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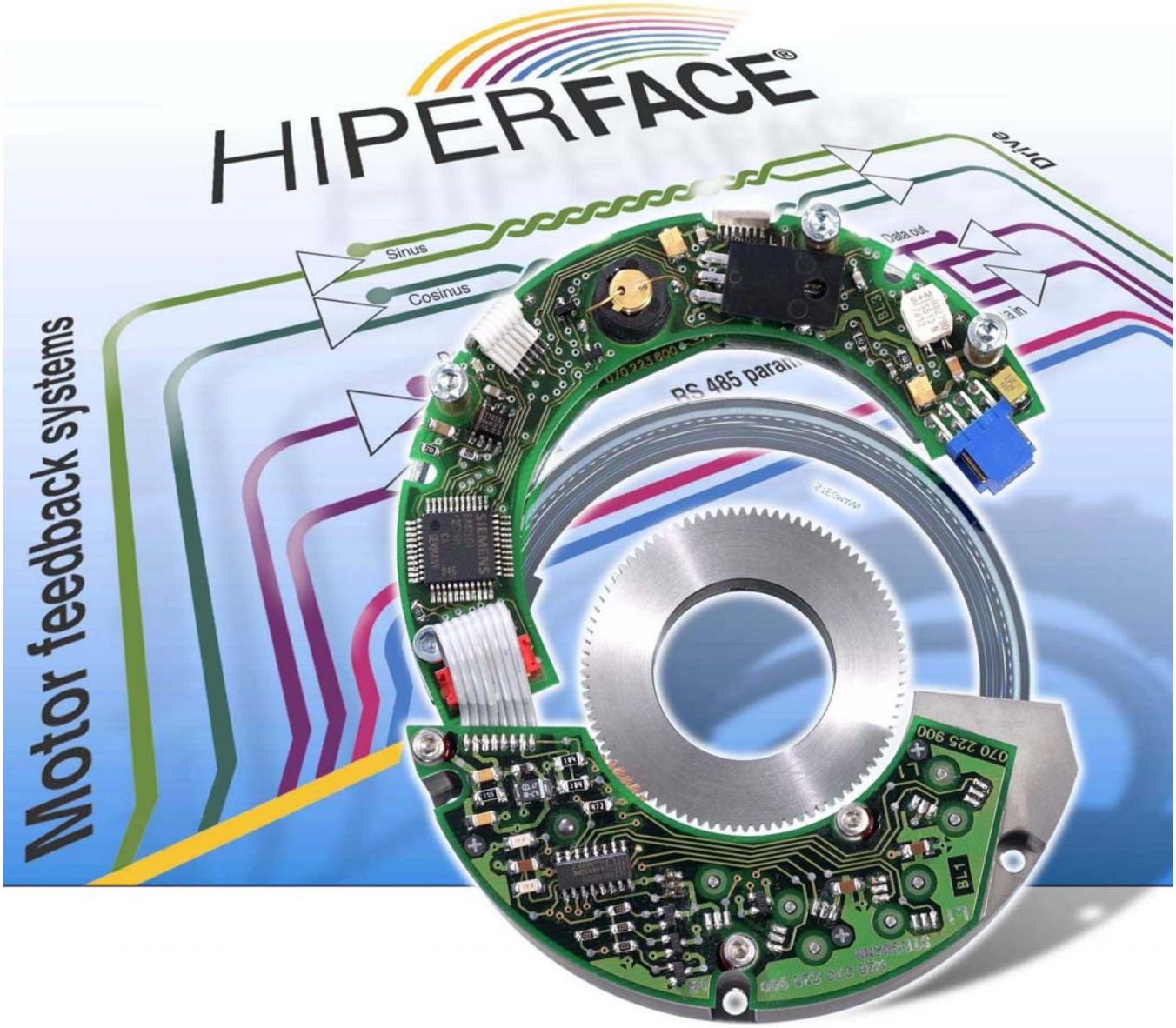
Motor feedback systems for hollow shaft motors SinCos® SCM-KIT 101 with HIPERFACE®



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*** For HIPERFACE® detailed information, see product information 910 980 103 445**

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1. Features of the SinCos® SCM-KIT 101

The SCM-KIT 101 is a member of the SinCos® – Encoder family.
It is a multi turn kit encoder for motor feedback applications with HIPERFACE® and is mainly used in hollow shaft motors. It provides 1024 sine/cosine periods per turn and an absolute coded position over 4096 turns.
HIPERFACE® (**Hi**gh **per**formance inter**face**) is the electrical interface of the SCM-KIT 101. This is the standard interface of high performance motor feedback systems.
The position information within one turn is generated, using modern technology, such as mixed signal ASIC, custom specific photo diode array, Microcontroller and light regulation technology.
The position information over the 4096 revolutions of the shaft is generated by analogue Hall sensors which scans magnets, mounted on four 8:1 gear stages.

Kit type encoders have some advantages:

- No stator coupling is needed, which has influence onto the accuracy and the dynamic behavior of the system.
- No torque limit by ball bearings.
- The smallest possible mounting space.
- Cost saving (housing, stator coupling and bearings)

At design in you have to consider the following demands:

- Tight tolerances of motor shaft and centering are required.
- Axial play of the shaft has to be reduced to 0.05mm
- Accuracy depends on precise mounting of the encoder.
- The mounting of the encoder requires a very clean working space.
- Dust protection is necessary.

Features in brief

- **HIPERFACE® - interface**
- **1024 sine/cosine periods per revolution**
- **Digital absolute value with 32768 steps per revolution**
- **4096 revolutions can be measured**
- **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)**
- **Bearing less HIPERFACE® - Encoder**
- **Through holes from 25 to 53 mm**

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2. Technical data and characteristics to DIN 32 878

Number of sine/cosine cycles per revolution		1024	
Dimensions		see drawing	mm
Mass of the sensor block		50	g
Mass of the gear box	GB 101 SCM-35	182	g
	GB 101 SCM-53	270	g
Mass of the code disc	CS 25 SCM	58	g
	CS 35 SCM	52	g
	CS 40 SCM	68	g
	CS 45 SCM	62	g
	CS 53 SCM	56	g
Moment of inertia of the code disc	CS 25 SCM	246	gcm^2
	CS 35 SCM	273	gcm^2
	CS 40 SCM	468	gcm^2
	CS 45 SCM	455	gcm^2
	CS 53 SCM	474	gcm^2
Tightening torque for the code disc set screws		20 ... 40	Ncm
Code type for the absolute value		binary	
Code direction with clockwise shaft rotation as viewed in direction »A« (see dimensional drawing)		increasing	
Number of steps per revolution (digital absolute value via RS 485)		32768	
Total number of steps		32768 x 4096	
Limits of error of the digital absolute value via RS 485		$\pm 50 \times 10^{-3}$	degree
Error limits in the evaluation of the 1024-cycle signals, integral non-linearity [1]		$\pm 47 \times 10^{-3}$	degree
Non-linearity within one sine/cosine period, differential non-linearity		$\pm 3{,}3 \times 10^{-3}$	degree
Output frequency for sine/cosine signals		0...200	kHz
Max. operating speed			
SCM-KIT 101-25 / 35		6000	rpm
SCM-KIT 101-40 / 45 / 53		5000	rpm
Max. angular acceleration		$0{,}2 \times 10^6$	rad/s^2
Permissible shaft movement			
- Radial movement	dynamic	±0,015	mm
- Axial movement	dynamic	±0,05	mm
Working temperature range		-10 .... +100	°Celsius
Operating temperature range		-20 .... +110	°Celsius
Storage temperature range		-40 .... +110	°Celsius
Permissible relative air humidity (no condensation allowed)		90	%
Resistance to shocks when assembled, to IEC 68 Part 2-27		70/10	g/ms
Resistance to vibration when assembled, to IEC 68 Part 2-6		10/10 ... 2000	g/Hz
Degree of protection to IEC 60529		IP00	
EMC according EN 50081-2 and EN 61000-6-2 [2]			
Operating voltage range		7 12	V
Recommended supply voltage		8	V
Max. no-load operating current		< 110	mA
Interface signals:			
Process data channel:	SIN, COS	0.8 ... 1.1	Vpp
	REFSIN, REFCOS	2.2 ... 2.8	V
Parameter channel		According to EIA 485	

Notes:

1. With a maximum run out of the code tracks on the code disc of 0.06 mm (see chapter 7 and 8)
2. To insure the specified EMC the encoder has to be mounted in a housing which is connected to ground. The shield of the encoder cable has to be connected to the housing and the ground connection of the drive. GND (0V) of the encoder power supply must also be connected to the same ground within the Drive.

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3. HIPERFACE® - Type specific parameter

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 SCM-KIT 101 are described below.

Basic settings

Type identifier (Command hx52)	27h
Free EEPROM [Bytes]	128
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:F0h)		Temperature $\cong \frac{\text{Digital value}+40}{2048}[°C]$
44h	Read analogue value (Cannel number C8h)		Vector length ≅ 40 x digital value
46h	Read counter		
47h	Increment counter		
49h	Delete 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 key		
50h	Read encoder status		
52h	Read type label		Encoder type = 27h
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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3. HIPERFACE® - Type-specific status messages

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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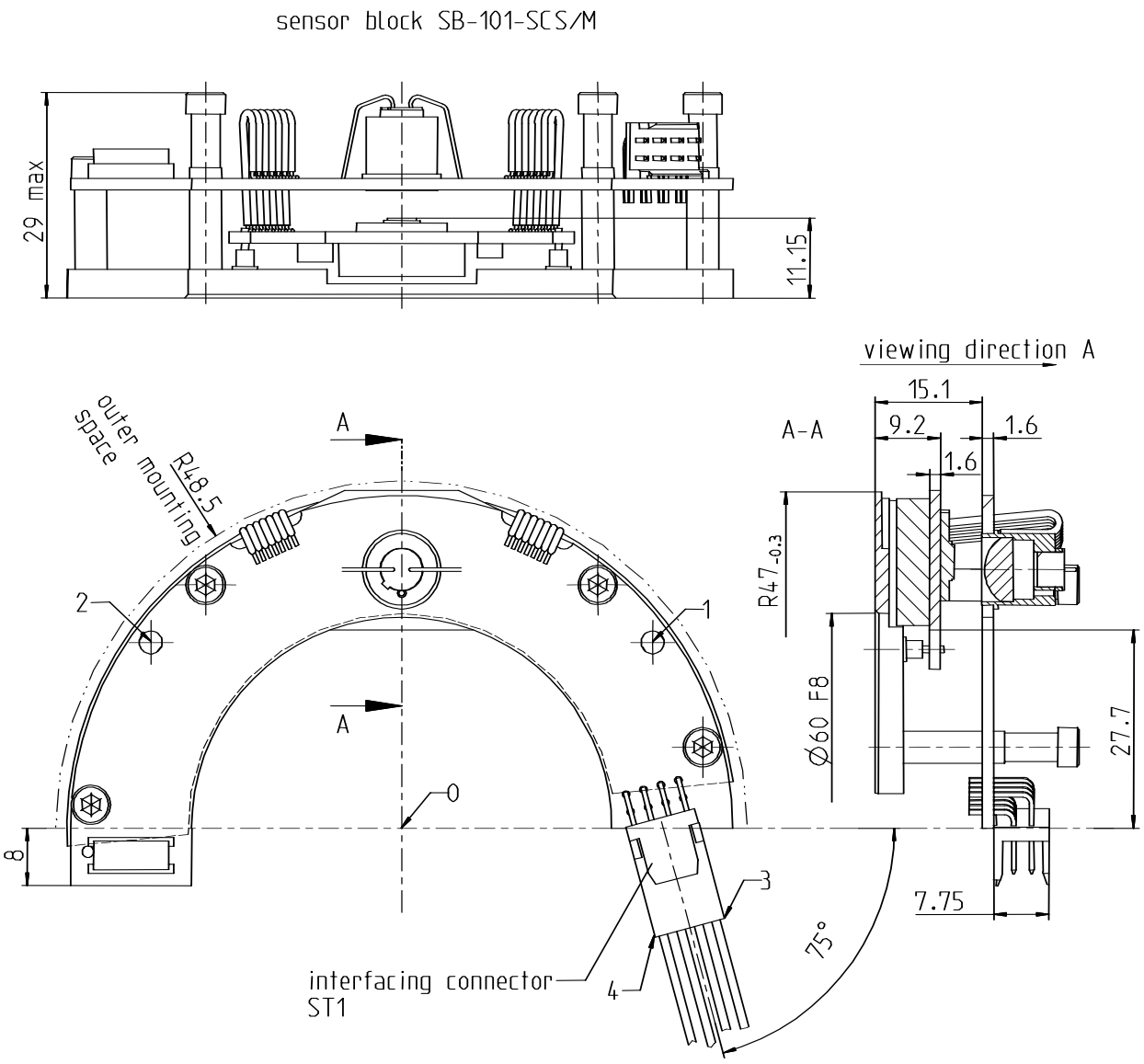
4. Dimensions sensor block



POS.	X±0.05	Y±0.05
0	0.000	0.000
1	35.217	25.974
2	-35.217	25.974
3	45.301	-12.606
4	35.565	-15.215

all measurements in [mm]

general tolerances according DIN ISO 2768-mK

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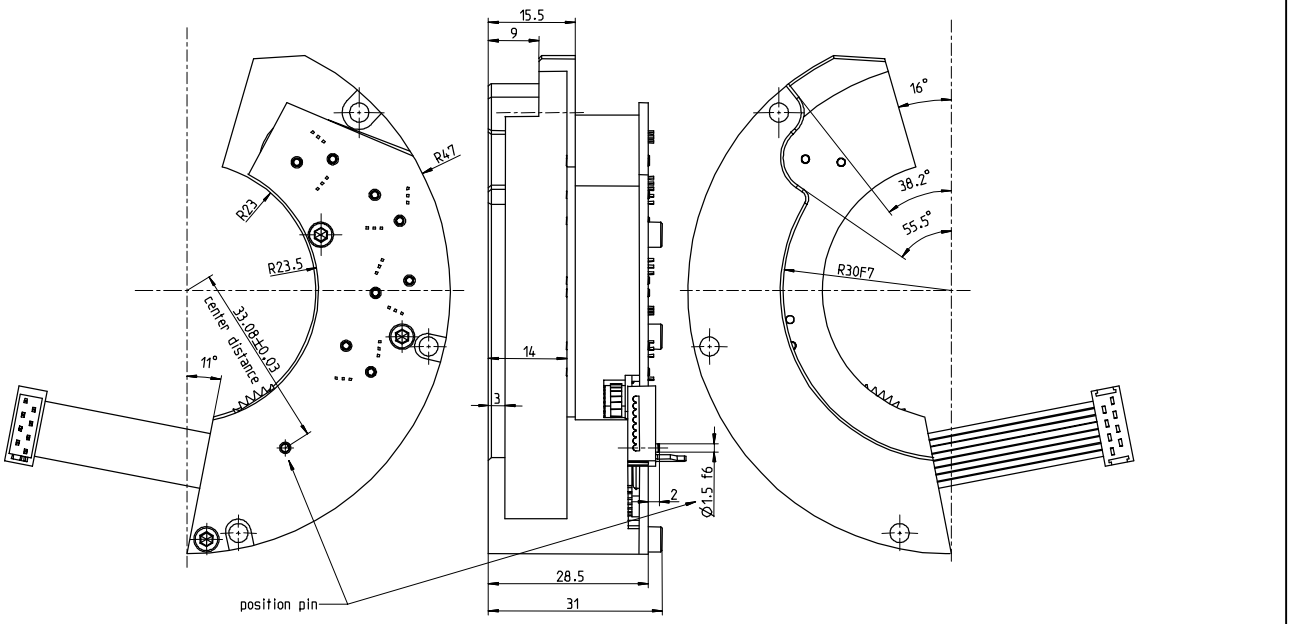
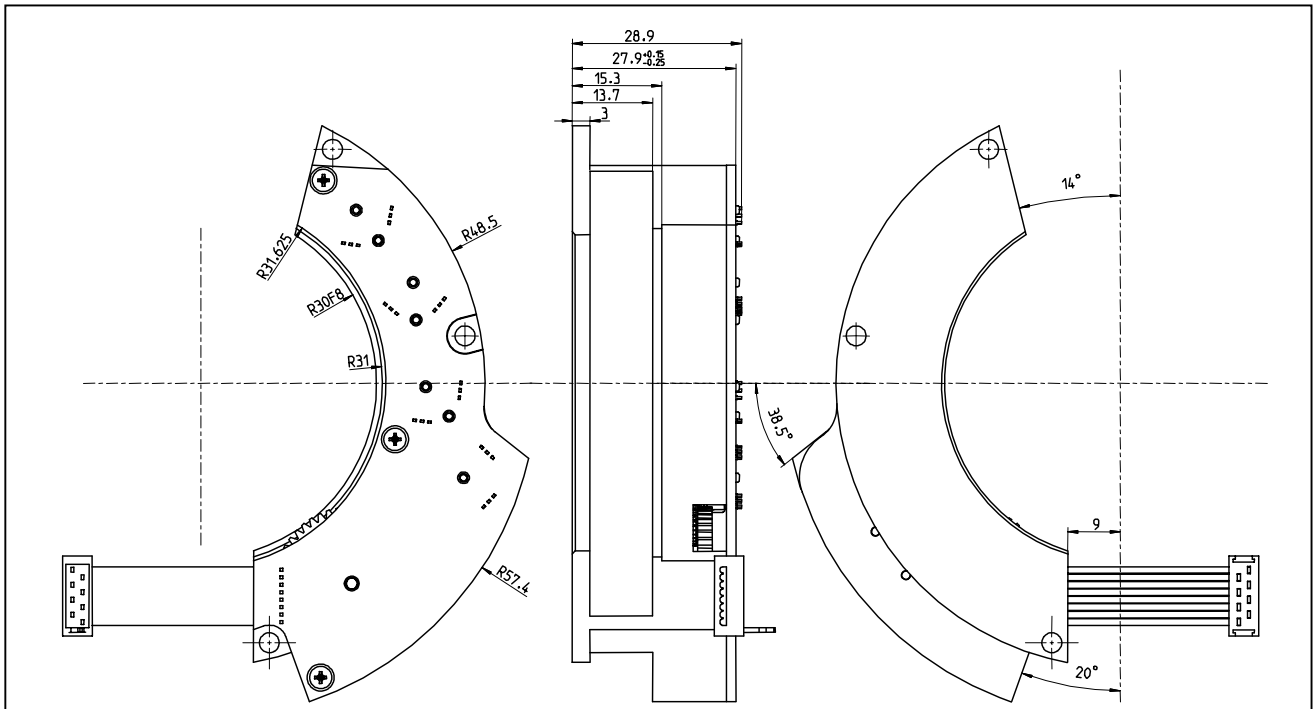
5. Dimensions - gear boxes

GB 101 SCM-35



general tolerances according DIN ISO 2768-mK

GB 101 SCM-53



general tolerances according DIN ISO 2768-mK

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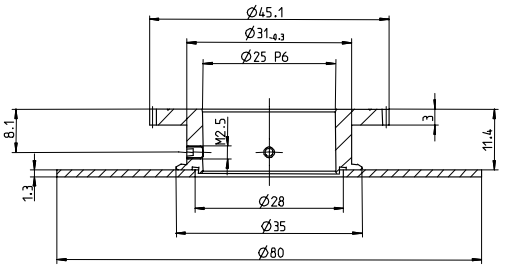
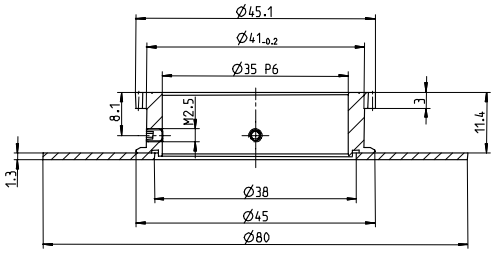
6. Dimensions – code disk with hub

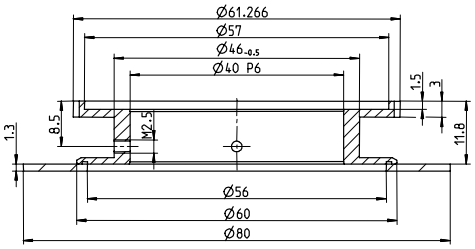
CS 25 SCM



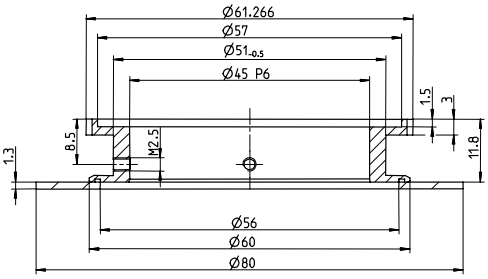
CS 35 SCM



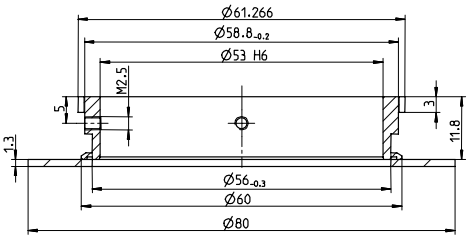
CS 40 SCM



CS 45 SCM



CS 53 SCM



Material of the hub X12CrMoS17 Nr. 1.4104

general tolerances according DIN ISO 2768-mK

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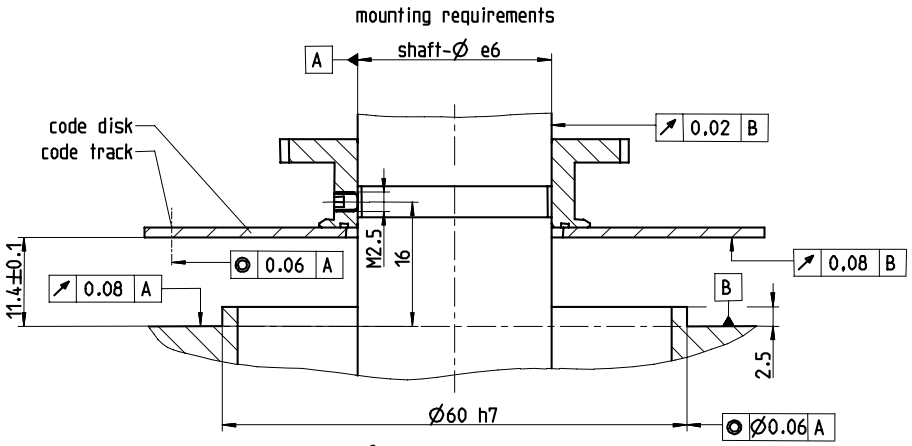
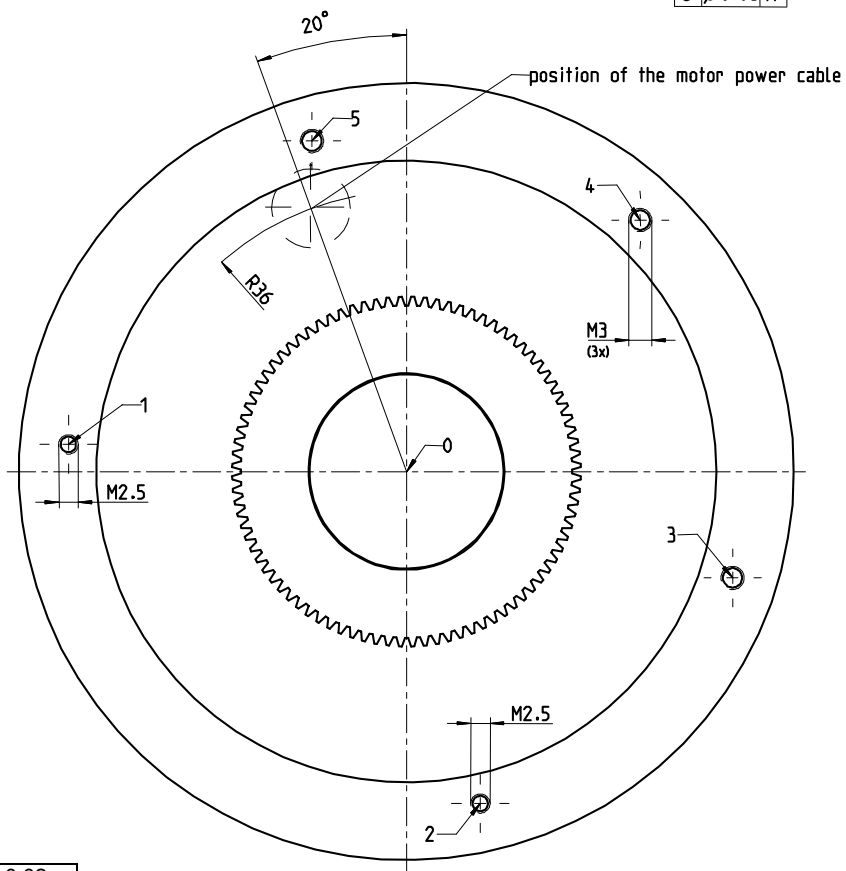
7. Recommended mounting arrangement SCM-KIT 101 -25/35





Pos.	X ±0,02	Y ±0,02
0	0,000	0,000
1	-43.619	3.502
2	9.538	-42.707
3	42.084	-13.674
4	30.178	32.362
5	-12.197	42.536

shaft-∅
25 e6
35 e6

general tolerances according DIN ISO 2768-mK

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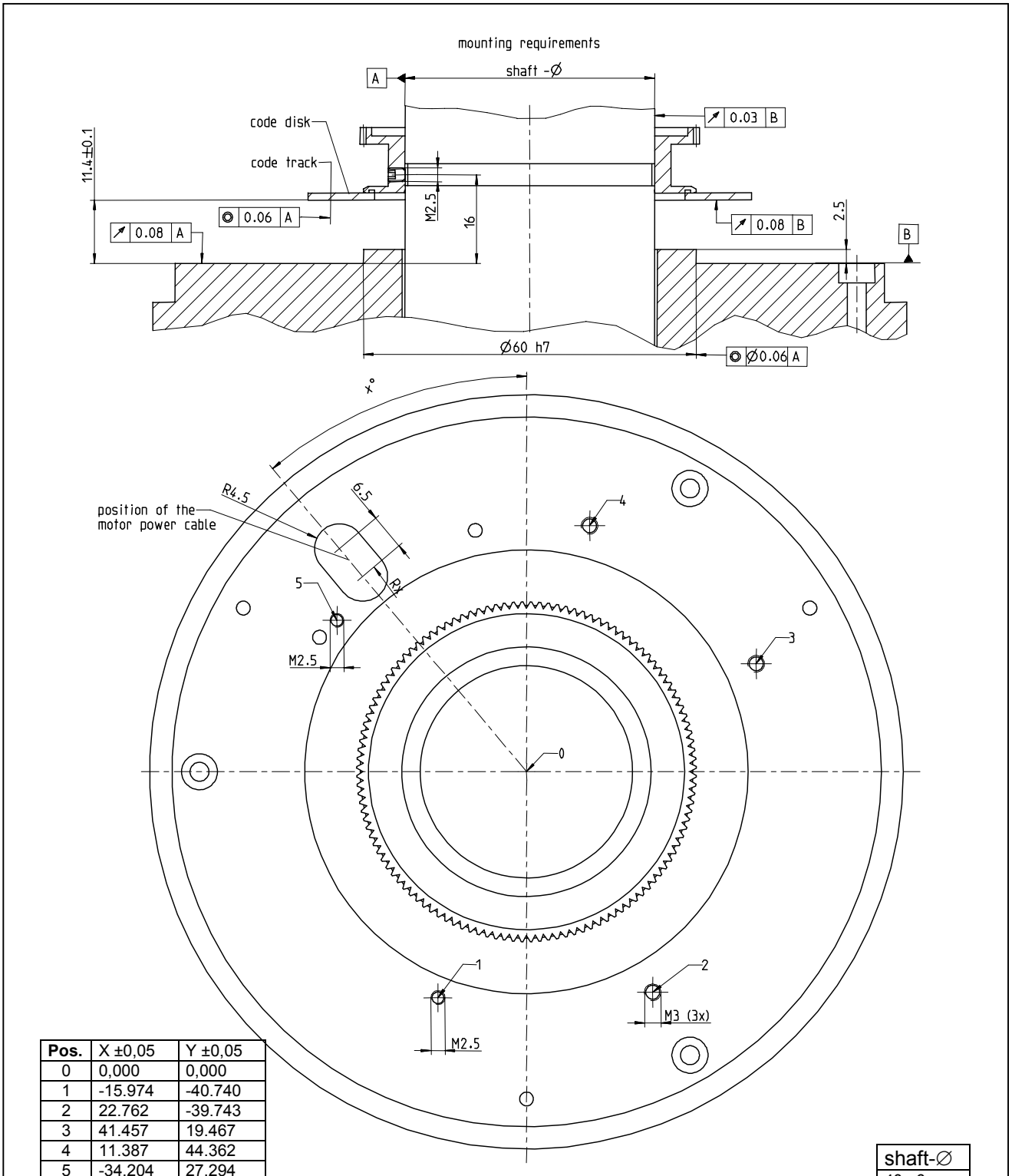
8. Recommended mounting arrangement
SCM-KIT 101 – 40/45/53



Pos.	X ±0,05	Y ±0,05
0	0,000	0,000
1	-15.974	-40.740
2	22.762	-39.743
3	41.457	19.467
4	11.387	44.362
5	-34.204	27.294
x	40°	35°
Rx	R46	R62

shaft-∅
40 e6
45 e6
53 g6

general tolerances according DIN ISO 2768-mK

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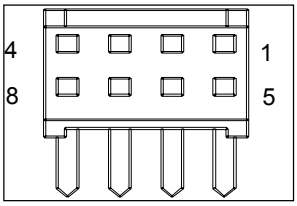
9. Pin allocation

Pin allocation



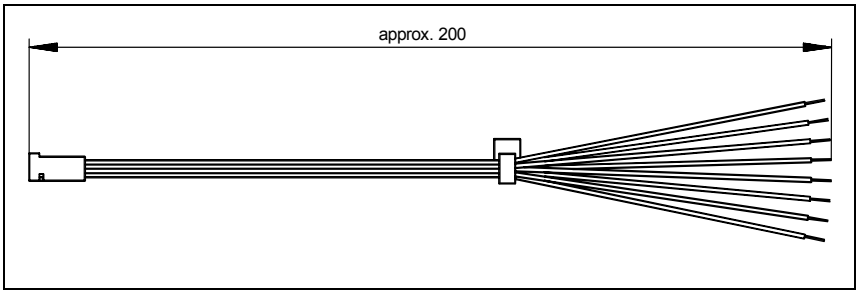
Viewed from wiring side

PIN	Color of the stranded cable	Signal	
1	red	VS	7 - 12 V
2	blue	GND	
3	brown	REFSIN	
4	black	REFCOS	
5	gray	Data+	RS 485
6	green	Data-	RS 485
7	white	+SIN	
8	pink	+COS	

Stranded cable

Article number
046 029 000 320

The stranded cable with Berg-Dubox-connector 2 x 4 is not included in the scope of delivery. Please order separately.



10. Ordering information, scope of delivery

shaft diameter	KIT	Code Disk	Encoder Module	Gear Box
25	SCM-KIT 101-25	CS 25 SCM	EM 101 SCM-35	GB 101 SCM-35
35	SCM-KIT 101-35	CS 35 SCM	EM 101 SCM-35	GB 101 SCM-35
40	SCM-KIT 101-40	CS 40 SCM	EM 101 SCM-53	GB 101 SCM-53
45	SCM-KIT 101-45	CS 45 SCM	EM 101 SCM-53	GB 101 SCM-53
53	SCM-KIT 101-53	CS 53 SCM	EM 101 SCM-53	GB 101 SCM-53

Scope of delivery of the KIT:
Sensor block SB 101 SCM, code disk, gear box, mounting screws, pin allocation

Scope of delivery of the Encoder module:
Sensor block SB 101 SCM and gear box

Note: Sensor block and gear box with the same serial number have to be paired. They cannot be ordered separately!

2 Distance blocks Art.-No. 022 500 004 330 (not included in the scope of delivery) are required for correct mounting of the code disk.

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