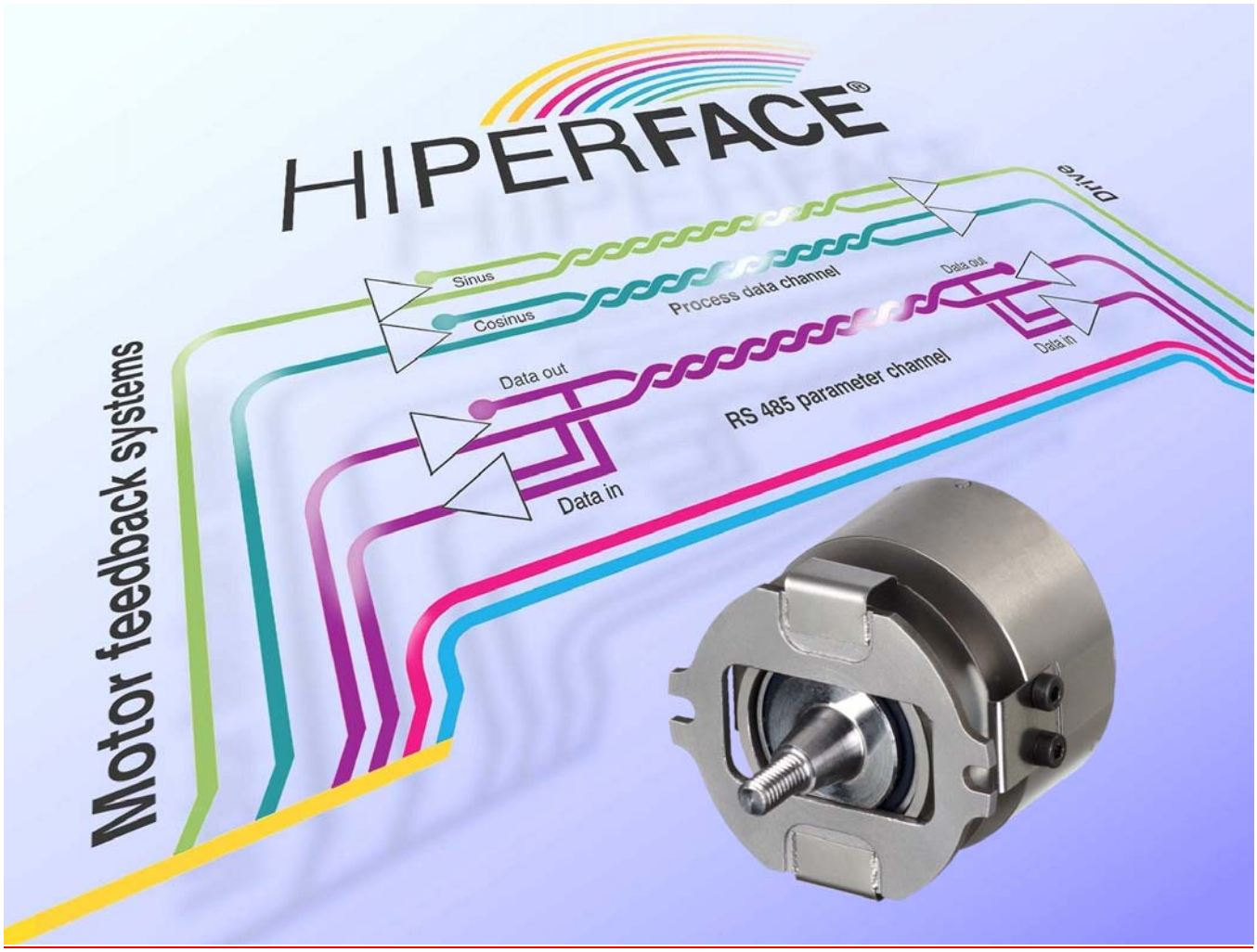
SICK | STEGMANN

Motor Feedback System SinCos® SKS 36 with HIPERFACE®



1. Features of the SinCos® SKS 36

The SKS 36 MiDi encoder is the first member of a new generation of optical encoders within the SinCos® product family. Common to all members is the novel **Mi**ni-**Di**sc technology.
This new rotary encoder generation is not simply a miniaturised version of conventional rotary encoders. The construction is fundamentally different and opens the door to the production of truly small rotary encoders.
The unique feature of this generation: *a very small code disc with a code track radius of only 2 mm permitting holistic (integral) scanning.*
In the process, the eccentricity errors of the code disc, ball bearings and shaft, which are unavoidable in conventional systems, are compensated for by the system.

The 128 lines on the code disc are scanned integrally using an Opto-ASIC specifically developed for the purpose. The sinusoidal signals produced have a high linearity and interpolation capability. In spite of its small dimensions, the MiDi encoder offers maximum reliability as a result of the "self-monitoring absolute position". The absolute position within a revolution is produced by means of digital evaluation of a sequential code. An error in the absolute information can be determined even before a shaft movement takes place. In the event of an erroneous code, an error message is produced.

The light source used is an IR LED which is mounted inside the shaft. The light intensity is controlled in order to compensate for ageing and temperature variation. The current to the LED is monitored.

By mounting the code disc in the centre of the axis of rotation, high angular velocities are no longer limited by the code disc.
The overall size is essentially determined by the mechanical and electrical interfaces. The SKS 36 has HIPERFACE® as an electrical interface.

The number of components is optimised to a minimum and, of course, only the newest technologies, such as "chip on board" are used.

The small dimension of the SKS 36 MiDi encoder permits the manufacturers of small motors to shorten the overall length of their motors considerably.

Features in brief

- **HIPERFACE©** - interface
- 128 sine/cosine periods per revolution
- Digital absolute value with 4096 steps per revolution
- Programming of the position value
- Electronic type label
- Internal encoder temperature can be read
- EEPROM may be used by the customer (e.g. motor data)
- Compact design
- Simple and fast installation

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2. Technical data and characteristics to DIN 32 878

		Units
Number of sine/cosine periods per revolution	128	
Dimensions	See drawing	mm
Mass (without cable)	0.06	kg
Moment of inertia of the rotor	4.3	gcm^2
Code type for the absolute value	binary	
Code direction with clockwise shaft rotation as viewed in direction "A" (see dimensional drawing)	increasing	
Measuring steps after forming the arctan with 12-bit resolution	2,5	Seconds of arc
Number of steps per revolution of the digital absolute value via RS 485	4096	
Error limits of the digital absolute value via RS 485	±125	Seconds of arc
Error limits in evaluating the 128 cycle signals, integral non-linearity	± 80	Seconds of arc
Nonlinearity within one sine/cosine period, differential non-linearity	±40	Seconds of arc
Working speed	12,000	min^{-1}
Max. angular acceleration	5×10^5	rad/s^2
Operating torque	0.2	Ncm
Starting torque	0.3	Ncm
Permissible shaft movement - Radial movement - Axial movement Permissible misalignment of the shaft - Radial - Axial (see drawing)	 ±0.05 ±0.1 ±0.1 ±0.2	 mm mm mm mm
Bearing lifetime	3.6×10^9	revolutions
Working temperature range	-20 .... +110	°C
Operating temperature range to DIN 32878	-20 .... +125	°C
Storage temperature range without packaging	-40 .... +125	°C
Permissible relative air humidity (no condensation allowed)	90	%
Resistance to shocks when assembled, to DIN IEC 68 Part 2-27	100/6	g/ms
Resistance to vibration when assembled, to DIN IEC 68 Part2-6	50/10 ... 2000	g/Hz
Degree of protection to IEC 60 529	IP 64	
EMC to EN 50081-2 and EN 61000-6-2		
Operating voltage range	7 12	V
Recommended supply voltage	8	V
Max. no-load operating current	60	mA
Interface signals: *Process data channel:* SIN, COS REFSIN, REFCOS	 0.8 ... 1.1 2.2 ... 2.8	 Vpp V
Parameter channell	According to EIA 485	

[1] Short term pea kambient temperature at reduced shaft speed.

[2] The specified EMC standards are fulfilled if the SKS 36 is electrically connected to the motor housing which is also connected by the cable screen to earth on the drive side. The GND (0V) connection of the supply voltage must also be connected to earth. If different earthing concepts are applied, then the user must perform additional EMC tests.

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3. HIPERFACE® - Type specific

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

The functional scope can differ from type to type.

The HIPERFACE® functions of the SKS 36 are described below.

Basic settings

Type identifier (Command 52h)	32h
Free EEPROM [Bytes]	1792
Address	40h
Mode_485	E4h
Codes 0..3	55h
Counter	0

Summary of the commands supported

Command -byte	Function	*Code 0*[1)]	Comment
42h	Read position		
43h	Set position	●	
44h	Read analogue value		Channel number:48h, temperature [°C]
46h	Read counter		
47h	Increment counter		
49h	Delete counter value	●	
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 key		
50h	Read encoder status		
52h	Read type label		Encoder type = 32h
53h	Encoder reset		
55h	Allocate encoder address	●	
56h	Read serial number and program version		
57h	Configure serial interface	●	

1) The appropriately identified commands contain the parameter "code 0".
Code 0 is a byte which is inserted into the protocol as an additional safeguard against inadvertent overwriting of important system parameters.
When delivered, "Code 0" = 55H.

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4. HIPERFACE® - type-specifc

Summary of the status messages

Error type	Status Code	Description
	00h	The encoder has not detected an error
Initialisation	01h	Analogue signals out of specification
	02h	Internal angle offset wrong
	03h	Data field partitioning table destroyed
	04h	Analogue limiting values not available
	05h	Internal I^2C bus not serviceable
	06h	Internal check sum error
Protocol	07h	Encoder reset by program monitoring
	09h	Parity error
	0Ah	Check sum of the data transmitted is wrong
	0Bh	Unknown command code
	0Ch	Number of data transmitted wrong
	0Dh	Command argument transmitted is inadmissible
Data	0Eh	The selected data field may not be overwritten
	0Fh	Wrong access code
	10h	The size of the specified data field may not be changed
	11h	Specified word address outside data field
	12h	Access to non-existent data field
	20h	Single-turn position unreliable
	1Dh	LED current critical (contamination, defective LED)
	1Eh	Encoder temperature critical
	08h	Counter overflow

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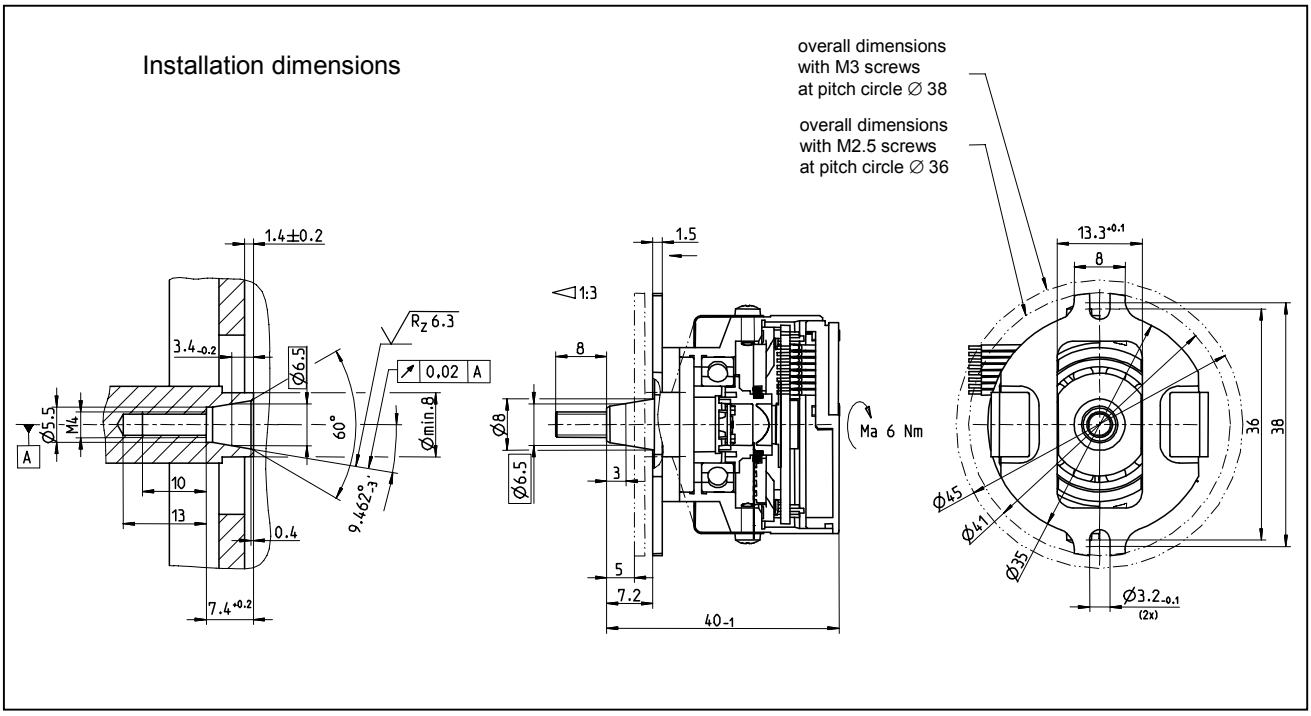
5. Dimensional drawing



Caution:

- The encoder shaft must not be machined.
- The ball bearings can be damaged by impacts on the shaft.

Installation:

- The two flats on the encoder shaft must be latched into the slot in the stator coupling.
- Lock the motor shaft to prevent rotation.
- Place the installation tool on the rear of the encoder and latch it on the slots in the encoder housing.
- Screw the encoder into the motor shaft with a tightening torque of 6 Nm using the hexagonal location on the installation tool.
- Release the motor shaft.
- Rotate the encoder until the fixing tabs of the stator coupling lie above the fixing threads in the motor bearing plate.
- Screw the stator coupling firmly to the motor bearing plate with two M 2.5 (or M 3) screws.
- Tighten these screws alternately and uniformly.
- The stator coupling has then released the encoder shaft, so that it can rotate freely.

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6. Connection details

Colour Connection wires	Signal		Length of stranded cable: approx: 200 mm Screening: In the built-in encoder, the encoder housing is connected to the motor via the stator coupling. The mounting space for the encoder is therefore screened by the motor housing, so that it is possible to work with unscreened connecting wires within the motor. Us and GND are connected internally to the housing via 2.2 nF capacitors.
red	Us	7 - 12 V	
blue	GND		
brown	REFSIN		
black	REFCOS		
grey	Data +	RS 485	
green	Data -	RS 485	
white	+SIN		
pink	+COS		

7. Ordering information

When ordering, please use the following ordering description:

Variant	Single-turn-encoder	Standard
Built-in encoder	SKS 36 E	With RS485 line termination

8. Accessories

Mounting screws
M3x8 2 pieces
M2,5x6 2 pieces

Programming Tool
For the configuration of HIPERFACE®- encoders, comprising:
- programming adapter
- link cable
- encoder cable
- plug-in power supply unit
- program floppy disk

Installation tool
For screwing the encoder into the motor shaft.

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