SICK | STEGMANN

Motor feedback system
for internally and externally ventilated drives
SinCos® SRS/SRM 64 with HIPERFACE®

Inhaltsverzeichnis

*** HIPERFACE®: For detailed information see Product information 910 980 003 391**

Highlights

- **1024 sine/cosine cycles per revolution**
- **Absolute with 15 bits per revolution over 12 bits (4096) revolutions**
- **Electronic type label**

- **Particularly suitable for fitting to internally and externally ventilated motors**
- **Very small rotation angle error arising from mechanical fitting, because of double taper shaft coupling**

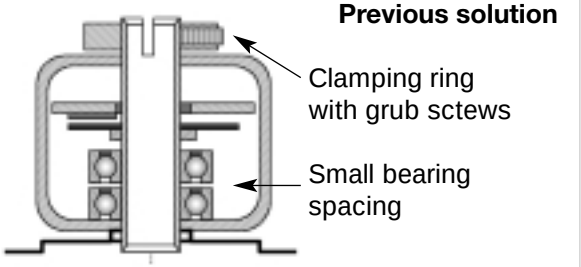
1.HIPERFACE®

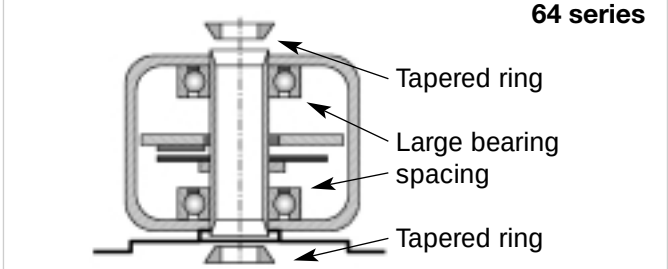
The SRS/SRM 64 encoder series

Sine/cosine encoders are sensors of very high quality with regard to the measured variables to be registered: rotational speed and position of servomotors. They are precision measuring devices, which are produced with the utmost care.
In order also to be able to use the precision when installed, care must be taken in particular over the most precise mechanical coupling of such measuring devices to the motors.
This is relatively satisfactorily obtained in rotary encoders which are equipped with blind hollow shafts or with taper shaft connections in conjunction with stator couplings on the parallelogram principle.

However, fitting in this way always means that the motor shaft cannot pass through the encoder fitted or incorporated, and thus further functions, such as the fan impeller, of the motor shaft are not possible on the so-called B side.

The 64 series is distinguished by the fact that the motor shaft can pass through the encoders and, at the same time, simple, highly accurate fitting of the shaft coupling can be carried out. Furthermore, because of their high degree of protection, the devices are suitable for use in internally and externally ventilated motors.





Approaches to technical development:

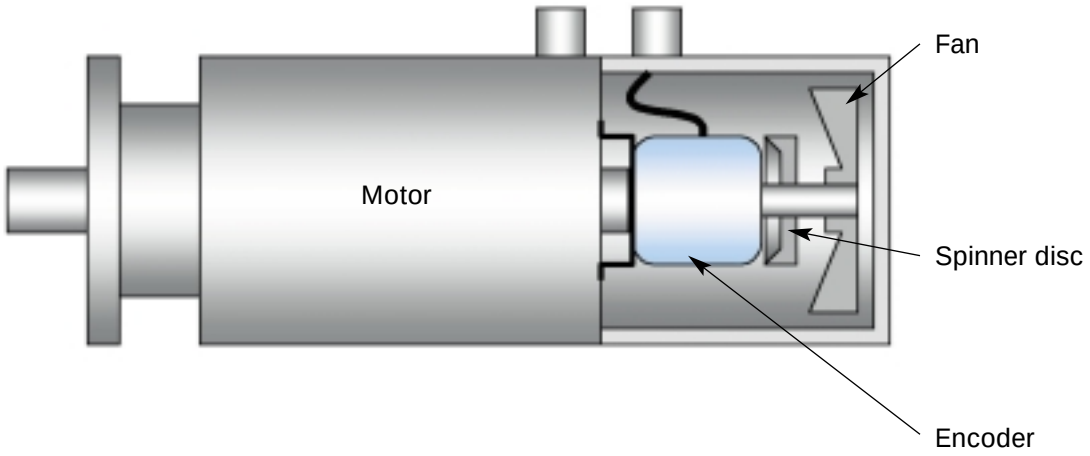
1. Maximizing the bearing spacing in the encoder
- Minimizes the wobbling of the encoder housing arising from unavoidable skewed positions of the encoder shafts because of fitting tolerances between ball-bearing inner ring diameter and encoder shaft diameter.
- Optimizes the degree of protection, above all around the shaft opening to the encoder housing, and is therefore particularly suitable for applications with fans.

2. Mechanical coupling to the motor shaft with tapered rings
- Minimizes the impact on the encoder shaft caused by the unavoidable fitting tolerances between motor shaft diameter and encoder shaft diameter.
- Minimizes the skewed position of the encoder shaft with respect to the motor axis of rotation.

2. Recommended installation

Recommended installation when used in motors with internal or external ventilation.

We recommend expressly and explicitly the provision of a spinner disc coupled firmly to the motor shaft between the fan impeller and the incorporated encoder. This primarily prevents
penetration of water into the encoder housing and optimizes the dew point for the encoder. If there were no spinner disc, the encoder would be cooled on the side facing the fan and heated on the side facing the motor. This can lead to condensation of the atmospheric humidity which is always present in the encoder housing. This can in turn lead to failure of the encoder function.
The spinner disc should be sufficiently large for the metallic cable outlet from the encoder also to be covered to the greatest extent against the cooling air.



3. Technical data and characteristics to DIN 32878

			Units
Number of sine/cosine cycles per revolution		1024	
Dimensions		see dimensional drawing	mm
Mass		0.4	kg
Moment of inertia of the rotor		45	gcm^2
Code type for the absolute value		binary	
Code direction with clockwise shaft rotation as viewed in direction “A” (see dimensional drawing)		rising	
Measuring step after forming the arctan with 12 bit resolution		0.3	seconds of arc
Number of steps per revolution	SRS SRM (32768 x 4096)	32.768 134.217.728	
Error limits of the digital absolute value via RS485		± 90	seconds of arc
Error limits in evaluating the 1024 cycle signals, integral nonlinearity		± 45	seconds of arc
Nonlinearity within one sine/cosine cycle, differential nonlinearity		± 7	seconds of arc
Output frequency for sine/cosine signals		0 ... 200	kHz
Working speed up to which the absolute position can be formed reliably		6000	min^{-1}
Operating speed		9000	min^{-1}
Max. angular acceleration		5×10^5	rad/s^2
Operating torque		0.2	Ncm
Starting torque		0.4	Ncm
Permissible shaft movement			
- Radial movement	static dynamic	± 0.1 ± 0.05	mm mm
- Axial movement	static dynamic	± 2 ± 0.2	mm mm
- Angular movement perpendicular to the axis of rotation	static dynamic	34×10^{-3} 17×10^{-3}	mm/mm mm/mm
Bearing service life		$3{,}6 \times 10^9$	revolutions
Working temperature range		-20 ... +85	°Celsius
Operating temperature range		-20 ... +85	°Celsius
Storage temperature range		-40 ... +85	°Celsius
Perm. relative atmospheric humidity (no condensation allowed)		90	%
Resistance to shocks when fitted to DIN IEC 68 Part 2-27		30/10	g/ms
Resistance to vibration when fitted to DIN IEC 68 Part 2-6		20/10 ... 2000	g/Hz
Degree of protection to DIN VDE 0470 Part 1 when fitted		IP 50	
EMC to DIN EN 61000-6-3 and DIN EN 61000-6-4			
Operating voltage range		7 ... 12	V
Recommended supply voltage		8	V
No-load operating current		< 80	mA
Available storage area in EEPROM		128	bytes
Interface signals SIN, REFSIN, COS, REFCOS RS485	 = *Process data channel* = *Parameter channel*	 analogue, differential digital	

4.HIPERFACE® Type specific

HIPERFACE® defines the physical interface of the motor feedback systems and also the transmission protocol of the parameter channel and the structure of commands, messages and functions (see HIPERFACE® parameter channel datasheet)

The functional scope can vary from type to type.

The HIPERFACE® functions of the SRS/SRM 64 are described below.

Basic settings

Type identifier (Command 52h)	SRS 64 SRM 64	22h 27h
Free EEPROM [bytes]		128
Address		40h
Mode_485		E4h
Codes 0..3		55h
Counter		0

Overview of the commands supported

Command -byte	**Function**	***Code 0*[1)]**	**Kommentar**
42h	Read position		
43h	Set position	•	
44h	Read analogue value		Channel number: 48h, Temperature [°C]
46h	Read counter		
47h	Increment counter		
49h	Erase counter	•	
4Ah	Read data		
4Bh	Save data		
4Ch	Determine status of a data field		
4Dh	Create data field		
4Eh	Determine available storage area		
4Fh	Change access key		
50h	Read encoder status		
52h	Read type label		Encoder type = 22h SRS 64 27h SRM 64
53h	Reset encoder		
55h	Allocate encoder address	•	
56h	Read serial number and program version		
57h	Configure serial interface	•	

[1)] The correspondingly identified commands contain the parameter “code 0”.
Code 0 is a byte which is inserted into the protocol to provide additional security against important system parameters being inadvertently overwritten.
At time of delivery, “code 0” = 55h.

4.HIPERFACE® Type specific

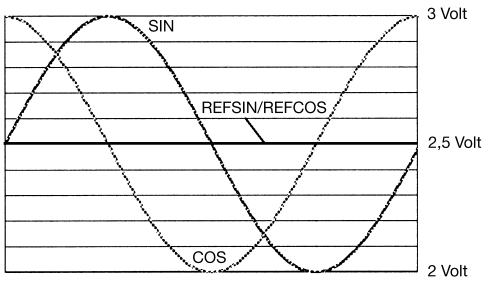
Overview of the status messages

Error type	Status code	Description
Initialization	00h	The encoder has not detected an error
	01h	Analogue signal outside specification
	02h	Internal angular offset incorrect
	03h	Data field partition table destroyed
	04h	Analogue limiting values unavailable
	05h	Internal I^2C bus unserviceable
	06h	Internal checksum error
Protocol	07h	Encoder reset from program monitoring
	09h	Parity error
	0Ah	Checksum of the data transmitted is incorrect
	0Bh	Unknown command code
	0Ch	Number of data items transmitted incorrect
	0Dh	Command argument transmitted is impermissible
Data	0Eh	The selected data field must not be written to
	0Fh	Incorrect access code
	10h	The size of the specified data field cannot be changed
	11h	Specified word address outside data field
	12h	Access to nonexistent data field
Position	01h	Analogue signal outside specification
	1Fh	Speed too high, no position formation possible
	20h	Impermissible single-turn position
	21h	Multi-turn position error
	22h	Multi-turn position error
	23h	Multi-turn position error
Others	1Dh	Critical transmitter current (contamination, transmitter drop-out)
	1Eh	Encoder temperature critical
	08h	Counter overflow

5. Signal specification

Signal specification of the process data channel

Signal waveform with
clockwise rotation,
as viewed in direction “A”



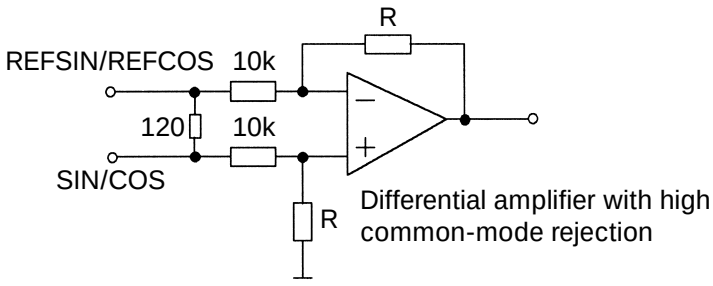
1 cycle = 360° : 1024

The access to the process data which is used for the actual speed control, i.e. the sine and cosine signals, is virtually always “on-line”. When the voltage supply is switched on, the speed controller has access to this data at any time.

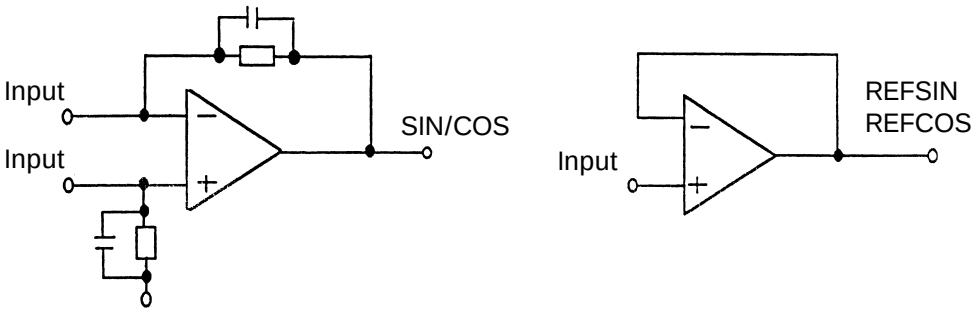
Refined technology guarantees an amplitude response of the analogue signals over all the specified ambient conditions up to a maximum change in amplitude of only 20%.

Characteristic values valid for all the specified ambient conditions		Units
Signal peak to peak Vss 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

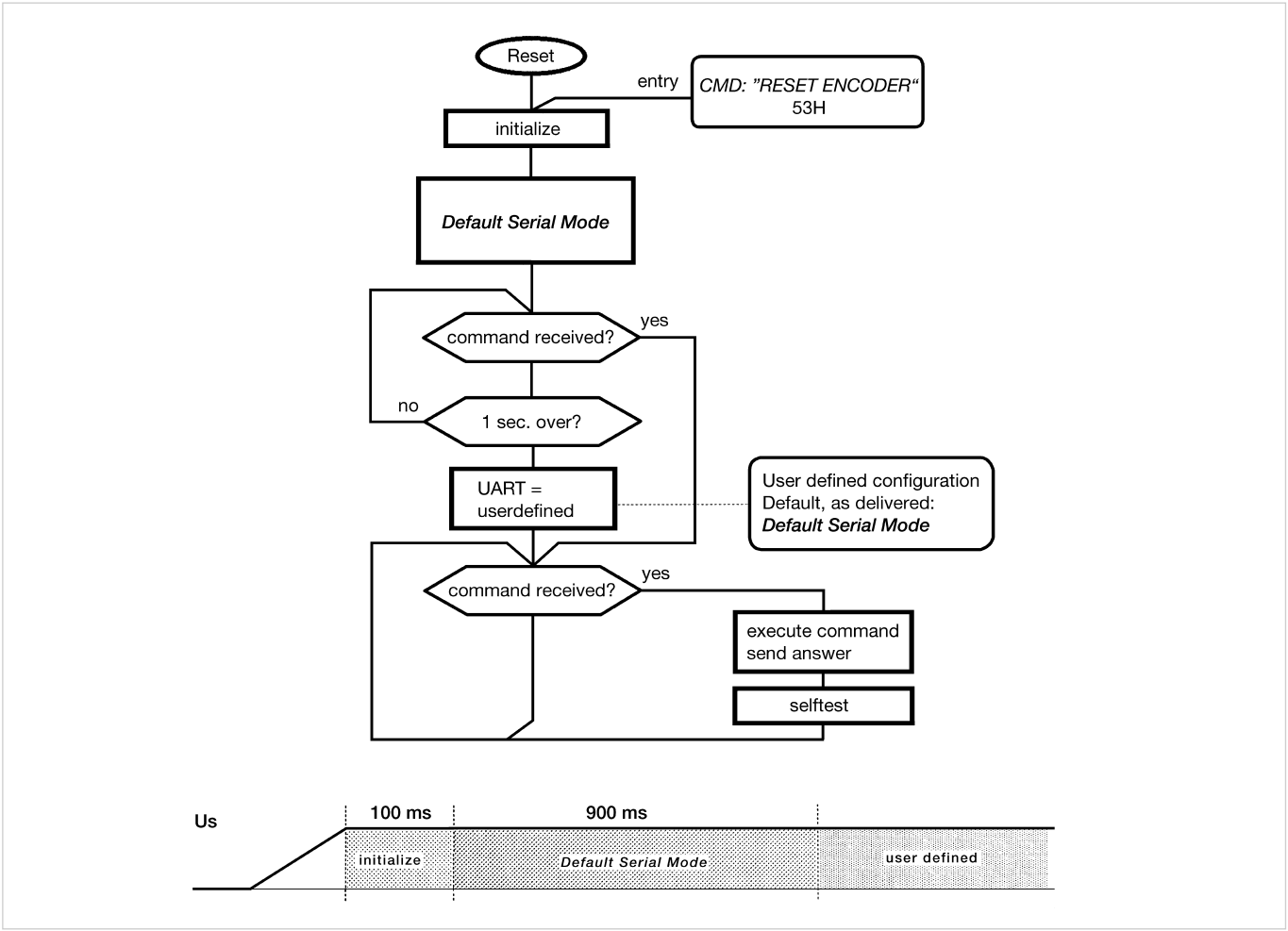


The output circuit of the process data channel SinCos® encoder



6. Restart

The set baud rate and the definition of the parity become effective only via an *ENCODER RESET* (53H) or after the encoder has been switched off and on.



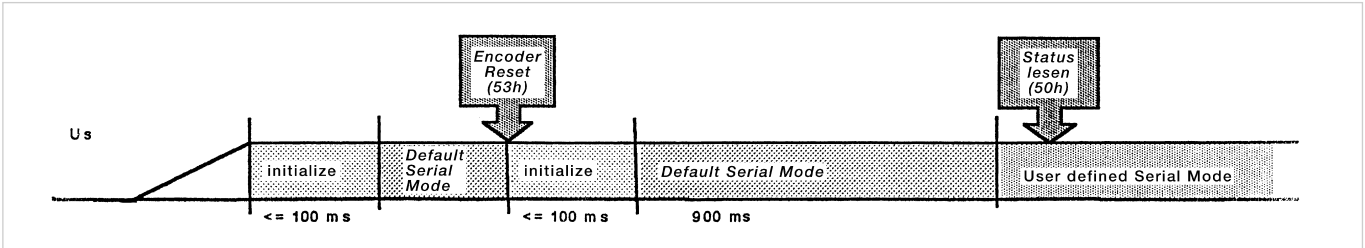
Default Serial Mode = E4h

see command 57h

In individual cases an unfavourable start-up of the operating voltage can have a detrimental effect on the power-up sequence.

We recommend in any case that a software reset (53h) be carried out after the encoder supply voltage has been switched on (t > 100 ms).

This means that the power-up sequence will be run through again. After one second, the encoder status can then be checked (command 50h).



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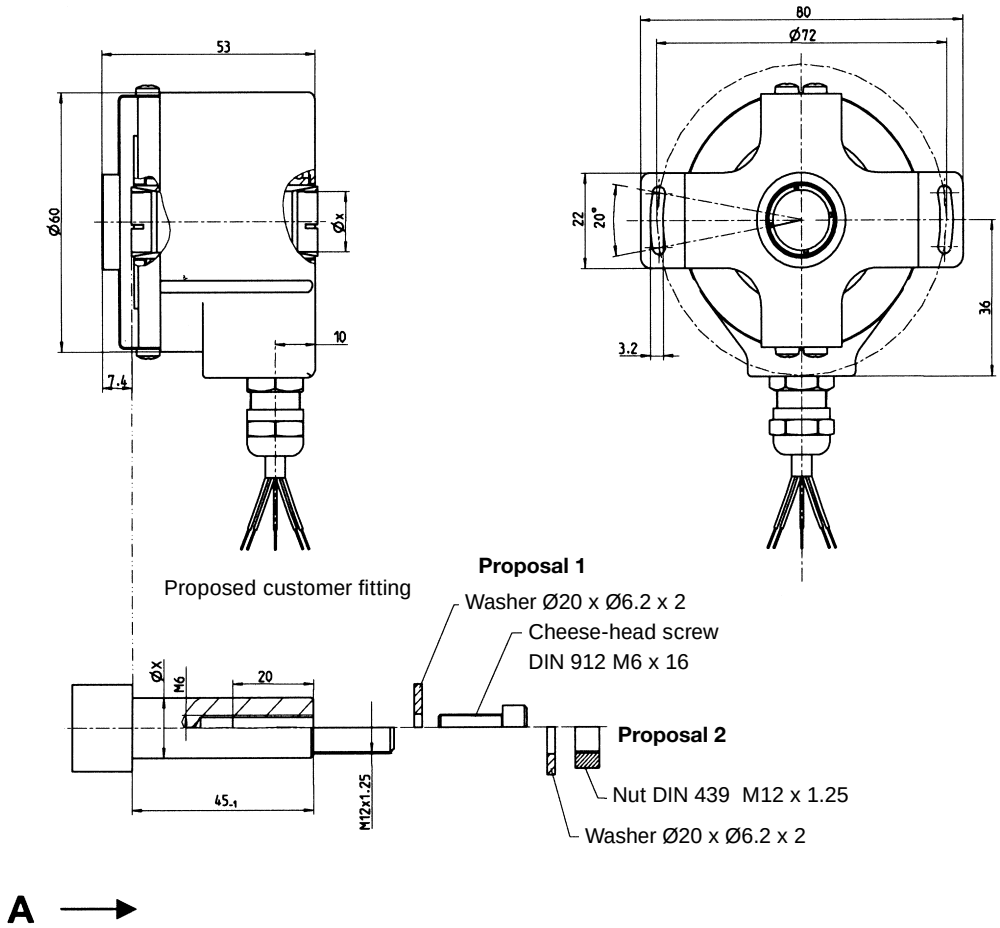
7. Dimensional drawing and recommended installation



General tolerances to DIN ISO 2768

Hollow shaft diameter (X) Standard **14 mm** ^{F7}

By using tapered reducers, the following diameters can be implemented:

1/2 inch
3/8 inch
10 mm
12 mm

8. Pin allocation

Cable outlet:

Prefitted cable (8-way) for SinCos SRS/SRM 64

Colour	Signal	Description
red	US	Supply voltage 7 – 12 V
blue	GND	Ground 0 V
brown	REFSIN	Sine reference signal line
black	REFCOS	Cosine reference signal line
grey	Data +	RS 485 data line
green	Data -	RS 485 data line inverted
white	+ SIN	Sine signal line
pink	+ COS	Cosine signal line

Screening:

The braided screen of the cable is connected to the encoder housing.
US and GND are connected internally to the housing via 2.2 nF housing capacitors.
The screen must be connected without fail at the end of the cable.

Standard cable length 1.5 m

9. Accessories

Programming tool

For the individual configuration of HIPERFACE® encoders, comprising:

- Programming adapter
- Link cable
- Encoder cable
- Plug-in power supply unit
- Program floppy disk

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