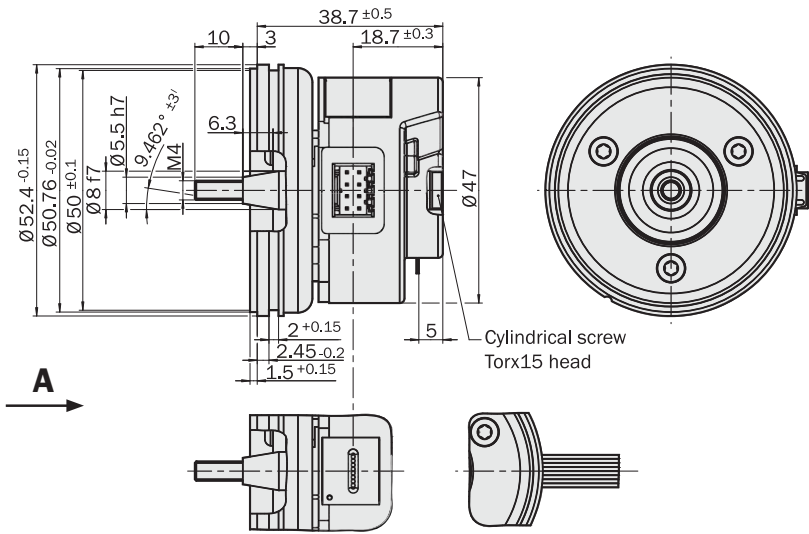
1,024 sine/cosine periods

Motor Feedback Systems

- 1,024 sine/cosine periods per revolution
- Absolute position with a resolution of 32,768 steps per revolution
- 4,096 revolutions measurable (Multiturn)
- Programming of the positional value
- Electronic type label



Dimensional drawing SRS/SRM50, resolver support Ø 52

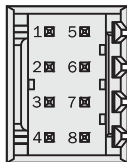


General tolerances according to DIN ISO 2768-mk

PIN and wire allocation

PIN	Signal	Colour of Wires	Explanation
1	Us	red	Supply voltage 7 ... 12 V
2	GND	blue	Ground connection
3	REFSIN	brown	Process data channel
4	REFCOS	black	Process data channel
5	Data +	grey or yellow	RS-485-parameter channel
6	Data -	green or purple	RS-485-parameter channel
7	+ SIN	white	Process data channel
8	+ COS	pink	Process data channel

Caution: To ensure proper function, the screen connection strand (200 mm) MUST be connected. It is included in the supply.



Accessories

Connection systems (page 346)
Mounting systems (page 346)
Programming tool (page 346)

Technical data to DIN 32878		Tapered shaft SRS/SRM50	SRS	SRM								
Number of sine/cosine periods per revolution		1,024										
Number of the absolute ascertainable revolutions	Single SRS	1										
	Multi SRM	4,096										
Dimensions		mm (see dimensional drawing)										
Mass		0.20 kg										
Moment of inertia to the rotor		10 gcm ²										
Code type for the absolut value		Binary										
Code sequence for clockwise shaft rotation, looking in direction "A" (see dimensional drawing)		Increasing										
Measurement step at interpolation of the sine/cosine signals with e. g. 12 bits		0.3 angular seconds										
Error limits for evaluating the sine/cosine signals												
integral non-linearity		± 45 angular seconds ¹⁾										
Non-linearity within 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 produced		6,000 min ⁻¹										
Max. operating speed		12,000 min ⁻¹										
Max. angular acceleration		0.2 x 10 ⁶ rad/s ²										
Operating torque		0.2 Ncm										
Starting torque		0.4 Ncm										
Permissible shaft movement												
static	radial/axial	± 0.5 mm/± 0.75 mm										
dynamic	radial/axial	± 0.1 mm/± 0.2 mm										
Angular motion, perpendicular to the rotational axis												
static		± 0.005 mm/mm										
dynamic		± 0.0025 mm/mm										
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 ²⁾		90 %										
Resistance												
To shocks ³⁾		100 g/10 ms										
To vibration ⁴⁾		20 g/10 ... 2000 Hz										
Protection class to IEC 60529 ⁵⁾		IP 40										
EMC ⁶⁾												
Operating voltage range		7 ... 12 V										
Recommended supply voltage		8 V										
Max. operating current, no load		80 mA										
Available memory area												
Within EEPROM 512 ⁷⁾		128 bytes										
Within EEPROM 2048 ⁷⁾		1,792 bytes										
Interface signals												
Process data channel = SIN, REFSIN, COS, REFCOS	Analogue, differential											
Parameter channel = RS 485	Digital											

¹⁾ Without mechanical tension of the stator coupling

²⁾ Condensation not permitted

³⁾ To EN 60068-2-27

⁴⁾ To EN 60068-2-6

⁵⁾ With mating connector inserted

⁶⁾ To EN 61000-6-2 and EN 61000-6-3

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 screen. This is also where the GND (0 V) connection of the supply voltage is linked to earth. Users must perform their own tests when other screen designs are used.

⁷⁾ If applying the electronic type label, in connection with numeric controllers, attention should be paid to Patent EP 425 912 B 2; Application of the electronic type label in connection with speed regulation is exempt.

Ordering information

SRS/SRM50; tapered shaft; resolver support

Type	Part no.	Description
SRS50-HGA0-K21	1037075	Single, 512 EEPROM, connector
SRS50-HGV0-K21	1037077	Single, 512 EEPROM, stranded cable
SRS50-HGA0-K22	1037076	Single, 2048 EEPROM, connector
SRS50-HGV0-K22	1037078	Single, 2048 EEPROM, stranded cable
SRM50-HGA0-K21	1037079	Multi, 512 EEPROM, connector
SRM50-HGV0-K21	1037081	Multi, 512 EEPROM, stranded cable
SRM50-HGA0-K22	1037080	Multi, 2048 EEPROM, connector
SRM50-HGV0-K22	1037082	Multi, 2048 EEPROM, stranded cable

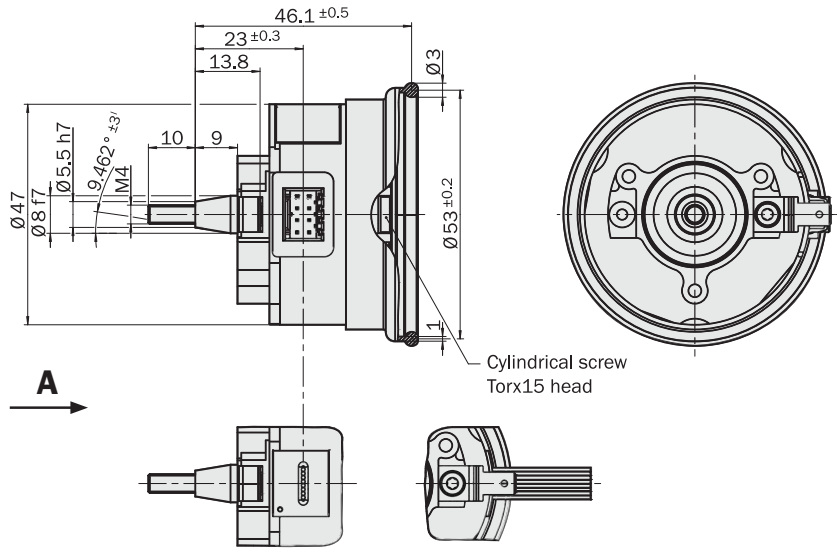


**1,024 sine/
cosine periods**

Motor Feedback Systems

- 1,024 sine/cosine periods per revolution
- Absolute position with a resolution of 32,768 steps per revolution
- 4,096 revolutions measurable (Multiturn)
- Programming of the positional value
- Electronic type label

Dimensional drawing SRS/SRM50, rubber support Ø 50

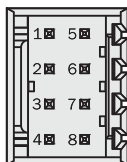


General tolerances according to DIN ISO 2768-mk

PIN and wire allocation

PIN	Signal	Colour of Wires	Explanation
1	Us	red	Supply voltage 7 ... 12 V
2	GND	blue	Ground connection
3	REFSIN	brown	Process data channel
4	REFCOS	black	Process data channel
5	Data +	grey or yellow	RS-485-parameter channel
6	Data -	green or purple	RS-485-parameter channel
7	+ SIN	white	Process data channel
8	+ COS	pink	Process data channel

Caution: To ensure proper function, the screen connection strand (200 mm) MUST be connected. It is included in the supply.



Accessories

- Connection systems (page 346)
- Mounting systems (page 346)
- Programming tool (page 346)

Technical data to DIN 32878		Tapered shaft SRS/SRM50	SRS	SRM								
Number of sine/cosine periods per revolution		1,024										
Number of the absolute ascertainable revolutions	Single SRS	1										
	Multi SRM	4,096										
Dimensions		mm (see dimensional drawing)										
Mass		0.20 kg										
Moment of inertia to the rotor		10 gcm ²										
Code type for the absolut value		Binary										
Code sequence for clockwise shaft rotation, looking in direction "A" (see dimensional drawing)		Increasing										
Measurement step at interpolation of the sine/cosine signals with e. g. 12 bits		0.3 angular seconds										
Error limits for evaluating the sine/cosine signals												
integral non-linearity		± 45 angular seconds ¹⁾										
Non-linearity within 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 produced		6,000 min ⁻¹										
Max. operating speed		12,000 min ⁻¹										
Max. angular acceleration		0.2 x 10 ⁶ rad/s ²										
Operating torque		0.2 Ncm										
Starting torque		0.4 Ncm										
Permissible shaft movement												
static	radial/axial	± 0.5 mm/± 0.75 mm										
dynamic	radial/axial	± 0.1 mm/± 0.2 mm										
Angular motion, perpendicular to the rotational axis												
static		± 0.005 mm/mm										
dynamic		± 0.0025 mm/mm										
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 ²⁾		90 %										
Resistance												
To shocks ³⁾		100 g/10 ms										
To vibration ⁴⁾		20 g/10 ... 2000 Hz										
Protection class to IEC 60529 ⁵⁾		IP 40										
EMC ⁶⁾												
Operating voltage range		7 ... 12 V										
Recommended supply voltage		8 V										
Max. operating current, no load		80 mA										
Available memory area												
Within EEPROM 512 ⁷⁾		128 bytes										
Within EEPROM 2048 ⁷⁾		1,792 bytes										
Interface signals												
Process data channel = SIN, REFSIN, COS, REFCOS	Analogue, differential											
Parameter channel = RS 485	Digital											

¹⁾ Without mechanical tension of the stator coupling

²⁾ Condensation not permitted

³⁾ To EN 60068-2-27

⁴⁾ To EN 60068-2-6

⁵⁾ With mating connector inserted

⁶⁾ To EN 61000-6-2 and EN 61000-6-3

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 screen. This is also where the GND (0 V) connection of the supply voltage is linked to earth. Users must perform their own tests when other screen designs are used.

⁷⁾ If applying the electronic type label, in connection with numeric controllers, attention should be paid to Patent EP 425 912 B 2; Application of the electronic type label in connection with speed regulation is exempt.

Ordering information

SRS/SRM50; tapered shaft; rubber support Ø 50 mm

Type	Part no.	Description
SRS50-HEA0-K21	1037083	Single, 512 EEprom, connector
SRS50-HEV0-K21	1037085	Single, 512 EEprom, stranded cable
SRS50-HEA0-K22	1037084	Single, 2048 EEprom, connector
SRS50-HEV0-K22	1037086	Single, 2048 EEprom, stranded cable
SRM50-HEA0-K21	1037087	Multi, 512 EEprom, connector
SRM50-HEV0-K21	1037089	Multi, 512 EEprom, stranded cable
SRM50-HEA0-K22	1037088	Multi, 2048 EEprom, connector
SRM50-HEV0-K22	1037090	Multi, 2048 EEprom, stranded cable

Technical data to DIN 32878 Standalone, face mount flange SRS/SRM50			SRS	SRM									
Number of sine/cosine periods per revolution		1,024											
Number of the absolute ascertainable revolutions	Single SRS	1											
	Multi SRM	4,096											
Dimensions		mm (see dimensional drawing)											
Mass		0.55 kg											
Moment of inertia to the rotor		25 gcm ²											
Code type for the absolute value		Binary											
Code sequence for clockwise shaft rotation, looking in direction "A" (see dimensional drawing)		Increasing											
Measurement step at interpolation of the sine/cosine signals with e. g. 12 bits		0.3 angular seconds											
Error limits for evaluating the sine/cosine signals													
integral non-linearity		± 45 angular seconds											
Non-linearity within 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 produced		6,000 min ⁻¹											
Max. operating speed		6,000 min ⁻¹											
Max. angular acceleration		0.2 x 10 ⁶ rad/s ²											
Operating torque with shaft sealing ring		1 Ncm											
Starting torque with shaft sealing ring		1.5 Ncm											
Load capacity of shaft	radial/axial	40 N/20 N											
Life of ball bearings		3.6 x 10 ⁹ revolutions											
Working temperature range		-20 ... +85 °C											
Storage temperature range		-30 ... +90 °C											
Permissible relative humidity ¹⁾		90 %											
Resistance													
To shocks ²⁾		30 g/11 ms											
To vibration ³⁾		20 g/10 ... 2000 Hz											
Protection class to IEC 60529 ⁴⁾		IP 65											
EMC ⁵⁾													
Operating voltage range		7 ... 12 V											
Recommended supply voltage		8 V											
Max. operating current, no load		80 mA											
Available memory area													
Within EEPROM 512 ⁶⁾		128 bytes											
Within EEPROM 2048 ⁶⁾		1,792 bytes											
Interface signals													
Process data channel = SIN, REFSIN, COS, REFCOS		Analogue, differential											
Parameter channel = RS 485		Digital											

¹⁾ Condensation not permitted

²⁾ To EN 60068-2-27

³⁾ To EN 60068-2-6

⁴⁾ With mating connector inserted

⁵⁾ To EN 61000-6-2 and EN 61000-6-3


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 screen. This is also where the GND (0 V) connection of the supply voltage is linked to earth. Users must perform their own tests when other screen designs are used.

⁶⁾ If applying the electronic type label, in connection with numeric controllers, attention should be paid to Patent EP 425 912 B 2; Application of the electronic type label in connection with speed regulation is exempt.

Ordering information

SRS/SRM50 Standalone; solid shaft Ø 10 mm; face mount flange

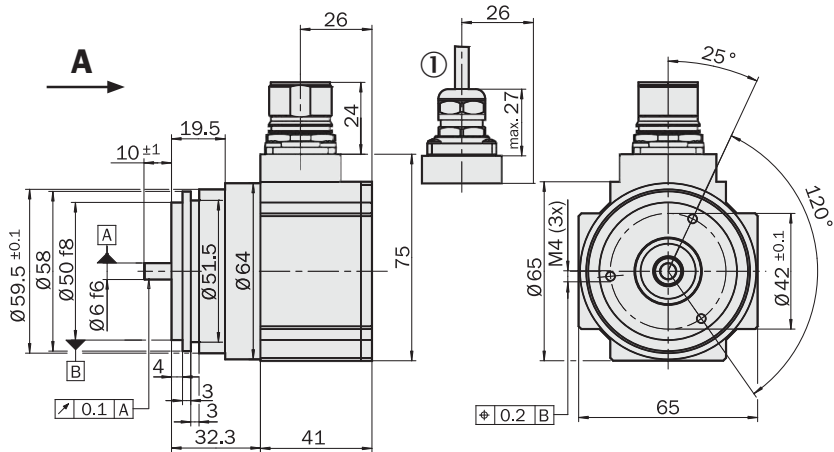
Type	Part no.	Description
SRS50-HWA0-K21	1037091	Single, 512 EEprom, connector
SRS50-HWV0-K21	1037093	Single, 512 EEprom, stranded cable
SRS50-HWA0-K22	1037092	Single, 2048 EEprom, connector
SRS50-HWV0-K22	1037094	Single, 2048 EEprom, stranded cable
SRM50-HWA0-K21	1037095	Multi, 512 EEprom, connector
SRM50-HWV0-K21	1037097	Multi, 512 EEprom, stranded cable
SRM50-HWA0-K22	1037096	Multi, 2048 EEprom, connector
SRM50-HWV0-K22	1037098	Multi, 2048 EEprom, stranded cable

 **1,024 sine/cosine periods**

Motor Feedback Systems

- 1,024 sine/cosine periods per revolution
- Absolute position with a resolution of 32,768 steps per revolution
- 4,096 revolutions measurable (Multiturn)
- Programming of the positional value
- Electronic type label

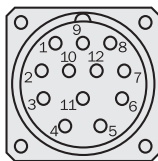
Dimensional drawing SRS50/SRM50 Standalone, rectangular housing, servo flange



① R = min. bending radius 40 mm General tolerances according to DIN ISO 2768-mk

PIN and wire allocation

PIN	Signal	Colour of Wires	Explanation
1	REFCOS	black	Process data channel
2	Data +	grey or yellow	RS-485-parameter channel
3	N. C.	-	N. C.
4	N. C.	-	N. C.
5	SIN	white	Process data channel
6	REFSIN	brown	Process data channel
7	Data -	green or purple	RS-485-parameter channel
8	COS	pink	Process data channel
9	N. C.	-	N. C.
10	GND	blue	Ground connection
11	N. C.	-	N. C.
12	Us	red	7 ... 12 V Supply voltage



View of the plug-in face

Screen connection on connector housing

N. C. = Not connected

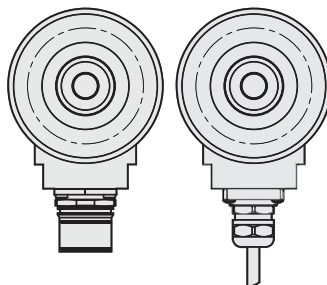


Accessories

- Connection systems (page 346)
- Mounting systems (page 346)
- Programming tool (page 346)

Type of connection

- M23 Connector radial
- Cable radial



Technical data to DIN 32878		Standalone, servo flange SRS/SRM50		SRS	SRM								
Number of sine/cosine periods per revolution		1,024											
Number of the absolute ascertainable revolutions	Single SRS	1											
	Multi SRM	4,096											
Dimensions		mm (see dimensional drawing)											
Mass		0.55 kg											
Moment of inertia to the rotor		25 gcm ²											
Code type for the absolute value		Binary											
Code sequence for clockwise shaft rotation, looking in direction "A" (see dimensional drawing)		Increasing											
Measurement step at interpolation of the sine/cosine signals with e. g. 12 bits		0.3 angular seconds											
Error limits for evaluating the sine/cosine signals													
integral non-linearity		± 45 angular seconds											
Non-linearity within 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 produced		6,000 min ⁻¹											
Max. operating speed		6,000 min ⁻¹											
Max. angular acceleration		0.2 x 10 ⁶ rad/s ²											
Operating torque with shaft sealing ring		1 Ncm											
Starting torque with shaft sealing ring		1.5 Ncm											
Load capacity of shaft	radial/axial	40 N/20 N											
Life of ball bearings		3.6 x 10 ⁹ revolutions											
Working temperature range		-20 ... +85 °C											
Storage temperature range		-30 ... +90 °C											
Permissible relative humidity ¹⁾		90 %											
Resistance													
To shocks ²⁾		30 g/11 ms											
To vibration ³⁾		20 g/10 ... 2000 Hz											
Protection class to IEC 60529 ⁴⁾		IP 65											
EMC ⁵⁾													
Operating voltage range		7 ... 12 V											
Recommended supply voltage		8 V											
Max. operating current, no load		80 mA											
Available memory area													
Within EEPROM 512 ⁶⁾		128 bytes											
Within EEPROM 2048 ⁶⁾		1,792 bytes											
Interface signals													
Process data channel = SIN, REFSIN, COS, REFCOS		Analogue, differential											
Parameter channel = RS 485		Digital											

¹⁾ Condensation not permitted

²⁾ To EN 60068-2-27

³⁾ To EN 60068-2-6

⁴⁾ With mating connector inserted

⁵⁾ To EN 61000-6-2 and EN 61000-6-3

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 screen. This is also where the GND (0 V) connection of the supply voltage is linked to earth. Users must perform their own tests when other screen designs are used.

⁶⁾ If applying the electronic type label, in connection with numeric controllers, attention should be paid to Patent EP 425 912 B 2; Application of the electronic type label in connection with speed regulation is exempt.

Ordering information

SRS/SRM50 Standalone; solid shaft Ø 6 mm; servo flange

Type	Part no.	Description
SRS50-HXA0-K21	1037099	Single, 512 EEprom, connector
SRS50-HXV0-K21	1037101	Single, 512 EEprom, stranded cable
SRS50-HXA0-K22	1037100	Single, 2048 EEprom, connector
SRS50-HXV0-K22	1037102	Single, 2048 EEprom, stranded cable
SRM50-HXA0-K21	1037103	Multi, 512 EEprom, connector
SRM50-HXV0-K21	1037105	Multi, 512 EEprom, stranded cable
SRM50-HXA0-K22	1037104	Multi, 2048 EEprom, connector
SRM50-HXV0-K22	1037106	Multi, 2048 EEprom, stranded cable

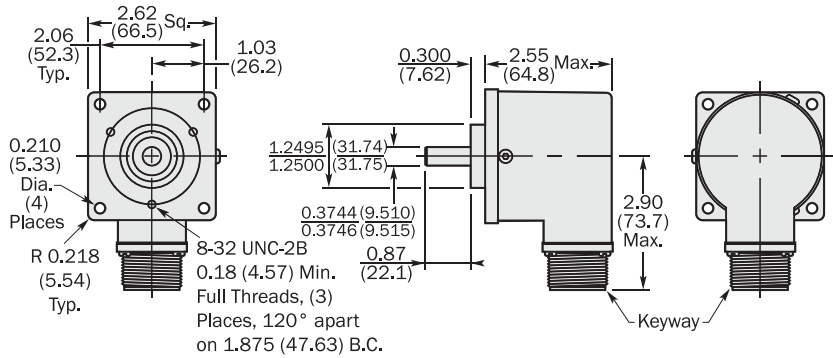
1,024 sine/cosine periods

Motor Feedback Systems

- 1,024 sine/cosine periods per revolution
- Absolute position with a resolution of 32,768 steps per revolution
- 4,096 revolutions measurable (Multiturn)
- Programming of the positional value
- Electronic type label

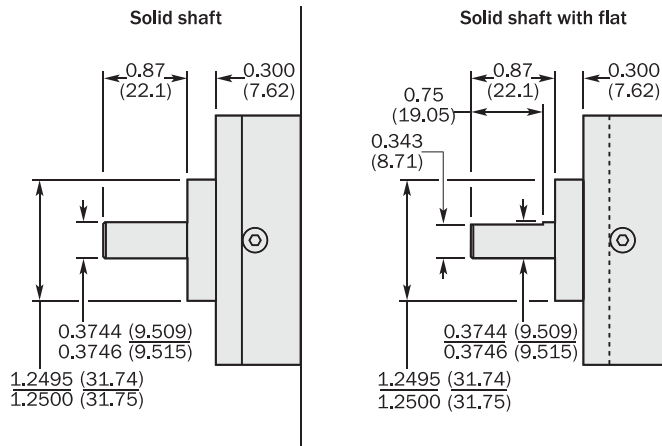


Dimensional drawing SRS50/SRM50 Standalone, square mount flange



All dimensions in inch, dimensions within brackets in mm.

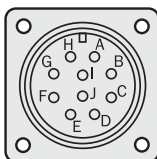
Dimensional drawing shaft options



All dimensions in inch, dimensions within brackets in mm.

PIN and wire allocation

PIN	Signal	Wire colour	Explanation
A	+ U _s	red	7 ... 12 V Supply voltage
B	GND	blue	Ground connection
C	Ref SIN	brown	Process data channel
D	Ref COS	black	Process data channel
E	Data +	grey	RS-485-parameter channel
F	Data -	green	RS-485-parameter channel
G	SIN	white	Process data channel
H	COS	pink	Process data channel
I	N. C.		
J	Housing	Housing	



View of the plug-in face

Screen connection on connector housing

N. C. = Not connected



Accessories

Connection systems (page 346)

Mounting systems (page 346)

Programming tool (page 346)

Technical data to DIN 32878 Standalone, square mount flange SRS/SRM50			SRS	SRM								
Number of sine/cosine periods per revolution		1,024										
Number of the absolute ascertainable revolutions	Single SRS	1										
	Multi SRM	4,096										
Dimensions		mm (see dimensional drawing)										
Mass		0.48 kg										
Moment of inertia to the rotor		28.8 gcm ²										
Code type for the absolute value		Binary										
Code sequence for clockwise shaft rotation, looking in direction "A" (see dimensional drawing)		Increasing										
Measurement step at interpolation of the sine/cosine signals with e. g. 12 bits		0.3 angular seconds										
Error limits for evaluating the sine/cosine signals												
integral non-linearity		± 45 angular seconds										
Non-linearity within 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 produced		6,000 min ⁻¹										
Max. operating speed without shaft sealing ring		6,000 min ⁻¹										
Max. operating speed with shaft sealing ring		3,000 min ⁻¹										
Max. angular acceleration		5 x 10 ⁵ rad/s ²										
Operating torque with shaft sealing ring		1 Ncm										
Starting torque with shaft sealing ring		1.5 Ncm										
Load capacity of shaft	radial/axial	155 N/88 N										
Life of ball bearings		3.6 x 10 ⁹ revolutions										
Working temperature range		0 ... +75 °C										
Storage temperature range		-40 ... +85 °C										
Permissible relative humidity ¹⁾		90 %										
Resistance												
To shocks ²⁾		100 g/10 ms										
To vibration ³⁾		20 g/10 ... 2000 Hz										
Protection class to IEC 60529 ⁴⁾		IP 66										
EMC ⁵⁾												
Operating voltage range		7 ... 12 V										
Recommended supply voltage		8 V										
Max. operating current, no load		80 mA										
Available memory area												
Within EEPROM 512 ⁶⁾		128 bytes										
Interface signals												
Process data channel = SIN, REFSIN, COS, REFCOS		Analogue, differential										
Parameter channel = RS 485		Digital										

¹⁾ Condensation not permitted

²⁾ To EN 60068-2-27

³⁾ To EN 60068-2-6

⁴⁾ With mating connector inserted

⁵⁾ To EN 61000-6-2 and EN 61000-6-3

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 screen. This is also where the GND (0 V) connection of the supply voltage is linked to earth. Users must perform their own tests when other screen designs are used.

⁶⁾ If applying the electronic type label, in connection with numeric controllers, attention should be paid to Patent EP 425 912 B 2; Application of the electronic type label in connection with speed regulation is exempt.

Ordering information

SRS/SRM50 Standalone; solid shaft Ø 3/8"; square mount flange 2,5"

Type	Part no.	Description
SRS50-HTA0-K21	7127309	Single, solid shaft, connector MS/10
SRS50-HUA0-K21	7127310	Single, solid shaft with flat, connector MS/10
SRM50-HTA0-K21	7127313	Multi, solid shaft, connector MS/10
SRM50-HUA0-K21	7127311	Multi, solid shaft with flat, connector MS/10

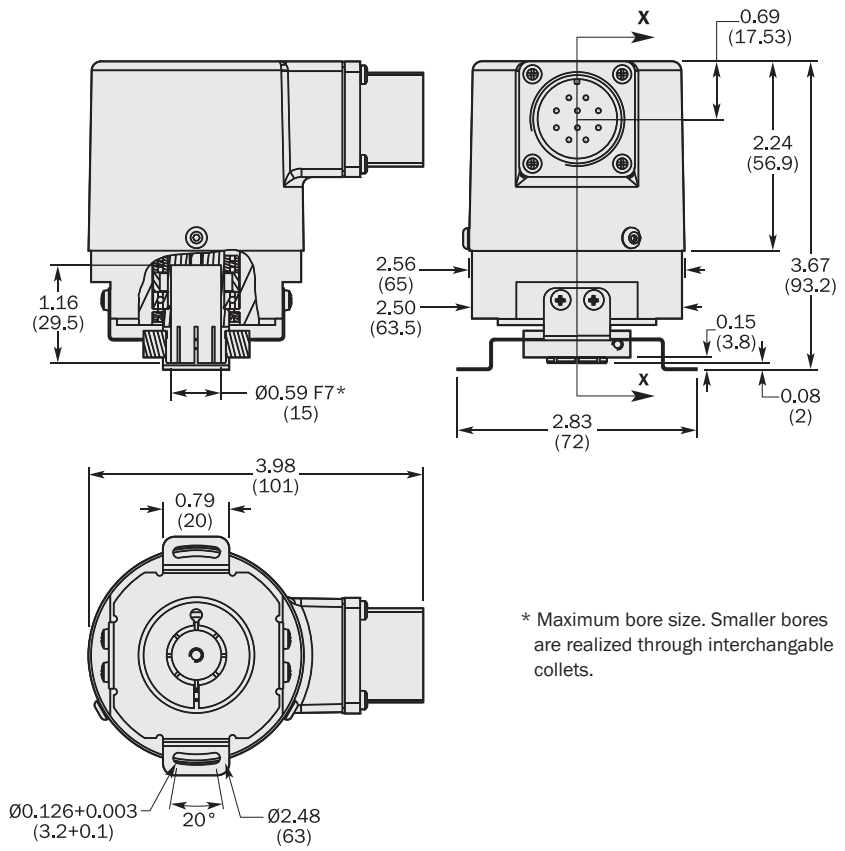
1,024 sine/cosine periods

Motor Feedback Systems

- 1,024 sine/cosine periods per revolution
- Absolute position with a resolution of 32,768 steps per revolution
- 4,096 revolutions measurable (Multiturn)
- Programming of the positional value
- Electronic type label



Dimensional drawing SRS50/SRM50 Standalone, blind hollow shaft

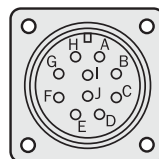


* Maximum bore size. Smaller bores are realized through interchangeable collets.

All dimensions in inch, dimensions within brackets in mm.

PIN and wire allocation

PIN	Signal	Wire colour	Explanation
A	+ U _s	red	7 ... 12 V Supply voltage
B	GND	blue	Ground connection
C	Ref SIN	brown	Process data channel
D	Ref COS	black	Process data channel
E	Data +	grey	RS-485-parameter channel
F	Data -	green	RS-485-parameter channel
G	SIN	white	Process data channel
H	COS	pink	Process data channel
I	N. C.		
J	Housing	Housing	



View of the plug-in face

Screen connection on connector housing

N. C. = Not connected



Accessories

Connection systems (page 346)
Mounting systems (page 346)
Programming tool (page 346)

Technical data to DIN 32878		Standalone, blind hollow shaft SRS/SRM50	SRS	SRM								
Number of sine/cosine periods per revolution		1,024										
Number of the absolute ascertainable revolutions	Single SRS	1										
	Multi SRM	4,096										
Dimensions		mm (see dimensional drawing)										
Mass		0.48 kg										
Moment of inertia to the rotor		50 gcm ² max.										
Code type for the absolut value		Binary										
Code sequence for clockwise shaft rotation, looking in direction "A" (see dimensional drawing)		Increasing										
Measurement step at interpolation of the sine/cosine signals with e. g. 12 bits		0.3 angular seconds										
Error limits for evaluating the sine/cosine signals												
integral non-linearity		± 45 angular seconds										
Non-linearity within 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 produced		3.000 min ⁻¹										
Max. operating speed		3.000 min ⁻¹										
Max. angular acceleration		5 x 10 ⁵ rad/s ²										
Max. operating torque		1.8 Ncm										
Starting torque with shaft sealing ring		2.6 Ncm										
Allowable runout												
static/dynamic radial		± 3/± 1 mm										
static/dynamic axial		± 5/± 2 mm										
Working temperature range		0 ... +75 °C										
Storage temperature range		-40 ... +85 °C										
Permissible relative humidity ¹⁾		90 %										
Resistance												
To shocks ²⁾		100 g/10 ms										
To vibration ³⁾		20 g/10 ... 2000 Hz										
Protection class to IEC 60529 ⁴⁾		IP 66										
EMC ⁵⁾												
Operating voltage range		7 ... 12 V										
Recommended supply voltage		8 V										
Max. operating current, no load		80 mA										
Available memory area												
Within EEPROM 512 ⁶⁾		128 bytes										
Interface signals												
Process data channel = SIN, REFSIN, COS, REFCOS		Analogue, differential										
Parameter channel = RS 485		Digital										

Ordering information**SRS/SRM50 Standalone; blind hollow shaft Ø 15 mm**

Type	Part no.	Description
SRS50-HPA0-K21	7127312	Single, Aufsteckhohlwelle, Stecker MS/10
SRM50-HPA0-K21	7127314	Multi, Aufsteckhohlwelle, Stecker MS/10

Collets

Type	Part no.	Size
SPZ-006-AD-A	2029174	6 mm
SPZ-1E4-AD-A	2029175	1/4"
SPZ-008-AD-A	2029176	8 mm
SPZ-3E8-AD-A	2029177	3/8"
SPZ-010-AD-A	2029178	10 mm
SPZ-012-AD-A	2029179	12 mm
SPZ-1E2-AD-A	2029180	1/2"

Attention: Please order the Collet with required diameter separately.¹⁾ Condensation not permitted²⁾ To EN 60068-2-27³⁾ To EN 60068-2-6⁴⁾ With mating connector inserted⁵⁾ To EN 61000-6-2 and EN 61000-6-3

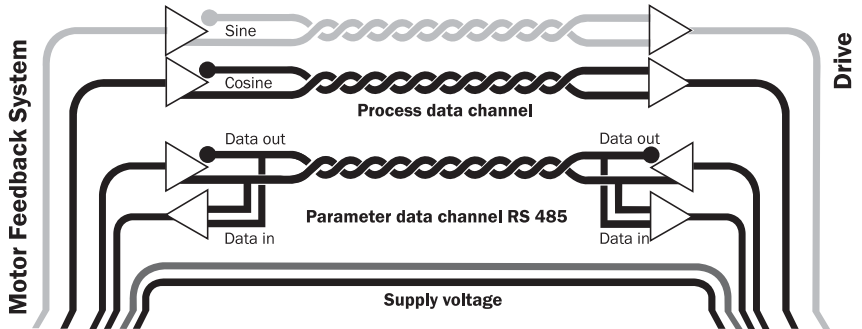
The EMC according to the standards quoted is achieved when the motor feedback system is mounted in an electrically conductive housing, which is connected to the central earthing point of the motor controller via a cable screen. This is also where the GND (0 V) connection of the supply voltage is linked to earth. Users must perform their own tests when other screen designs are used.

⁶⁾ If applying the electronic type label, in connection with numeric controllers, attention should be paid to Patent EP 425 912 B 2; Application of the electronic type label in connection with speed regulation is exempt.



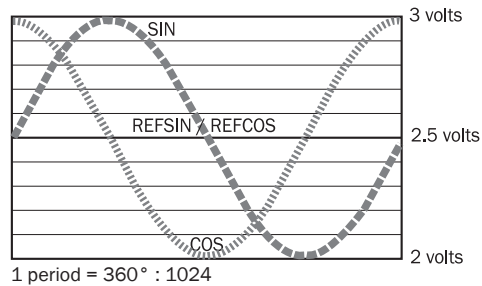
Electrical interface

- Safe data transmission
- High information content
- Electronic type label
- Only 8 leads
- Bus-enabled parameter channel
- Process data channel in real time



Signal specification of the process data channel

Signal diagram for clockwise rotation of the shaft, looking in direction "A"



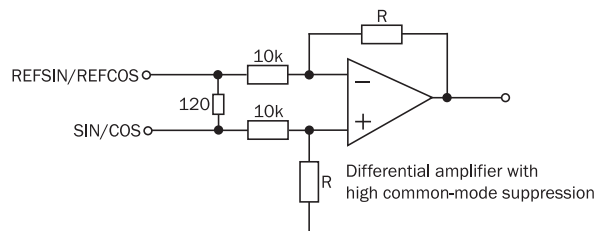
Access to the process data used for speed control, i.e. to the sine and cosine signals, is practically always "online". When the supply voltage is applied, the speed controller has access to this information at any time.

Sophisticated technology guarantees stable amplitudes of the analogue signals across all specified environmental conditions, with a maximum variation of only 20%.

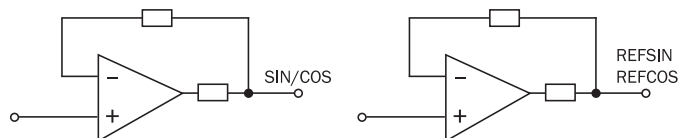
Characteristics applicable to all permissible environmental conditions

Signal	Value/Units
Signal peak, peak V_{SS} of SIN, COS	0.9 ... 1.1 V
Signal offset REFSIN, REFCOS	2.2 ... 2.8 V

Recommended receiver circuit for sine and cosine signals



The output circuit of the process data channel within the SinCos encoder



Further informations to the interface see HIPERFACE®-description part no. 8010701



Type-specific settings	SRS	SRM
Type ID (command 52h)	22h	27h
Free EEPROM [bytes]	128/1,792	128/1,792
Address	40h	40h
Mode_485	E4h	E4h
Codes 0 ... 3	55h	55h
Counter	0	0

Overview of commands supported			SRS	SRM
Command byte	Function	Code 0 ¹⁾	Comments	Comments
42h	Read position (5 bits per sine/cosine period)		15 bits	27 bits
43h	Set position	•		
44h	Read analogue value		Channel number 48h Temperature [°C]	Channel number 48h Temperature [°C]
46h	Read counter			
47h	Increase counter			
49h	Reset counter	•		
4Ah	Read data			
4Bh	Save 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 name plate		Encoder type = 22h	Encoder type = 27h
53h	Encoder reset			
55h	Allocate encoder address	•		
56h	Read serial number and program version			
57h	Configure serial interface	•		

¹⁾ 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.

Overview of status messages				
Error type	Statuscode	Description	SRS	SRM
	00h	The encoder has recognised no error	•	•
Initialisation	01h	Faulty compensating data	•	•
	02h	Faulty internal angular offset	•	•
	03h	Data field partitioning table damaged	•	•
	04h	Analogue limit values not available	•	•
	05h	Internal I ² C bus not operational	•	•
	06h	Internal checksum error	•	•
Protocol	07h	Encoder reset occurred as a result of program monitoring	•	•
	09h	Parity error	•	•
	0Ah	Checksum of the data transmitted is incorrect	•	•
	0Bh	Unknown command code	•	•
	0Ch	Number of data transmitted is incorrect	•	•
	0Dh	Command argument transmitted is not allowed	•	•
Data	0Eh	The selected data field must not be written to	•	•
	0Fh	Incorrect access code	•	•
	10h	Size of data field stated cannot be changed	•	•
	11h	Word address stated, is outside data field	•	•
	12h	Access to non-existent data field	•	•
	Position	01h	Analogue signals outside specification	•
1Fh		Speed too high, no position formation possible	•	•
20h		Singleturn position unreliable	•	•
21h		Positional error Multiturn		•
22h		Positional error Multiturn		•
23h		Positional error Multiturn		•
Other	1Ch	Monitoring the value of the analogue signals (process data)		
	1Dh	Transmitter current critical (dirt, transmitter breakage)	•	•
	1Eh	Encoder temperature critical	•	•
	08h	Counter overflow	•	•

Further informations to the interface see HIPERFACE®-description part no. 8010701

Dimensional drawings and ordering information

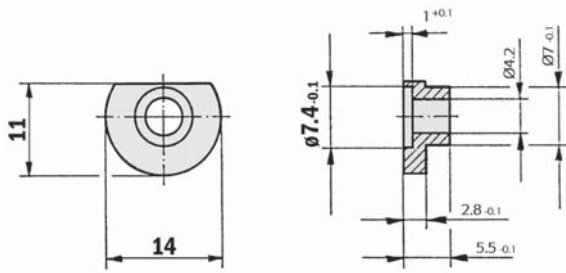
Accessories for SRS50/SRM50 Standalone

Programming Tool for HIPERFACE® devices

Type	Part no.	Motor Feedback System
PGT-03-S	1034252	SRS50/SRM50 Standalone

Servo clamp small, set (contents 3 off) for servo flanges

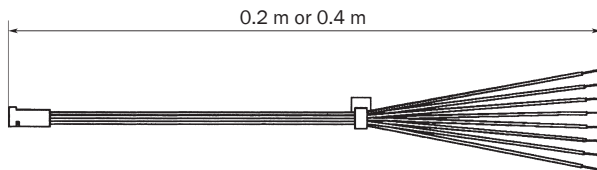
Type	Part no.
BEF-WK-SF	2029166



General tolerances according to DIN ISO 2768-mk

Stranded cable/connector, straight, 8 wires, 8 x 0.24 mm²

Type	Part no.	Contacts	Wire length
DOL-OB08-GOM2XB1	2031081	8	0.2 m
DOL-OB08-GOM4XB1	2031083	8	0.4 m

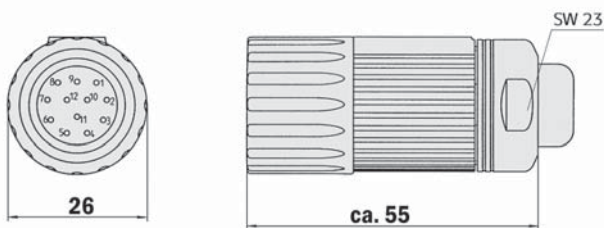


HIPERFACE® cable, 8 wires, supplied by the metre 4 x 2 x 0.15 mm², screened, flexible

Type	Part no.	Cores
LTG-2708-MW	6028361	8

Connector M23 female, 12-pin, straight, screened

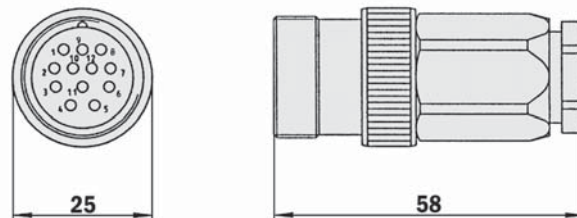
Type	Part no.	Contacts
DOS-2312-G	6027538	12



General tolerances according to DIN ISO 2768-mk

Connector M23 male, 12-pin, straight, screened

Type	Part no.	Contacts
STE-2312-G	6027537	12



General tolerances according to DIN ISO 2768-mk

Dimensional drawings and ordering information

Cable connector M23, 12-pin, straight, cable 8-core, HIPERFACE®, screened

Type	Part no.	Contacts	Cable length
DOL-2308-G1M5JB2	2031069	12	1.5 m
DOL-2308-G03MJB2	2031070	12	3.0 m
DOL-2308-G05MJB2	2031071	12	5.0 m
DOL-2308-G10MJB2	2031072	12	10.0 m
DOL-2308-G15MJB2	2031073	12	15.0 m

Mating Connectors fit in for MS/10

Type	Part no.	PIN
DOS-MS10-G	7102129	10-pin

Cable and connector assembly MS/10, 10-pin, straight, cable 8-core

Type	Part no.	Cable length
DOL-MS10-G1M5MA3	7102160	1.5 m
DOL-MS10-G03MMA3	7102161	3.0 m
DOL-MS10-G05MMA3	7102162	5.0 m
DOL-MS10-G10MMA3	7102163	10.0 m
DOL-MS10-G20MMA3	7102164	20.0 m
DOL-MS10-G30MMA3	7102165	30.0 m

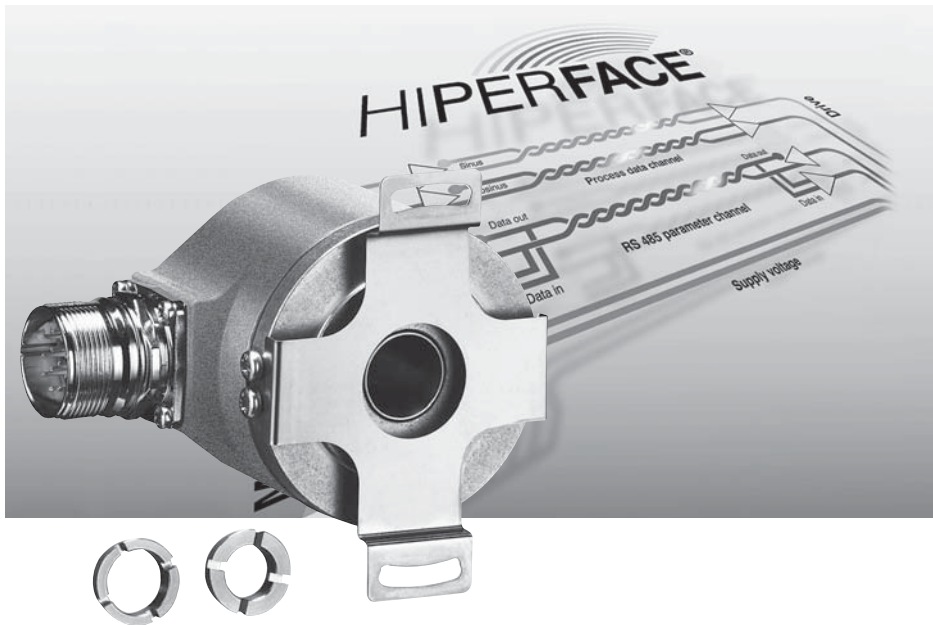
Accessories for SRS50/SRM50 Standalone

Interchangeable collets for blind hollow shaft

Type	Part no.	Size
SPZ-006-AD-A	2029174	6 mm
SPZ-1E4-AD-A	2029175	1/4"
SPZ-008-AD-A	2029176	8 mm
SPZ-3E8-AD-A	2029177	3/8"
SPZ-010-AD-A	2029178	10 mm
SPZ-012-AD-A	2029179	12 mm
SPZ-1E2-AD-A	2029180	1/2"



SinCos® SRS64, SRM64: Motor Feedback Systems with HIPERFACE®- Interface for Self-Ventilated and Force- Ventilated Drives



Writing motor-specific data to the electronic type label and programming are important features of these series.

Possible product variations:

Hollow shafts up to 14 mm in diameter.

	1,024 sine/cosine periods
Motor Feedback Systems	

The SRS/SRM series of Motor Feedback Systems are used world-wide in many different applications and environments.



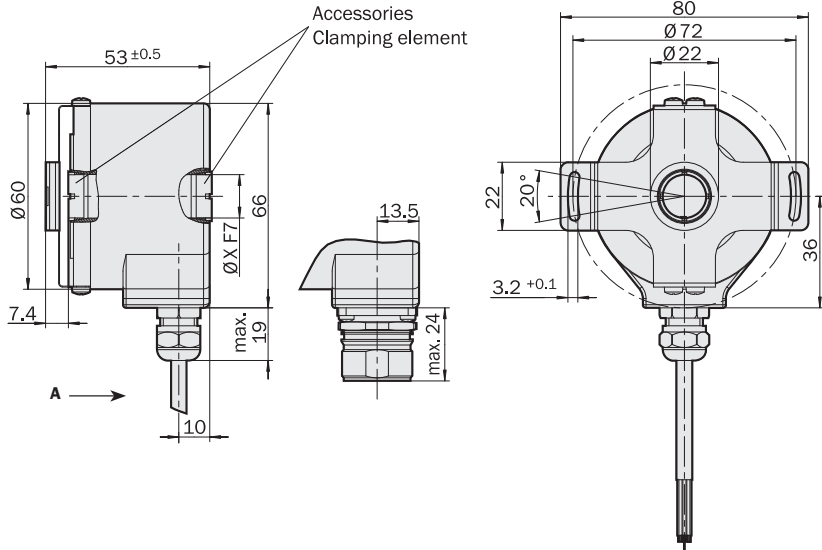
Absolute positioning with 32,768 steps per revolution and a maximum of 4,096 revolutions give a total resolution of 134,217,728 steps.

1,024 sine/cosine periods

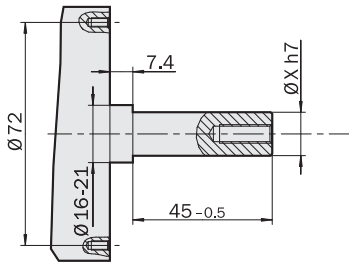
Motor Feedback Systems

- 1,024 sine/cosine periods per revolution
- Absolute position with a resolution of 32,768 steps per revolution
- 4,096 revolutions can be measured (Multiturn)
- Programming of the positional value
- Electronic type label

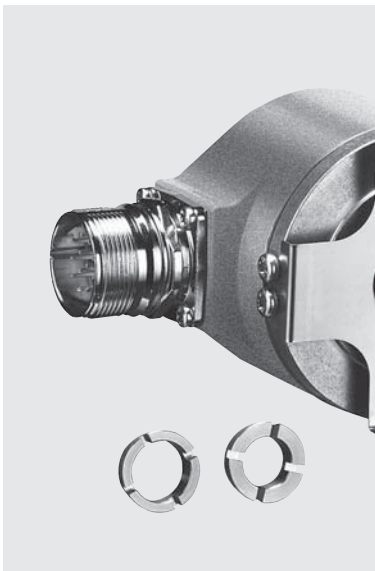
Dimensional drawing SRS/SRM64



Proposed customer fitting



General tolerances to DIN ISO 2768-mk



PIN and wire allocation

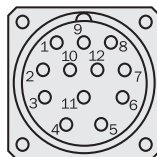
PIN	Signal	Colour of Wires	Explanation
1	REFCOS	black	Process data channel
2	Data +	grey or yellow	RS 485 parameter channel
3	N. C.	-	N. C.
4	N. C.	-	N. C.
5	SIN	white	Process data channel
6	REFSIN	brown	Process data channel
7	Data -	green or purple	RS 485 parameter channel
8	COS	pink	Process data channel
9	N. C.	-	N. C.
10	GND	blue	Ground connection
11	N. C.	-	N. C.
12	U _s	red	Supply voltage 7 ... 12 V

Accessories

Connection systems (page 354)

Programming tool (page 355)

Clamping elements (page 354)



View of the plug-in face

Screen connection on connector housing

N. C. = Not connected

Technical Data according to DIN 32878		Hollow Shaft SRS/SRM64	SRS	SRM							
Number of sine/cosine periods per revolution		1,024									
Dimensions		mm (see dimensional drawing)									
Weight		0.3 kg									
Inertial rotor moment		45 gcm ²									
Type of code for the absolute value		Binary									
Code sequence for clockwise shaft rotation, looking in											
direction "A" (see dimensional drawing)		Increasing									
Measurement step after generating arctan											
with 12 bit resolution		0.3 angular seconds									
Total number of steps	Single SRS	32,768									
	Multi SRM	134,21,728 = 4,096 x 32,768									
Error limits for the digital absolute value											
via RS 485		± 90 angular seconds									
Error limits for evaluating the "1,024" signals,											
integral non-linearity		± 45 angular seconds									
Non-linearity within 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 produced											
Max. operating speed		6,000 min ⁻¹									
Max. angular acceleration		9,000 min ⁻¹									
Operating torque		5 x 10 ⁵ rad/s ²									
Starting torque		0.2 Ncm									
Starting torque		0.4 Ncm									
Permissible shaft movement											
static	radial/axial	± 0.1 mm/± 2 mm									
dynamic	radial/axial	± 0.05 mm/± 0,2 mm									
Angular motion, perpendicular to the rotational axis											
static		34 x 10 ⁻³ mm/mm									
dynamic		17 x 10 ⁻³ mm/mm									
Life of ball bearings		3.6 x 10 ⁹ revolutions									
Working temperature range		-20 ... +110 °C									
Storage temperature range (without packaging)		-20 ... +115 °C									
Permissible relative humidity ¹⁾		90 %									
Shock resistance ²⁾		100/10 g/ms									
Oscillation resistance ³⁾		20/10 ... 2000 g/Hz									
Protection to IEC 60529 ⁴⁾		IP 65									
EMC ⁵⁾											
Operating voltage range		7 ... 12 V									
Recommended supply voltage		8 V									
Max. operating current, no load		< 80 mA									
Available memory area											
within EEPROM 512 ⁶⁾		128 bytes									
within EEPROM 2048 ⁶⁾		1,792 bytes									
Interface signals											
Process data channel = SIN, REFSIN, COS, REFCOS		Analogue, differential									
Parameter channel = RS 485		Digital									

¹⁾ Condensation not permissible

²⁾ To EN 60068-2-27

³⁾ To EN 60068-2-6

⁴⁾ In assembled state

⁵⁾ To EN 61000-6-2 and N 61000-6-3

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 screen. This is also where the GND (0 V) connection of the supply voltage is linked to earth. Users must perform their own tests when other screen designs are used.

⁶⁾ If applying the electronic type label, in connection with numeric controllers, attention should be paid to Patent EP 425 912 B 2; Application of the electronic type label in connection with speed regulation is exempt.

Ordering information

SRS/SRM64; hollow shaft *

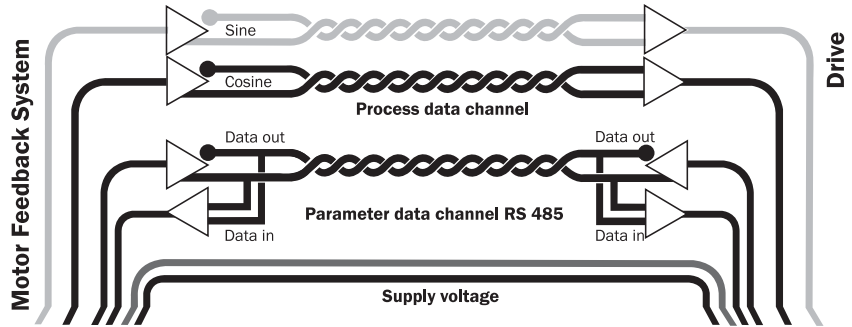
Type	Part no.	Description
SRS64-HRK0-K01	1034225	Single, 512 EEprom, cable 1.5 m
SRS64-HRA0-K01	1034223	Single, 512 EEprom, connector
SRM64-HRK0-K01	1034164	Multi, 512 EEprom, cable 1.5 m
SRM64-HRA0-K01	1034162	Multi, 512 EEprom, connector
SRS64-HRK0-K02	1034226	Single, 2048 EEprom, cable 1.5 m
SRS64-HRA0-K02	1034224	Single, 2048 EEprom, connector
SRM64-HRK0-K02	1034165	Multi, 2048 EEprom, cable 1.5 m
SRM64-HRA0-K02	1034163	Multi, 2048 EEprom, connector

* Clamping elements for 10, 12, 14 mm and 3/8" and 1/2" as accessories separate order item (see page 354).



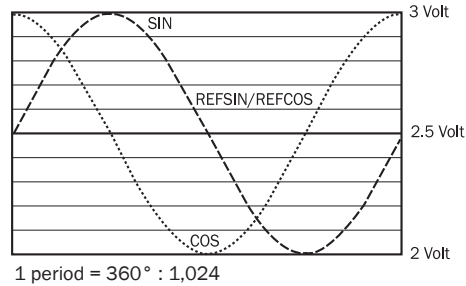
Electrical interface

- Safe data transmission
- High information content
- Electronic rating plate
- Only 8 leads
- Bus-enabled parameter channel
- Process data channel in real time



Signal specification of the process data channel

Signal diagram for clockwise rotation of the shaft, looking in direction "A"



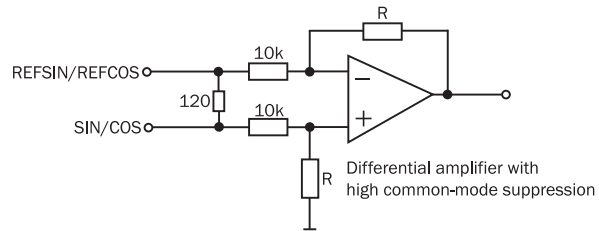
Access to the process data used for speed control, i.e. to the sine and cosine signals, is practically always "online". When the supply voltage is applied, the speed controller has access to this information at any time.

Sophisticated technology guarantees stable amplitudes of the analogue signals across all specified environmental conditions, with a maximum variation of only 20%.

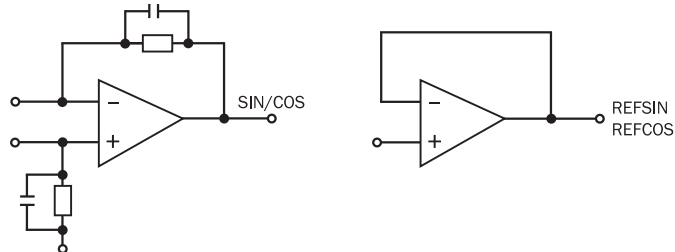
Characteristics applicable to all environmental conditions stated

Signal	Values/Units
Signal peak, peak V_{SS} of SIN, COS	0.9 ... 1.1 V
Signal offset REFSIN, REFCOS	2.2 ... 2.8 V

Recommended receiver circuit for sine and cosine signals



The output circuit of the process data channel within the SinCos encoder





Type-specific settings	SRS	SRM
Type ID (command 52h)	22h	27h
Free EEPROM [bytes]	128/1,792	128/1,792
Address	40h	40h
Mode_485	E4h	E4h
Codes 0 ... 3	55h	55h
Counter	0	0

Overview of commands supported			SRS	SRM
Command byte	Function	Code 0 ¹⁾	Comments	Comments
42h	Read position			
43h	Set position	•		
44h	Read analogue value		Channel number 48h Temperature [°C]	Channel number 48h Temperature [°C]
46h	Read counter			
47h	Increase counter			
49h	Reset counter	•		
4Ah	Read data			
4Bh	Save 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 name plate		Encoder type = 22h	Encoder type = 27h
53h	Encoder reset			
55h	Allocate encoder address	•		
56h	Read serial number and program version			
57h	Configure serial interface	•		

¹⁾ Code 0 is a byte inserted into the protocol, for additional safeguarding of vital system parameters against accidental overwriting.
When shipped, "Code 0" = 55h.

Overview of status messages				
Error type	Status code	Description	SRS	SRM
	00h	The encoder has recognised no error	•	•
Initialisation	01h	Faulty compensating data	•	•
	02h	Faulty internal angular offset	•	•
	03h	Data field partitioning table damaged	•	•
	04h	Analogue limit values not available	•	•
	05h	Internal I ² C bus not operational	•	•
	06h	Internal checksum error	•	•
Protocol	07h	Encoder reset occurred as a result of program monitoring	•	•
	09h	Parity error	•	•
	0Ah	Checksum of the data transmitted is incorrect	•	•
	0Bh	Unknown command code	•	•
	0Ch	Number of data transmitted is incorrect	•	•
	0Dh	Command argument transmitted is not allowed	•	•
Data	0Eh	The selected data field must not be written to	•	•
	0Fh	Incorrect access code	•	•
	10h	Size of data field stated cannot be changed	•	•
	11h	Word address stated, is outside data field	•	•
	12h	Access to non-existent data field	•	•
	Position	01h	Analogue signals outside specification	•
1Fh		Speed too high, no position formation possible	•	•
20h		Singleturn position unreliable	•	•
21h		Positional error Multiturn		•
22h		Positional error Multiturn		•
23h		Positional error Multiturn		•
Other	1Ch	Monitoring the value of the analogue signals (process data)		
	1Dh	Transmitter current critical (dirt, transmitter breakage)	•	•
	1Eh	Encoder temperature critical	•	•
	08h	Counter overflow	•	•

Dimensional drawings and ordering information

Clamping elements, set (contents 2 off)

Type	Part no.	Size
BEF-MW-SR64D14	2031074	14 mm
BEF-MW-SR64D12	2031075	12 mm
BEF-MW-SR64D10	2031076	10 mm
BEF-MW-SR64D1E2	2031077	1/2"
BEF-MW-SR64D3E8	2031078	3/8"

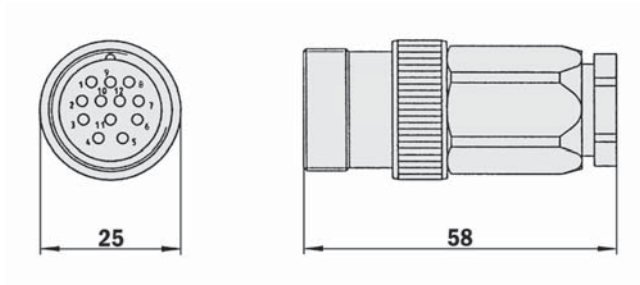
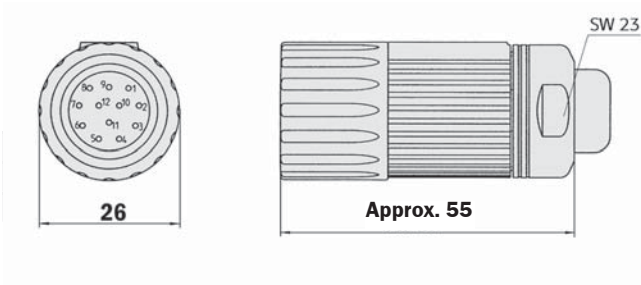


Connector M23 female, 12-pin, straight

Type	Part no.	Contacts
DOS-2312-G	6027538	12

Connector M23 male, 12-pin, straight, screened

Type	Part no.	Contacts
STE-2312-G	6027537	12



General tolerances to DIN ISO 2768-mk

General tolerances to DIN ISO 2768-mk

Cable connector M23, 12-pin, straight, cable 8-core, HIPERFACE®, screened

Type	Part no.	Contacts	Wire length
DOL-2308-G1M5JB2	2031069	12	1.5 m
DOL-2308-G03MJB2	2031070	12	3.0 m
DOL-2308-G05MJB2	2031071	12	5.0 m
DOL-2308-G10MJB2	2031072	12	10 m
DOL-2308-G15MJB2	2031073	12	15 m

HIPERFACE® cable 8 wires, supplied by the metre 4 x 2 x 0,15 mm², screened, flexible

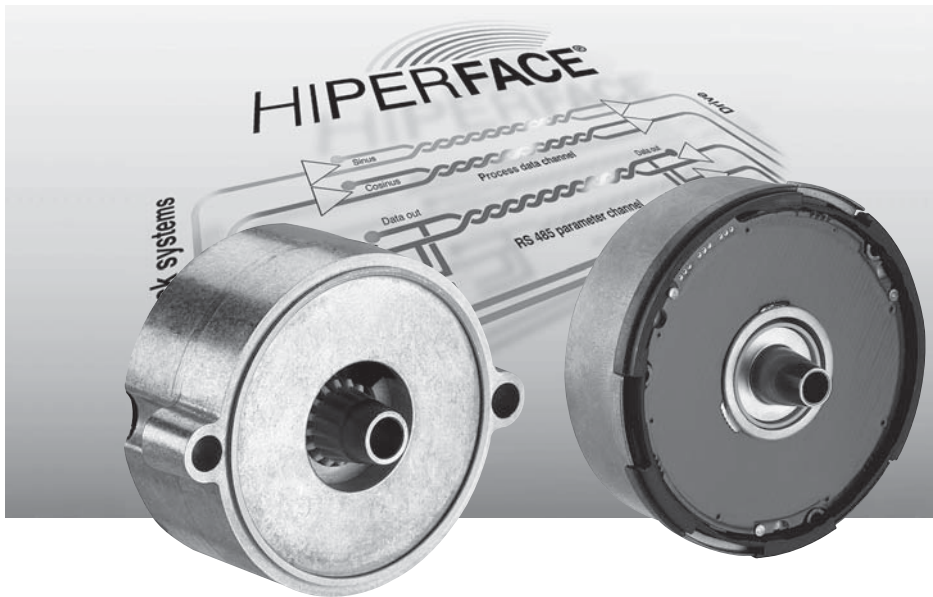
Type	Part no.	Cores
LTG-2708-MW	6028361	8

Dimensional drawings and ordering information

Programming tool for HIPERFACE®-devices		
Type	Part no.	Motor Feedback System
PGT-03-S	1034252	SRS/SRM64

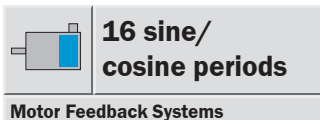


SinCos® SEK52/SEL52 and SEK37/SEL37: Motor Feedback Systems with HIPERFACE® interface



The holistic scanning almost completely compensates for eccentricity errors. The capacitive operating principle can function without ball bearings and is therefore extremely robust. By dispensing with wearing parts, possible error sources are largely excluded, and the motor feedback systems have a high temperature resistance previously reserved for resolvers. Moreover, the system construction allows extremely low power consumption.

The compact SEK/SEL37 products are designed for mounting onto conical shafts. In addition to the shoulder clamping used with resolvers, SEK/SEL device types in the 2.1" housing also feature hollow shaft and conical shaft types. Thus, these motor feedback systems with high resolution are particularly suited to industrial applications requiring a compact, precise and cost-effective solution.




Extreme robustness, multiturn capability and all benefits of the HIPERFACE® interface are reflected in the new SinCos® SEK/SEL52 and SEK/SEL37 product ranges.

At the heart of these new ranges is a bearing-less, capacitive sensor element.

HIPERFACE®
by **SICK|STEGMANN**



 **16 sine/cosine periods**

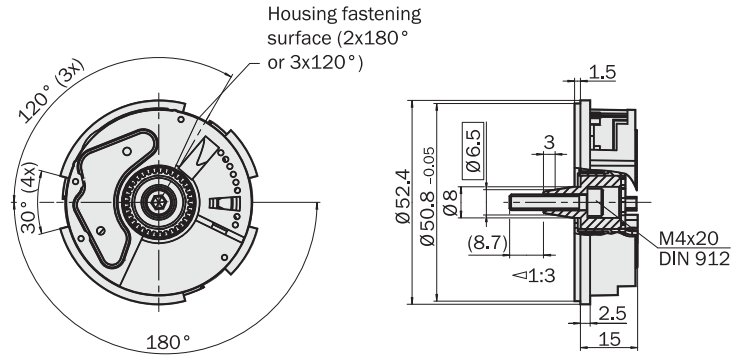
Motor Feedback Systems

- 16 sine/cosine periods per revolution
- 4,096 revolutions measurable (Multiturn)
- Programming of the positional value
- Electronic type label

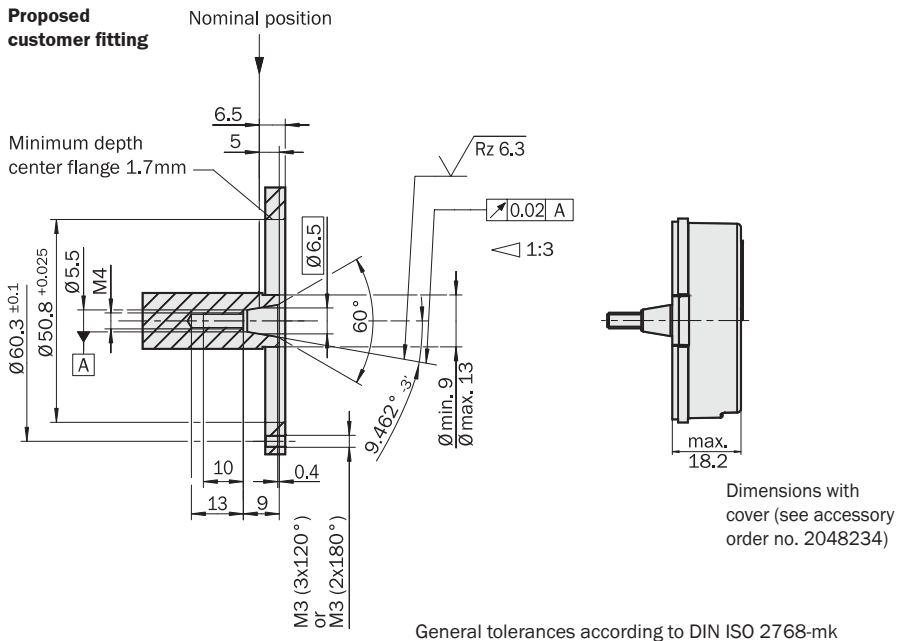


Accessories
Connection systems (page 370)
Mounting systems (page 370)
Programming Tool (page 370)
Cover (page 371)

Dimensional drawing SEK/SEL52 tapered shaft



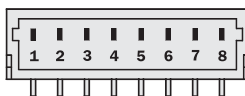
Proposed customer fitting



Pin and wire allocation

PIN	Signal	Colour of wires	Explanation
1	Us	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

The GND-(0V) connection of the supply voltage has no connection to the housing.



Technical data to DIN 32878		Tapered shaft SEK/SEL52	SEK	SEL								
Number of sine/cosine periods per revolution		16										
Number of the absolute ascertainable revolutions	Single SEK	1										
	Multi SEL	4,096										
Dimensions		mm (see dimensional drawing)										
Mass		0.04 kg										
Mass with cover ¹⁾		0.07 kg										
Moment of inertia to the rotor		7 gcm ²										
Code type for the absolut value		Binary										
Code sequence for clockwise shaft rotation, looking in direction "A" (see dimensional drawing)		Increasing										
Measurement step at interpolation of the sine/cosine signals with e. g. 12 bits		20 angular seconds										
Error limits for evaluating the sine/cosine signals												
integral non-linearity		± 288 angular seconds										
Non-linearity within a sine/cosine period												
differential non-linearity		± 72 angular seconds ²⁾										
Working speed up to which the absolute position can be reliably produced		6,000 min ⁻¹										
Max. Operating speed	Single SEK	12,000 min ⁻¹										
	Multi SEL	10,000 min ⁻¹										
Max. angular acceleration		5 x 10 ⁵ rad/s ²										
Permissible shaft movement												
axial		± 0.5 mm										
radial		± 0.15 mm										
Working temperature range	Single SEK	-40 ... +115 °C										
	Multi SEL	-20 ... +115 °C										
Storage temperature range ³⁾		-50 ... +125 °C										
Permissible relative humidity		90 % ⁴⁾										
Resistance												
To shocks ⁵⁾		100 g/10 ms										
To vibration ⁶⁾		50 g/10 ... 2000 Hz										
Protection class to IEC 60529 ⁷⁾		IP 40										
EMC ⁸⁾												
Operating voltage range		7 ... 12 V										
Recommended supply voltage		8 V										
Max. operating current, no load		< 50 mA										
Available memory area												
within EEPROM 2048 ⁹⁾		1,792 bytes										
Interface signals												
Process data channel = SIN, REFSIN, COS, REFCOS		Analogue, differential										
Parameter channel = RS 485		Digital										

¹⁾ Accessory part no. 2048234

²⁾ At nominal position ± 0.1 mm

³⁾ Without packaging

⁴⁾ Condensation not permitted

⁵⁾ To EN 60068-2-27

⁶⁾ To EN 60068-2-6

⁷⁾ With mating connector inserted and closed cover

⁸⁾ To EN 61000-6-2 and EN 61000-6-3


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 screen and by using the cover (see accessory part no. 2048234). Users must perform their own tests when other screen designs are used.

⁹⁾ If applying the electronic type label, in connection with numeric controllers, attention should be paid to Patent EP 425 912 B 2; Application of the electronic type label in connection with speed regulation is exempt.

Ordering information

SEK/SEL52 tapered shaft

Type	Part no.	Description
SEK52-HFA0-K02	1037368	Singleturn
SEL52-HFA0-K02	1037371	Multiturn

 **16 sine/cosine periods**

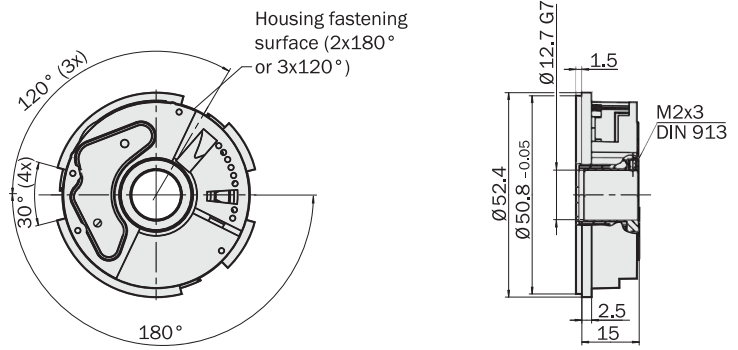
Motor Feedback Systems

- 16 sine/cosine periods per revolution
- 4,096 revolutions measurable (Multiturn)
- Programming of the positional value
- Electronic type label

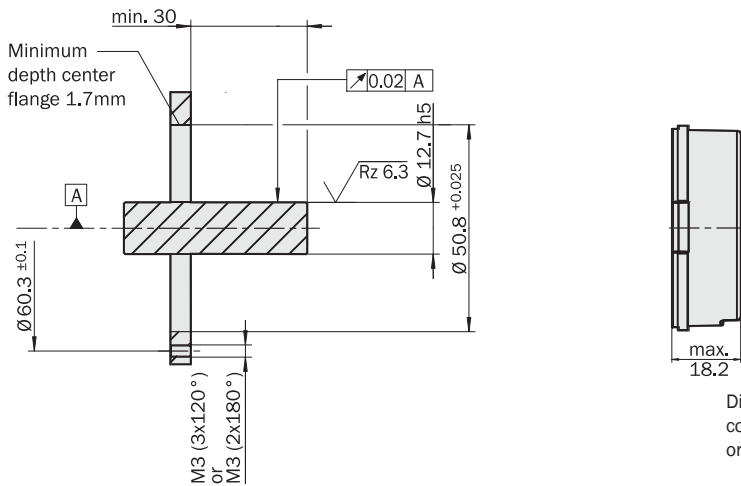


Accessories
Connection systems (page 370)
Mounting systems (page 370)
Programming Tool (page 370)
Cover (page 371)

Dimensional drawing SEK/SEL52 hollow shaft



Proposed customer fitting



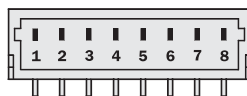
Dimensions with cover (see accessory order no. 2048232)

General tolerances according to DIN ISO 2768-mk

Pin and wire allocation

PIN	Signal	Colour of wires	Explanation
1	Us	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

The GND-(0V) connection of the supply voltage has no connection to the housing.



Technical data to DIN 32878		Hollow shaft SEK/SEL52	SEK	SEL							
Number of sine/cosine periods per revolution		16									
Number of the absolute ascertainable revolutions	Single SEK	1									
	Multi SEL	4,096									
Dimensions		mm (see dimensional drawing)									
Mass		0.04 kg									
Mass with cover ¹⁾		0.06 kg									
Moment of inertia to the rotor		7 gcm ²									
Code type for the absolut value		Binary									
Code sequence for clockwise shaft rotation, looking in direction "A" (see dimensional drawing)		Increasing									
Measurement step at interpolation of the sine/cosine signals with e. g. 12 bits		20 angular seconds									
Error limits for evaluating the sine/cosine signals											
integral non-linearity		± 288 angular seconds									
Non-linearity within a sine/cosine period											
differential non-linearity		± 72 angular seconds ²⁾									
Working speed up to which the absolute position can be reliably produced		6,000 min ⁻¹									
Max. Operating speed	Single SEK	12,000 min ⁻¹									
	Multi SEL	10,000 min ⁻¹									
Max. angular acceleration		5 x 10 ⁵ rad/s ²									
Permissible shaft movement											
axial		± 0.5 mm									
radial		± 0.15 mm									
Working temperature range	Single SEK	-40 ... +115 °C									
	Multi SEL	-20 ... +115 °C									
Storage temperature range ³⁾		-50 ... +125 °C									
Permissible relative humidity		90 % ⁴⁾									
Resistance											
To shocks ⁵⁾		100 g/10 ms									
To vibration ⁶⁾		50 g/10 ... 2000 Hz									
Protection class to IEC 60529 ⁷⁾		IP 40									
EMC ⁸⁾											
Operating voltage range		7 ... 12 V									
Recommended supply voltage		8 V									
Max. operating current, no load		< 50 mA									
Available memory area											
within EEPROM 2048 ⁹⁾		1,792 bytes									
Interface signals											
Process data channel = SIN, REFSIN, COS, REFCOS		Analogue, differential									
Parameter channel = RS 485		Digital									

¹⁾ Accessory part no. 2048232

²⁾ At nominal position ± 0.1 mm

³⁾ Without packaging

⁴⁾ Condensation not permitted

⁵⁾ To EN 60068-2-27

⁶⁾ To EN 60068-2-6

⁷⁾ With mating connector inserted and closed cover

⁸⁾ To EN 61000-6-2 and EN 61000-6-3

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 screen and by using the cover (see accessory part no. 2048232). Users must perform their own tests when other screen designs are used.

⁹⁾ If applying the electronic type label, in connection with numeric controllers, attention should be paid to Patent EP 425 912 B 2; Application of the electronic type label in connection with speed regulation is exempt.

Ordering information		
SEK/SEL52 hollow shaft		
Type	Part no.	Description
SEK52-HNA0-K02	1037370	Singleturn
SEL52-HNA0-K02	1037373	Multiturn

16 sine/cosine periods

Motor Feedback Systems

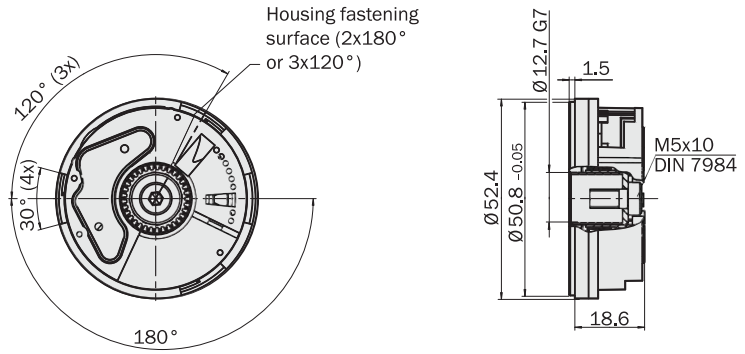
- 16 sine/cosine periods per revolution
- 4,096 revolutions measurable (Multiturn)
- Programming of the positional value
- Electronic type label



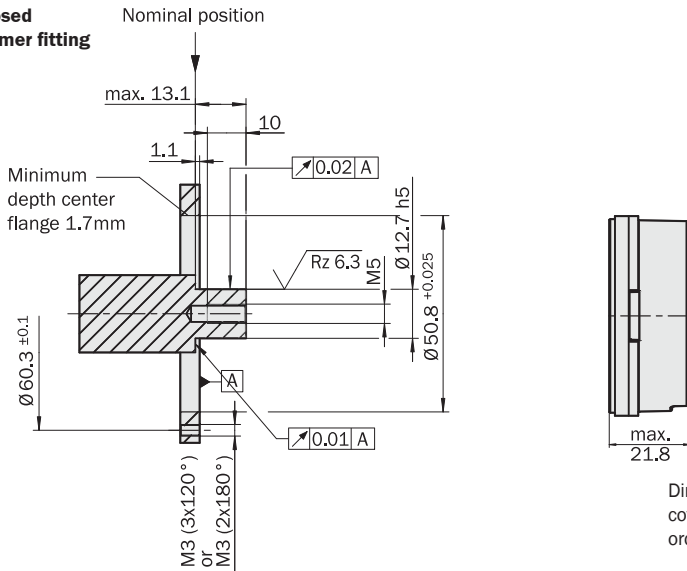
Accessories

Connection systems (page 370)
Mounting systems (page 370)
Programming Tool (page 370)
Cover (page 371)

Dimensional drawing SEK/SEL52 with shoulder clamping



Proposed customer fitting



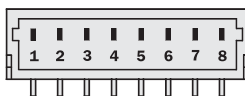
Dimensions with cover (see accessory order no. 2048234)

General tolerances according to DIN ISO 2768-mk

Pin and wire allocation

PIN	Signal	Colour of wires	Explanation
1	Us	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

The GND-(0V) connection of the supply voltage has no connection to the housing.



Technische Daten nach DIN 32878		Shoulder clamping SEK/SEL52	SEK	SEL								
Number of sine/cosine periods per revolution		16										
Number of the absolute ascertainable revolutions	Single SEK	1										
	Multi SEL	4,096										
Dimensions		mm (see dimensional drawing)										
Mass		0.04 kg										
Mass with cover ¹⁾		0.07 kg										
Moment of inertia to the rotor		6 gcm ²										
Code type for the absolut value		Binary										
Code sequence for clockwise shaft rotation, looking in direction "A" (see dimensional drawing)		Increasing										
Measurement step at interpolation of the sine/cosine signals with e. g. 12 bits		20 angular seconds										
Error limits for evaluating the sine/cosine signals												
integral non-linearity		± 288 angular seconds										
Non-linearity within a sine/cosine period												
differential non-linearity		± 72 angular seconds ²⁾										
Working speed up to which the absolute position can be reliably produced		6,000 min ⁻¹										
Max. Operating speed	Single SEK	12,000 min ⁻¹										
	Multi SEL	10,000 min ⁻¹										
Max. angular acceleration		5 x 10 ⁵ rad/s ²										
Permissible shaft movement												
axial		± 0.5 mm										
radial		± 0.15 mm										
Working temperature range	Single SEK	-40 ... +115 °C										
	Multi SEL	-20 ... +115 °C										
Storage temperature range ³⁾		-50 ... +125 °C										
Permissible relative humidity		90 % ⁴⁾										
Resistance												
To shocks ³⁾		100 g/10 ms										
To vibration ⁴⁾		50 g/10 ... 2000 Hz										
Protection class to IEC 60529 ⁵⁾		IP 40										
EMC ⁶⁾												
Operating voltage range		7 ... 12 V										
Recommended supply voltage		8 V										
Max. operating current, no load		< 50 mA										
Available memory area												
within EEPROM 2048 ⁷⁾		1,792 bytes										
Interface signals												
Process data channel = SIN, REFSIN, COS, REFCOS		Analogue, differential										
Parameter channel = RS 485		Digital										

¹⁾ Accessory part no. 2048234

²⁾ At nominal position ± 0.1 mm

³⁾ Without packaging

⁴⁾ Condensation not permitted

⁵⁾ To EN 60068-2-27

⁶⁾ To EN 60068-2-6

⁷⁾ With mating connector inserted and closed cover

⁸⁾ To EN 61000-6-2 and EN 61000-6-3

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 screen and by using the cover (see accessory part no. 2048234). Users must perform their own tests when other screen designs are used.

⁹⁾ If applying the electronic type label, in connection with numeric controllers, attention should be paid to Patent EP 425 912 B 2; Application of the electronic type label in connection with speed regulation is exempt.

Ordering information

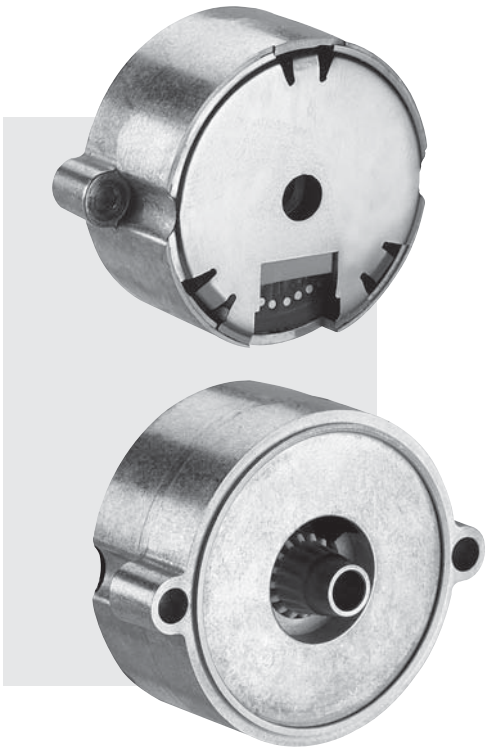
SEK/SEL52 with shoulder clamping

Type	Part no.	Description
SEK52-H1A0-K02	1037369	Singleturn
SEL52-H1A0-K02	1037372	Multiturn

16 sine/cosine periods

Motor Feedback Systems

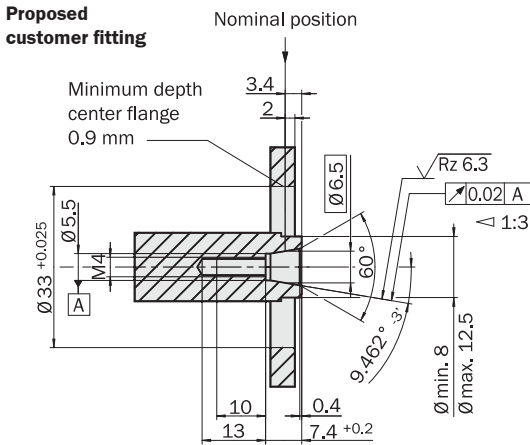
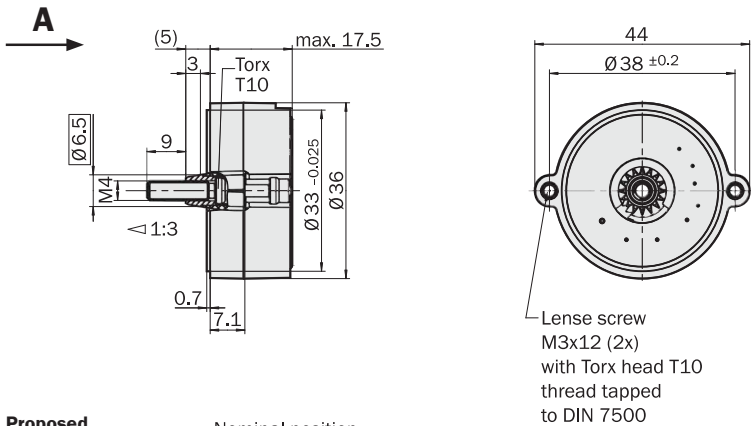
- 16 sine/cosine periods per revolution
- 4,096 revolutions measurable (Multiturn)
- Programming of the positional value
- Electronic type label



Accessories

Connection systems (page 370)
Mounting systems (page 370)
Programming Tool (page 370)

Dimensional drawing SEK/SEL37 radial connector

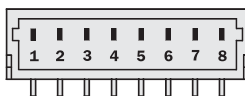


General tolerances according to DIN ISO 2768-mk

Pin and wire allocation

PIN	Signal	Colour of wires	Explanation
1	Us	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

The GND-(0V) connection of the supply voltage has no connection to the housing.



Technische Daten nach DIN 32878		SEK/SEL37 radial connector	SEK	SEL								
Number of sine/cosine periods per revolution		16										
Number of the absolute ascertainable revolutions	Single SEK	1										
	Multi SEL	4,096										
Dimensions		mm (see dimensional drawing)										
Mass		0.04 kg										
Moment of inertia to the rotor		1 gcm ²										
Code type for the absolut value		Binary										
Code sequence for clockwise shaft rotation, looking in direction "A" (see dimensional drawing)		Increasing										
Measurement step at interpolation of the sine/cosine signals with e. g. 12 bits		20 angular seconds										
Error limits for evaluating the sine/cosine signals												
integral non-linearity		± 288 angular seconds										
Non-linearity within a sine/cosine period												
differential non-linearity		± 144 angular seconds ¹⁾										
Working speed up to which the absolute position can be reliably produced		6,000 min ⁻¹										
Max. Operating speed	Single SEK and Multi SEL	12,000 min ⁻¹										
Max. angular acceleration		5 x 10 ⁵ rad/s ²										
Permissible shaft movement												
axial		± 0.3 mm										
radial		± 0.15 mm										
Working temperature range	Single SEK	-40 ... +115 °C										
	Multi SEL	-20 ... +115 °C										
Storage temperature range ²⁾		-50 ... +125 °C										
Permissible relative humidity		90 % ³⁾										
Resistance												
To shocks ⁴⁾		100 g/10 ms										
To vibration ⁵⁾		50 g/10 ... 2000 Hz										
Protection class to IEC 60529 ⁶⁾		IP 20										
EMC ⁷⁾												
Operating voltage range		7 ... 12 V										
Recommended supply voltage		8 V										
Max. operating current, no load		< 50 mA										
Available memory area												
within EEPROM 2048 ⁸⁾		1,792 bytes										
Interface signals												
Process data channel = SIN, REFSIN, COS, REFCOS		Analogue, differential										
Parameter channel = RS 485		Digital										

¹⁾ At nominal position ± 0.1 mm

²⁾ Without packaging

³⁾ Condensation not permitted

⁴⁾ To EN 60068-2-27

⁵⁾ To EN 60068-2-6

⁶⁾ With mating connector inserted and closed cover

⁷⁾ To EN 61000-6-2 and EN 61000-6-3

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 screen. Users must perform their own tests when other screen designs are used.

⁸⁾ If applying the electronic type label, in connection with numeric controllers, attention should be paid to Patent EP 425 912 B 2; Application of the electronic type label in connection with speed regulation is exempt.

Ordering information

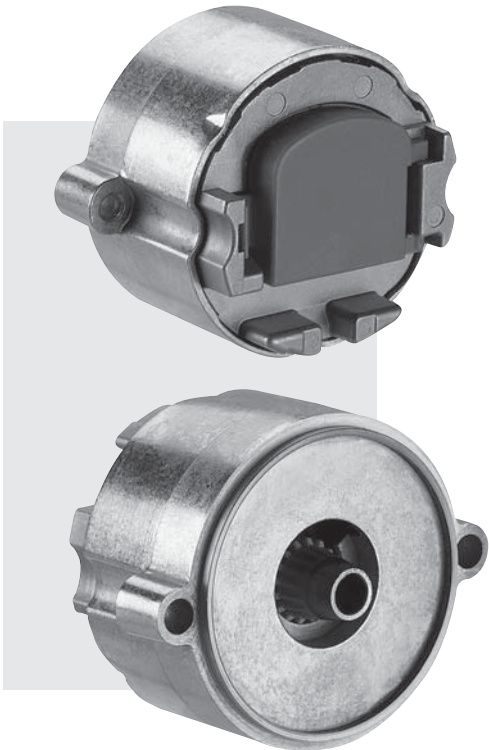
SEK/SEL37 radial connector

Type	Part no.	Description
SEK37-HFB0-K02	1037378	Singleturn
SEL37-HFB0-K02	1037379	Multiturn

16 sine/cosine periods

Motor Feedback Systems

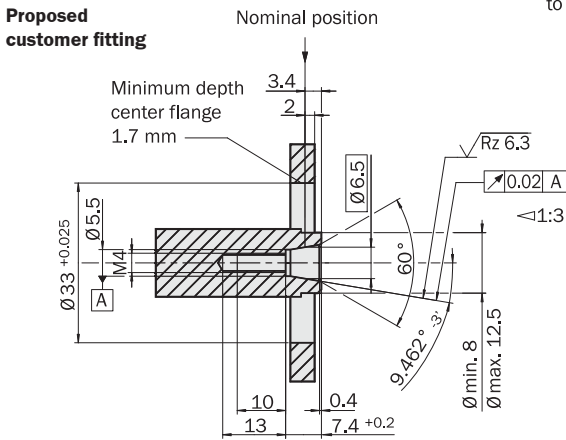
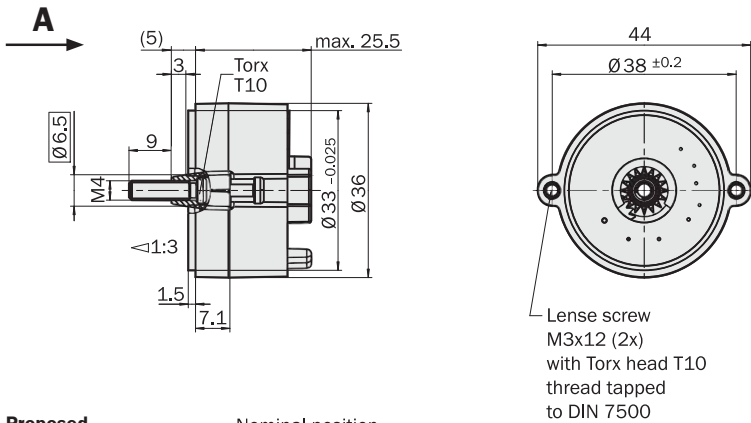
- 16 sine/cosine periods per revolution
- 4,096 revolutions measurable (Multiturn)
- Programming of the positional value
- Electronic type label



Accessories

Connection systems (page 370)
Mounting systems (page 370)
Programming Tool (page 370)

Dimensional drawing SEK/SEL37 axial connector

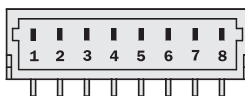


General tolerances according to DIN ISO 2768-mk

Pin and wire allocation

PIN	Signal	Colour of wires	Explanation
1	Us	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

The GND-(0V) connection of the supply voltage has no connection to the housing.



Technische Daten nach DIN 32878		SEK/SEL37 axial connector	SEK	SEL								
Number of sine/cosine periods per revolution		16										
Number of the absolute ascertainable revolutions	Single SEK	1										
	Multi SEL	4,096										
Dimensions		mm (see dimensional drawing)										
Mass		0.05 kg										
Moment of inertia to the rotor		1 gcm ²										
Code type for the absolut value		Binary										
Code sequence for clockwise shaft rotation, looking in direction "A" (see dimensional drawing)		Increasing										
Measurement step at interpolation of the sine/cosine signals with e. g. 12 bits		20 angular seconds										
Error limits for evaluating the sine/cosine signals												
integral non-linearity		± 288 angular seconds										
Non-linearity within a sine/cosine period												
differential non-linearity		± 144 angular seconds ¹⁾										
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Max. angular acceleration		5 x 10 ⁵ rad/s ²										
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Permissible relative humidity		90 % ³⁾										
Resistance												
To shocks ⁴⁾		100 g/10 ms										
To vibration ⁵⁾		50 g/10 ... 2000 Hz										
Protection class to IEC 60529 ⁶⁾		IP 40										
EMC ⁷⁾												
Operating voltage range		7 ... 12 V										
Recommended supply voltage		8 V										
Max. operating current, no load		< 50 mA										
Available memory area												
within EEPROM 2048 ⁸⁾		1,792 bytes										
Interface signals												
Process data channel = SIN, REFSIN, COS, REFCOS		Analogue, differential										
Parameter channel = RS 485		Digital										

¹⁾ At nominal position ± 0.1 mm

²⁾ Without packaging

³⁾ Condensation not permitted

⁴⁾ To EN 60068-2-27

⁵⁾ To EN 60068-2-6

⁶⁾ With mating connector inserted and closed cover

⁷⁾ To EN 61000-6-2 and EN 61000-6-3

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 screen. Users must perform their own tests when other screen designs are used.

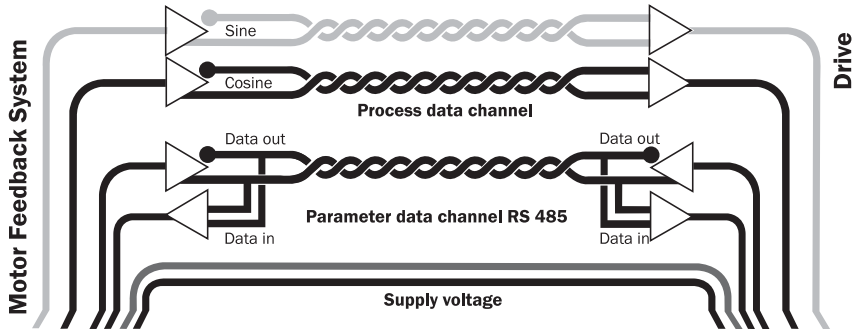
⁸⁾ If applying the electronic type label, in connection with numeric controllers, attention should be paid to Patent EP 425 912 B 2; Application of the electronic type label in connection with speed regulation is exempt.

Ordering information		
SEK/SEL37 axial connector		
Type	Part no.	Description
SEK37-HFA0-K02	1037376	Singleturn
SEL37-HFA0-K02	1037377	Multiturn

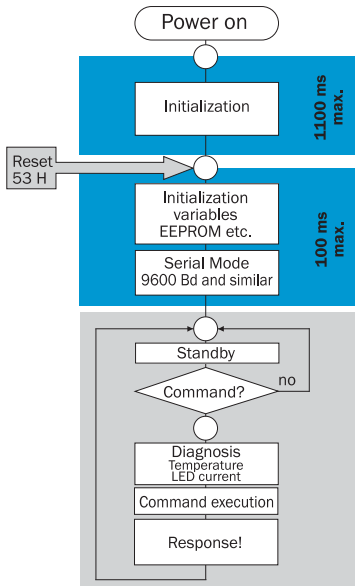


Electrical interface

- Safe data transmission
- High information content
- Electronic type label
- Only 8 leads
- Bus-enabled parameter channel
- Process data channel in real time



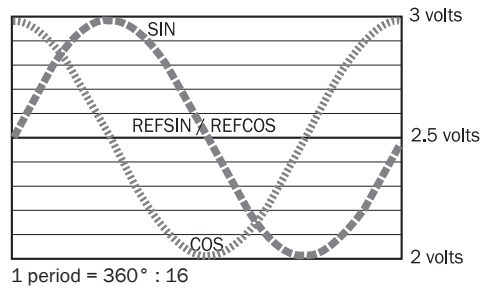
HIPERFACE® Starting time



CAUTION:
No **RS485 communication** is possible during the phases highlighted in blue

Signal specification of the process data channel

Signal diagram for clockwise rotation of the shaft, looking in direction "A"



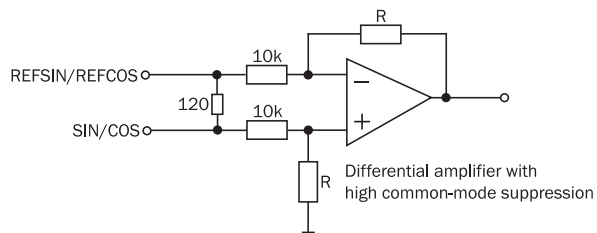
Access to the process data used for speed control, i.e. to the sine and cosine signals, is practically always "online". When the supply voltage is applied, the speed controller has access to this information at any time.

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 permissible environmental conditions

Signal	Value/Units
Signal peak, peak V_{SS} of SIN, COS	0.8 ... 1.2 V
Signal offset REFSIN, REFCOS	2.2 ... 2.8 V

Recommended receiver circuit for sine and cosine signals



Further informations to the interface see HIPERFACE®-description part no. 8010701



Type-specific settings	SEK37/SEK52	SEL37/SEL52
Type ID (command 52h)	42h	47h
Free EEPROM [bytes]	1,792	1,792
Address	40h	40h
Mode_485 ^{1) 2)}	E4h	E4h
Codes 0 ... 3	55h	55h
Counter	0	0

- ¹⁾ The baud rate 9600 is set by default. Other baud rates cannot be selected.
- ²⁾ When using the motor feedback systems SEK|SEL37 and SEK|SEL52, 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.
- ³⁾ 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.
- ⁴⁾ Temperature compatible with SCx (encoder temperature [°C] *2.048 - 40)

Overview of commands supported			SEK37/SEK52	SEL37/SEL52
Command byte	Function	Code 0 ³⁾	Comments	Comments
42h	Read position (5 bits per sine/cosine period)		9 bits	21 bits
43h	Set position	•		
44h	Read analogue value		Channel number F0h ⁴⁾ and 48h	Channel number F0h ⁴⁾ and 48h
			Temperature [°C]	Temperature [°C]
46h	Read counter			
47h	Increase counter			
49h	Reset counter	•		
4Ah	Read data			
4Bh	Save 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 name plate		Encoder type = 42h	Encoder type = 47h
53h	Encoder reset			
55h	Allocate encoder address	•		
56h	Read serial number and program version			

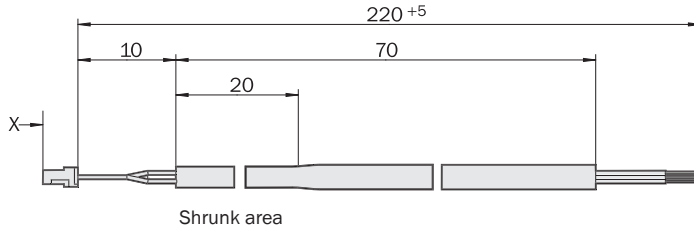
Overview of status messages				
Error type	Status code	Description	SEK37/52	SEL37/52
	00h	The encoder has recognised no error	•	•
Initialisation	01h	Faulty compensating data	•	•
	02h	Faulty internal angular offset	•	•
	03h	Data field partitioning table damaged	•	•
	04h	Analogue limit values not available	•	•
	05h	Internal I ² C bus not operational	•	•
	06h	Internal checksum error	•	•
Protocol	07h	Encoder reset occurred as a result of program monitoring	•	•
	09h	Parity error	•	•
	0Ah	Checksum of the data transmitted is incorrect	•	•
	0Bh	Unknown command code	•	•
	0Ch	Number of data transmitted is incorrect	•	•
	0Dh	Command argument transmitted is not allowed	•	•
Data	0Eh	The selected data field must not be written to	•	•
	0Fh	Incorrect access code	•	•
	10h	Size of data field stated cannot be changed	•	•
	11h	Word address stated, is outside data field	•	•
	12h	Access to non-existent data field	•	•
Position	1Fh	Speed too high, no position formation possible	•	•
	20h	Singleturn position unreliable	•	•
	21h	Positional error Multiturn		•
	22h	Positional error Multiturn		•
	23h	Positional error Multiturn		•
Other	1Ch	Monitoring the value of the analogue signals (process data)	•	•
	1Eh	Encoder temperature critical	•	•
	08h	Counter overflow	•	•

Further informations to the interface see HIPERFACE®-description part no. 8010701

Dimensional drawings and ordering information

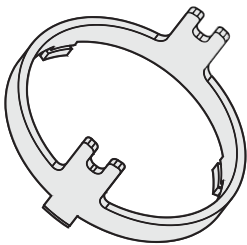
Stranded cable/connector, straight, 8 wires, 8 x 0.15 mm²

Type	Part no.	Contacts	Wire length
DOL-OJ08-G0M2XB6	2031086	8	0.2 m



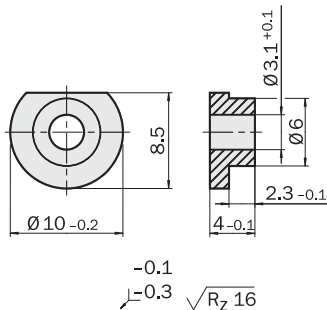
Assembly tool for SEK/SEL52 hollow shaft

Type	Part no.	Description
BEF-MW-SEY52	2048235	Assembly tool SEK/SEL52



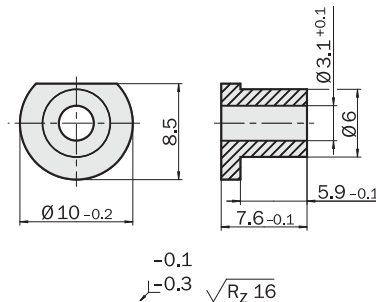
Servo clamp, Set (contents 3 off)

Type	Part no.	Description
BEF-WK-RESOL	2039082	Servo clamp for SEK/SEL52 (Hollow shaft and tapered shaft)



Servo clamp, Set (contents 3 off)

Type	Part no.	Description
BEF-WK-RESOL1	2048827	Servo clamp for SEK/SEL52 (Shoulder clamping)



Cable HIPERFACE®, 8 wires, per metre 4 x 2 x 0,15 mm²

Type	Part no.	Wires
LTG-2708-MW	6028361	8

Programming Tool for HIPERFACE® devices

Type	Part no.	Motor Feedback System
PGT-03-S	1034252	SEK/SEL37 and SEK/SEL52

Dimensional drawings and ordering information

Cover SEK/SEL52 with tapered shaft or collar clamping

Type	Part no.	Description
BEF-GA-SEY52BS1	2048234	Cover closed



Cover SEK/SEL52 with hollow shaft

Type	Part no.	Description
BEF-GA-SEY52TS1	2048232	Cover opened

