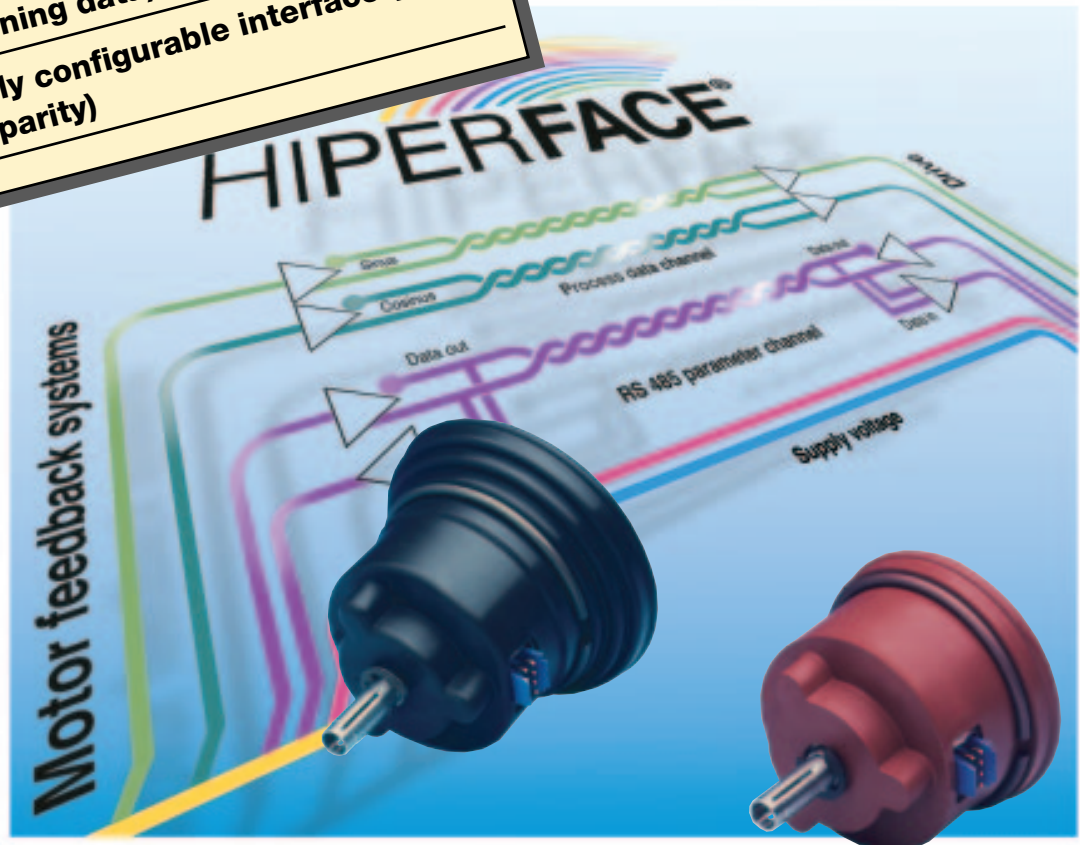


SINCOS® SRS/M 50 / SRS/M 60

Motor feedback systems for servomotors (HIPERFACE® compatible)

Features

- 1024 sine/cosine periods per revolution
- Absolute position with a resolution of 32768 steps per revolution
- 4096 revolutions can be measured (only Multiturn SRM)
- Position value programming
- Encoder temperature interrogation
- Electronic type label
- 128 bytes EEPROM freely programmable by the user (for example configuration/commissioning data)
- Individually configurable interface (baud rate and parity)



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

Highlights

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- Absolute position with a resolution of 32768 steps per revolution
- 4096 revolutions can be measured (only Multiturn SRM)
- Position value programming
- Encoder temperature interrogation
- Electronic type label
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(for example configuration/commissioning data)
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1. HIPERFACE® High Performance Interface

The universal interface for electric drives

Depending on their design and application, electric drives need the following information from corresponding sensors in the control loop:

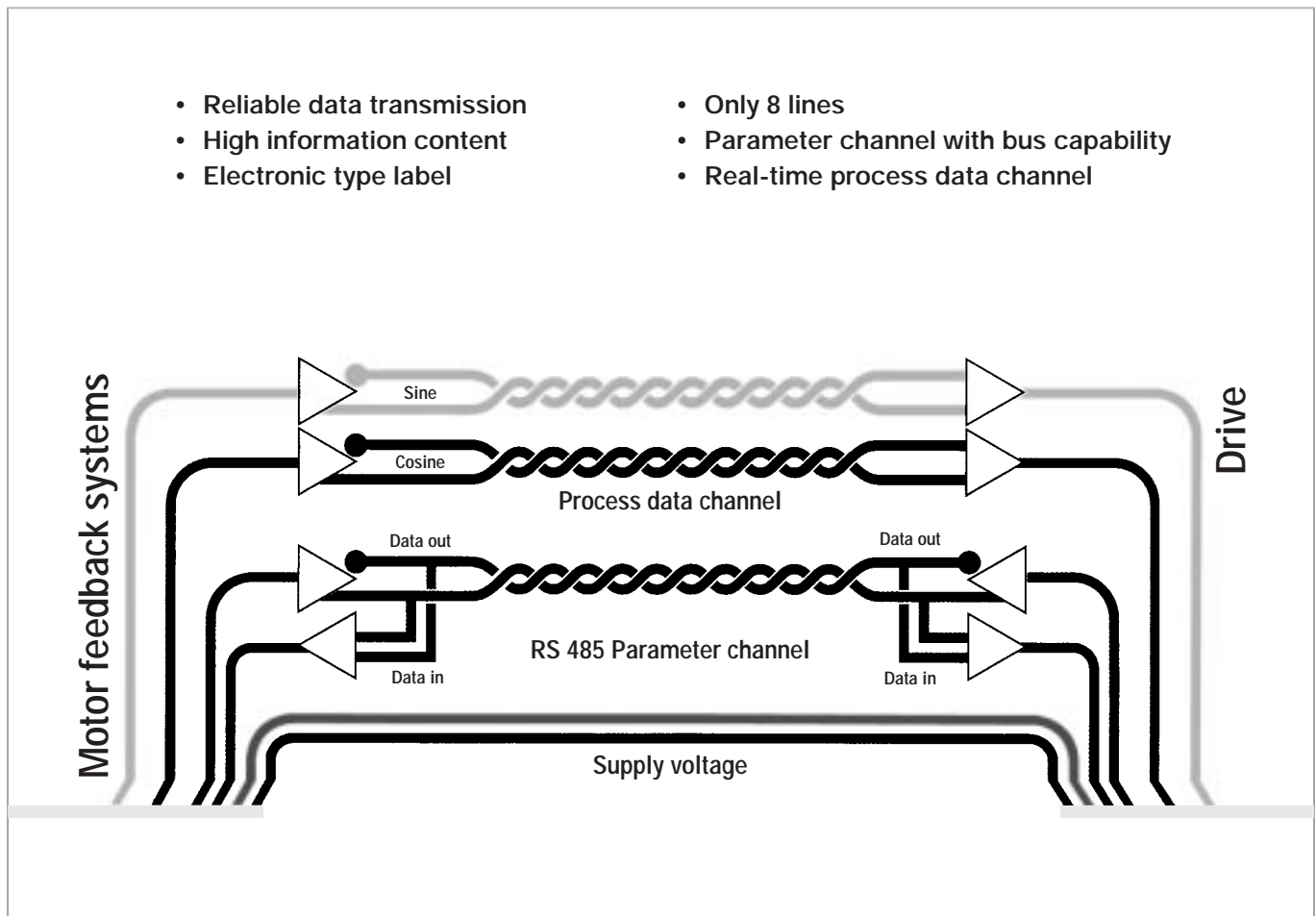
- ▷ Commutation information
- ▷ Rotational speed information
- ▷ Incremental position information
- ▷ Absolute position information over several revolutions

All this information can be transferred via HIPERFACE®.

Technical innovation to meet the highest requirements was brought into the marketplace by STEGMANN with their SinCos® product line.

The SinCoder® product line extends the range of motor feedback systems for standard and low-cost applications. SinCos® and SinCoder® can be supplied with compatible mechanical and electrical interfaces.

Electrical compatibility in respect of all physical parameters is ensured by the introduction of HIPERFACE® as the mandatory interface.



Benefit from the advantages of HIPERFACE®

- only **one** interface to the speed controller for all applications
- only **one** type of signal line between speed controller and signal transmitter
- only **one** mechanical interface for low-end and high-end applications
- manual parameter setting on the speed controller is dispensed with (intrinsic initialisation).

2. System description

SinCos® - The new dimension in motor feedback systems

The development objectives

The objective of developing this product was to provide a cost-effective feedback system with a performance previously unattainable.

The feedback system must be suitable for use with servomotors of all kinds.

- It must be possible to install the device in the servomotor. This requires a wide temperature range and a very high immunity to interference.
- It must be possible to transmit the information required for speed control with high accuracy over a distance of 100 m using only a small number of cable cores even at speeds up to 12,000 revolutions/minute.
- It must be possible to install the encoder in the servomotor simply. Furthermore the encoder must remain serviceable and error-free with axial expansion of the motor shaft of up to 1.5 mm. Likewise, radial eccentricity of the motor shaft must not cause any angular error.
- It must be possible to electronically assign an absolute positional value to any mechanical shaft position.
- The interface to the motor controller is to be such that, in addition to the actual measured angle values, it must be possible to read and store other items of information, such as motor characteristics and logistic information.

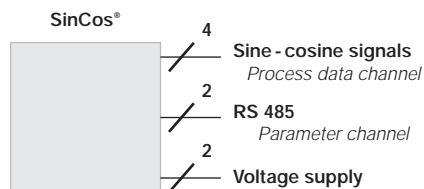
The novel features

Well known types of optical rotary encoders are so-called incremental encoders or absolute encoders. Because of their great complexity, absolute encoders are relatively expensive to produce using conventional methods.

This conventional method consists of reading binary information coded on a glass disc. Each binary position requires appropriate optical scanning. All these scanning operations must be synchronised with one another in such a way that there can be no read errors under all operating conditions. In addition, the electrical interface of such absolute encoders continuously transmits the complete absolute value.

The SinCos® system can be considered as a mixture of an incremental encoder and an absolute encoder. In this case, the absolute value is initially formed only when the device is switched on, and is communicated via an RS 485 interface to an external counter, which then continues to count incrementally from this absolute value using the analogue sine/cosine interface.

In order to attain a high resolution whilst ensuring suitability of the encoder to high speed applications, the incremental encoder signal is not transmitted as digital values, as is usual, but as an analogue sine/cosine voltage. With 1024 cycles per revolution, even at a speed of 12,000 rev/min the frequency produced is only 204.8 KHz, which can then be transmitted without difficulty, even over great distances.

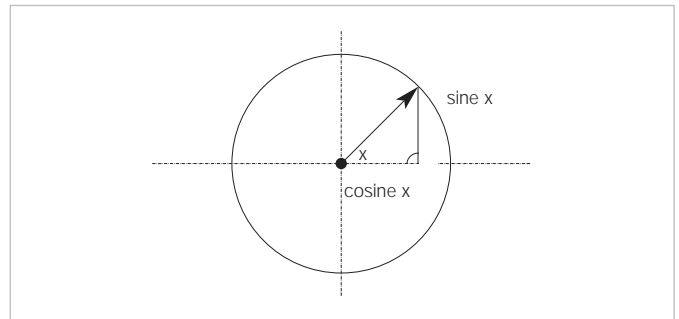


System description

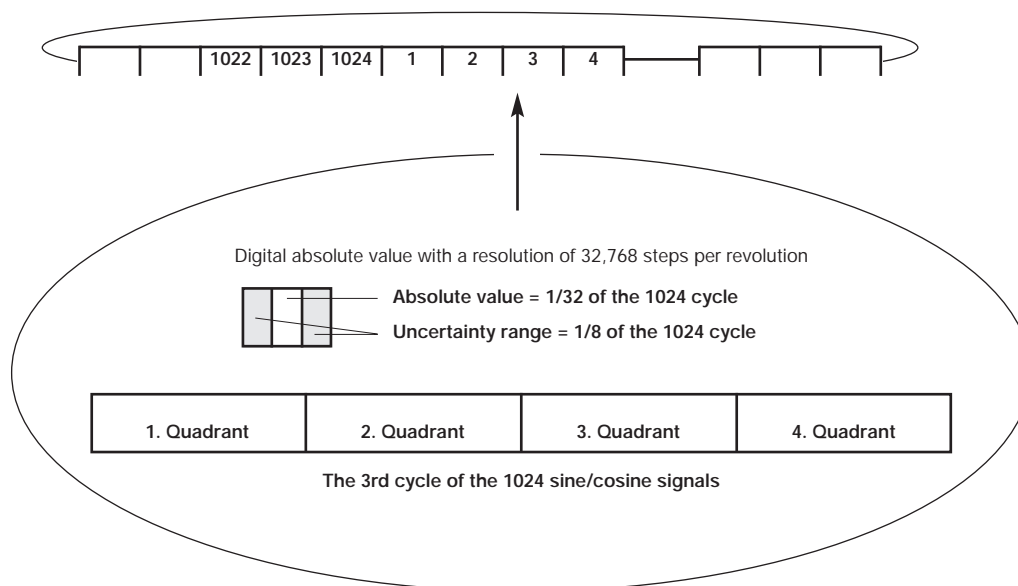
The advantage of using sinusoidal signals is that the transmission channel does not have to be designed for an extremely broad band, as is the case of digital signals, instead the bandwidth necessary is only determined by the speed.

The absolute information within one 1024 cycle

As the figure below shows, the angle x can be determined absolutely by means of the two analogue voltages $\sin x$ and $\cos x$. The calculation of the absolute position within a 1024 cycle is not performed by the SinCos® encoder but is performed externally - in the motor drive or position control system.



The digital absolute information and the assignment to the respective 1024 cycle



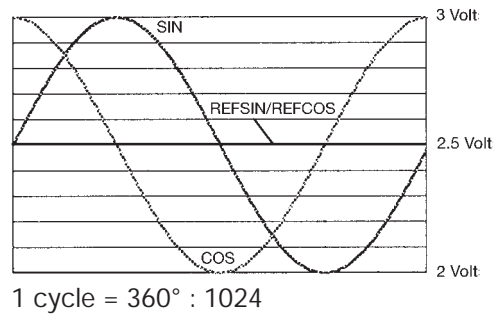
3. Technical data and characteristics to DIN 32 878

		Units
Number of sine/cosine cycles per revolution	1024	
Dimensions	see drawing	mm
Mass	0.2	kg
Moment of inertia of the rotor	10	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	0.3	Seconds of arc
Number of steps per revolution	SRS SRM	32.768 134.217.728 = 32768 x 4096
Error limits of the digital absolute value via RS 485	± 90	Seconds of arc
Error limits in evaluating the 1024 cycle signals, integral non-linearity	± 45	Seconds of arc
Non-linearity within one sine/cosine cycle, differential non-linearity	± 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	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		
- Radial movement	static dynamic	± 0.5 ± 0.1 mm mm
- Axial movement	static dynamic	± 0.75 ± 0.2 mm mm
- Angular movement perpendicular to the axis of rotation	static dynamic	± 0.005 ± 0.0025 mm/mm mm/mm
Bearing service life	3.6 x 10 ⁹	Revolutions
Working temperature range	-20 ... +115	°C
Operating temperature range	-20 ... +125	°C
Storage temperature range	-40 ... +125	°C
Permissible relative air humidity (no condensation allowed)	90	%
Resistance to shocks when assembled, to DIN IEC 68 Part 2-27	100/10	g/ms
Resistance to vibration when assembled, to DIN IEC 68 Part 2-6	20/10 ... 2000	g/Hz
Degree of protection to DIN VDE 0470 Part 1 when assembled	IP 40	
EMV to EN 50082-2 and EN 50081-2		
Operating voltage range	7 ... 12	V
Recommended supply voltage	8	V
Max. no-load operating current	80	mA
Available storage area in EEPROM	128	bytes
Interface signals		
SIN, REFSIN, COS, REFCOS = <i>Process data channel</i>	analogue, differential	
RS 485 = <i>Parameter channel</i>	digital	

4. Signal specification

Signal specification of the process data channel

Signal form with clockwise rotation of the shaft, as viewed in the direction "A" (see drawings on pages 10 and 11)

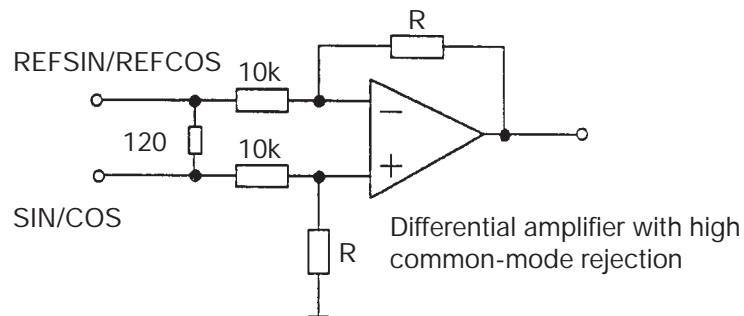


Access to the process data used for the actual speed control, that is the sine and cosine signals, is virtually always »on line«. When the supply voltage is switched on, the speed controller can access this information at any time.

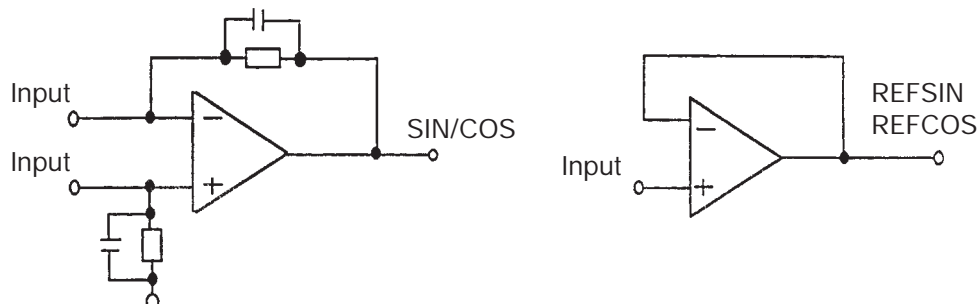
A sophisticated proven technique ensures that the amplitude of the analogue signals over the full range of specified environmental conditions varies by a maximum of only 20%.

Valid characteristics for all specified environmental conditions		Units
SIN, COS peak-peak signal V_{p-t-p}	0.9 ... 1.1	V
Signal offset REFSIN, REFCOS	2.2 ... 2.8	V
Static linearity after forming the arctan	± 3	° electrical

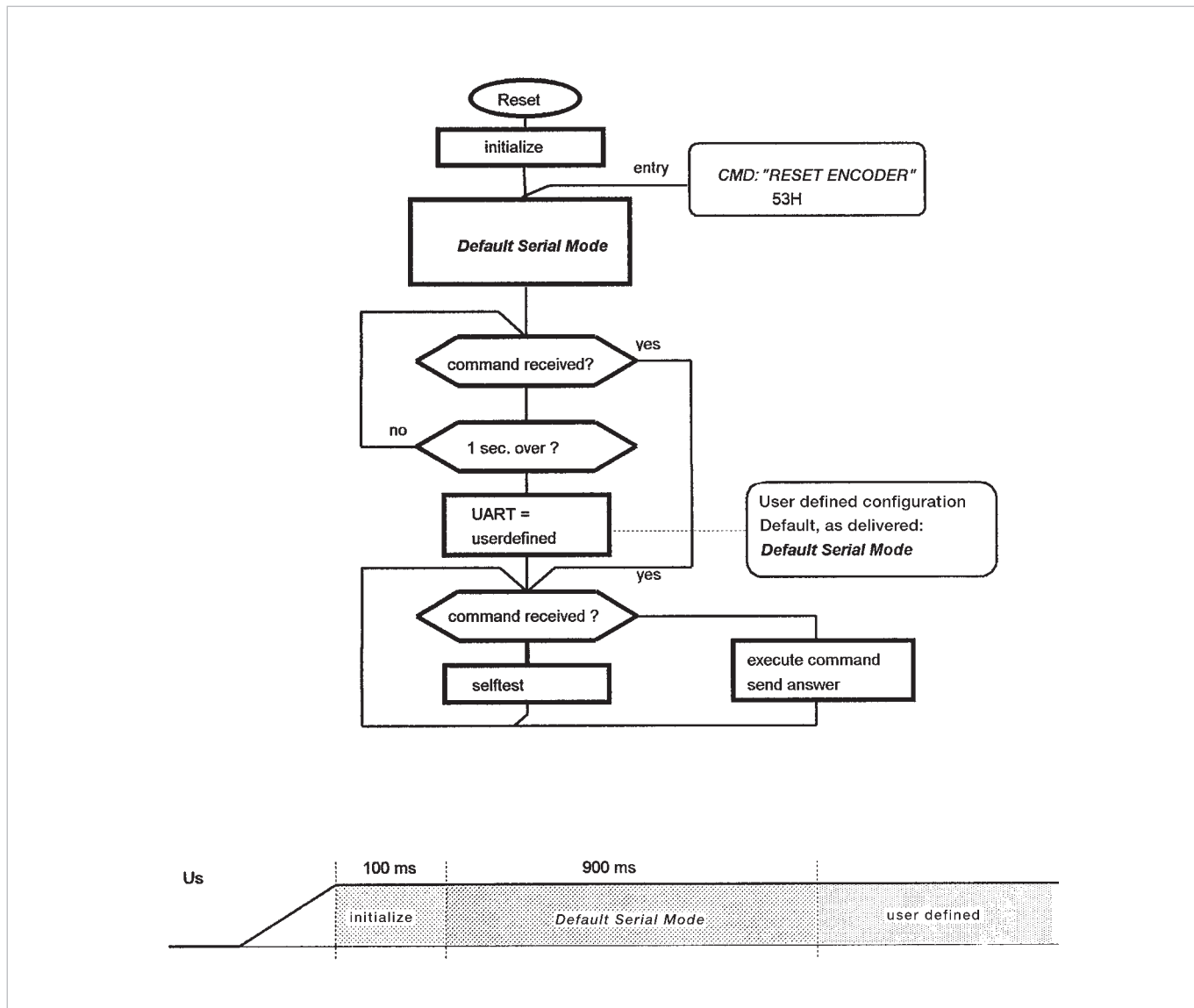
Recommended receiver circuit for the sine and cosine signals



The output circuit of the process data channel in the SinCos® encoder



5. Restart

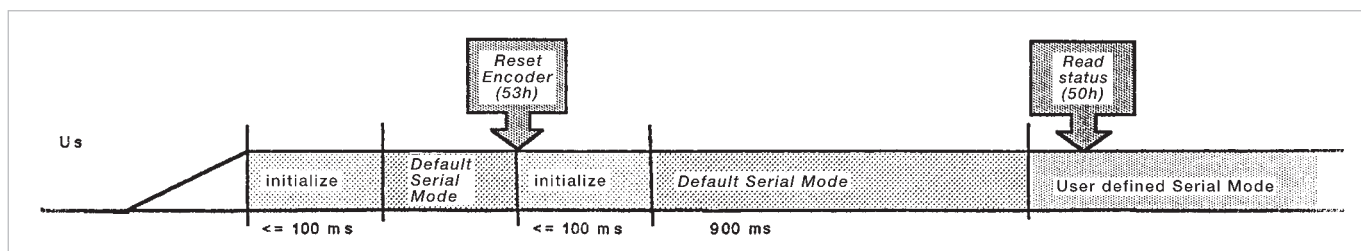


Default Serial Mode = E4h

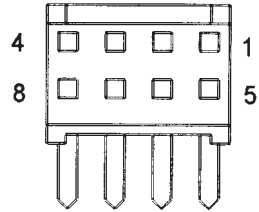
see Command 57h

In special cases, unfavourable operating voltage at start-up may impair the power-up sequence of the encoder. In this instance, we recommend that after the encoder supply voltage has been switched on ($t > 100$ ms), a

software reset (53H) be initiated. This causes the power-up sequence to be implemented again. The encoder status can then be checked after one second (Command 50H).



6. Connection details



Viewing direction »B«

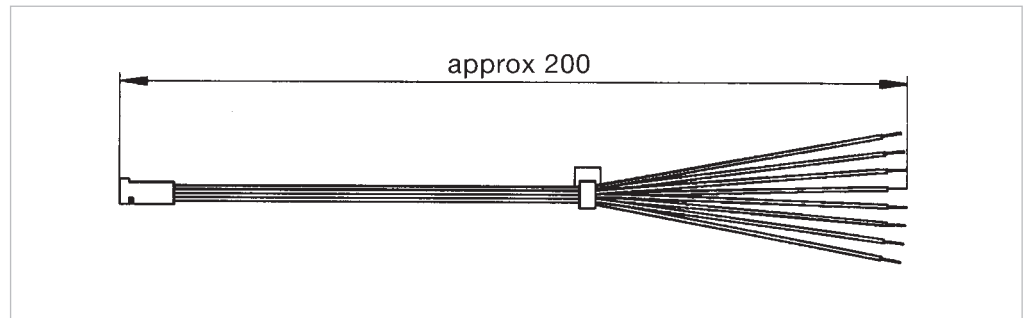
PIN	Colour	Signal	
1	red	Us	7 - 12 V
2	blue	GND	
3	brown	REFSIN	
4	black	REFCOS	
5	grey	Data+	RS 485
6	green	Data-	RS 485
7	white	+SIN	
8	pink	+COS	

Please note! For satisfactory operation, it is imperative that the stranded screen wire (200 mm) is connected.

Stranded cable

Article number
046 029 000 320

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



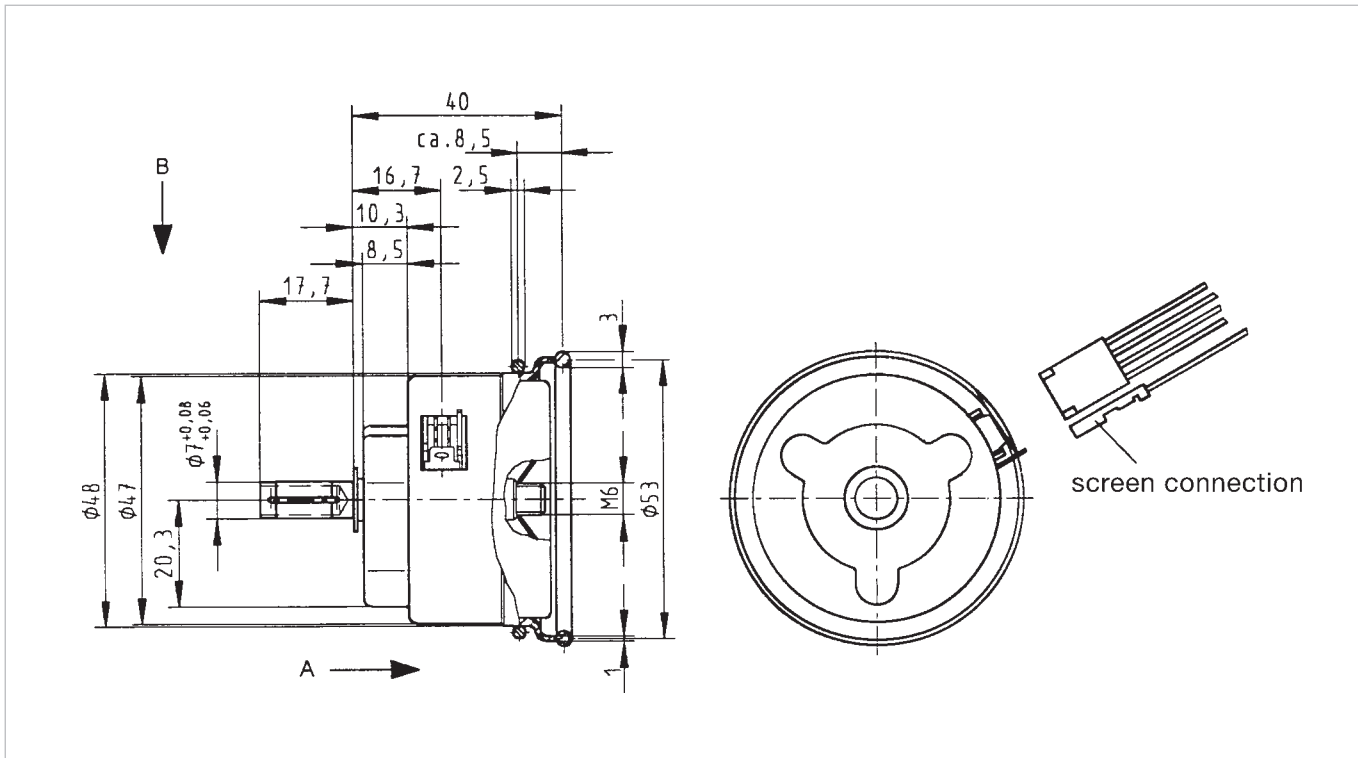
7. Ordering information

When ordering, please use the following ordering description.

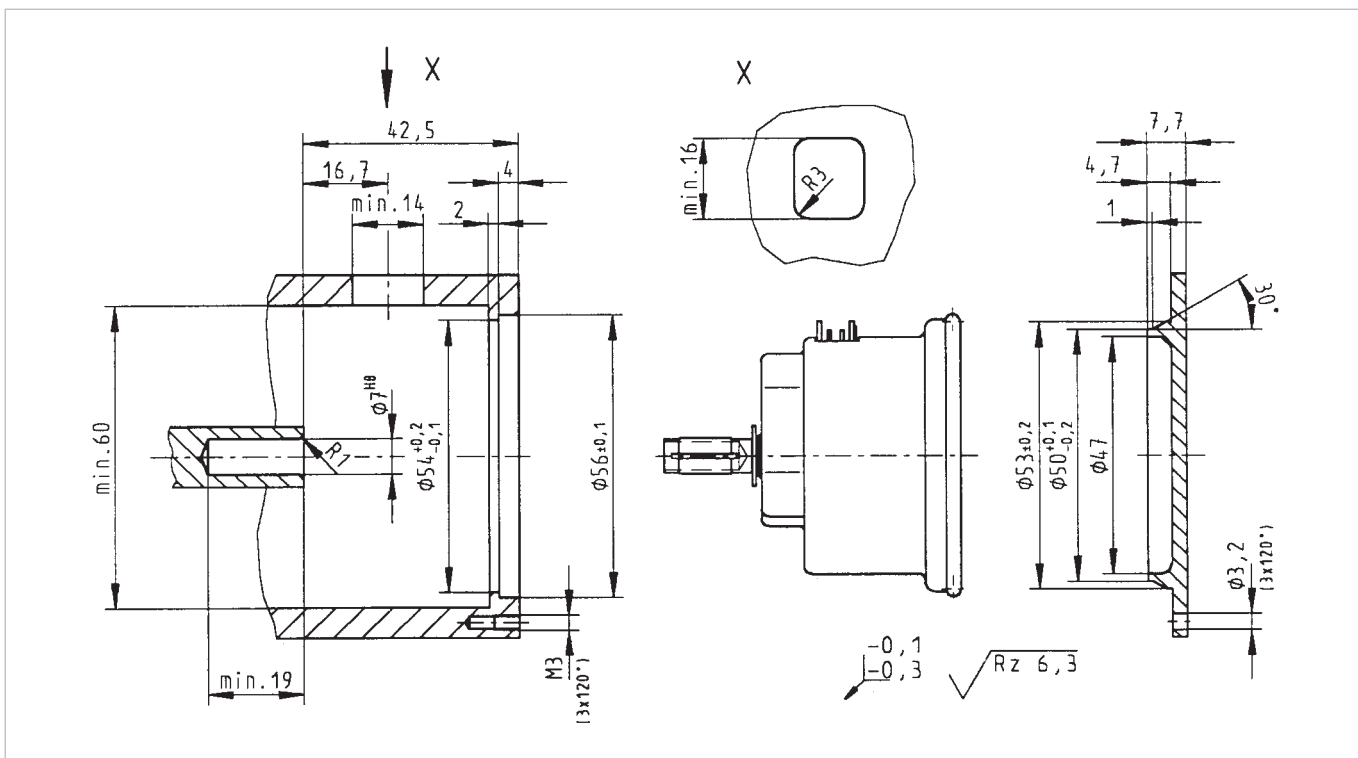
Mode of operation	Single turn encoder	Multiturn encoder*
Standard (single-ended)	SRS 50	SRM 50
	SRS 60	SRM 60
BUS	SRS 50 BUS	SRM 50 BUS
	SRS 60 BUS	SRM 60 BUS

* Available from mid 1999

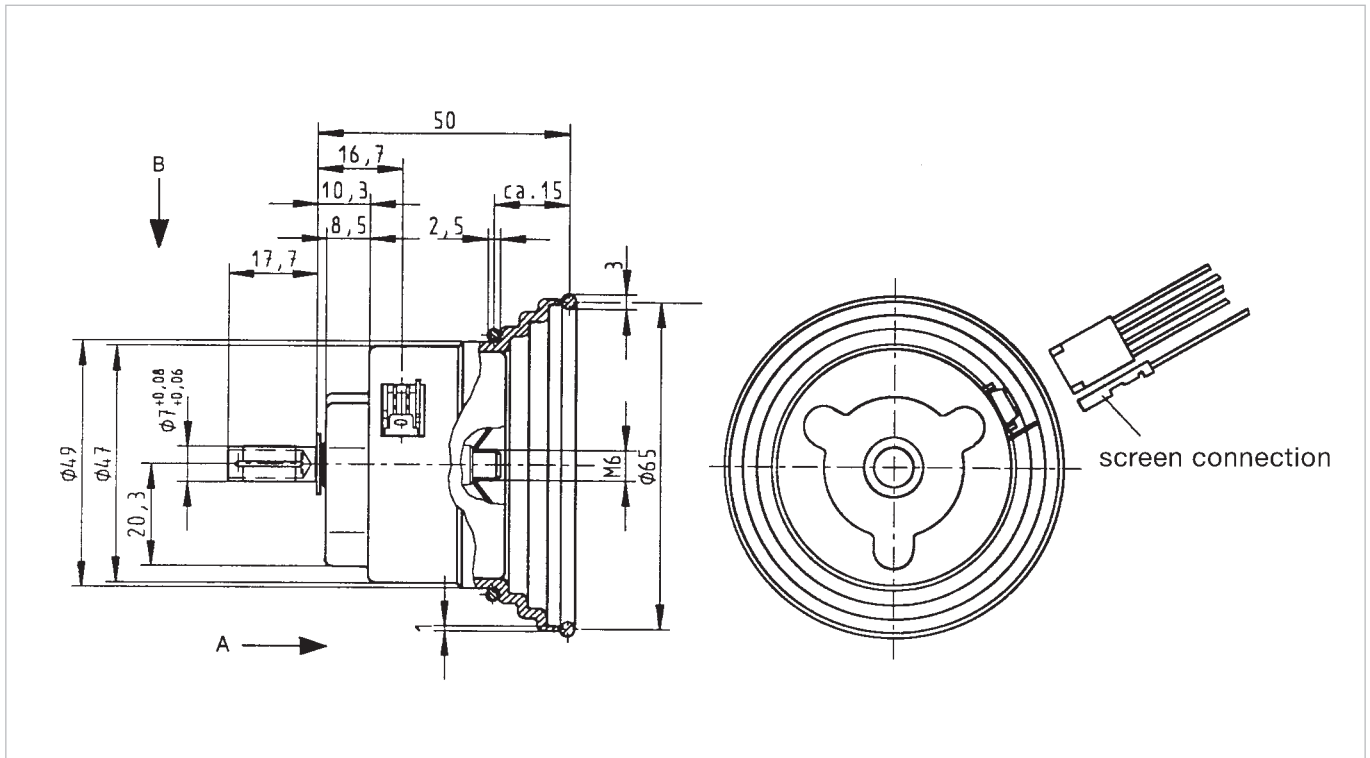
8. Dimensional drawings and suggested installation, SRS/M 50



The encoder may be pressed in or removed only by using the rear end of the shaft.
Under no circumstances should you press on the housing!
Follow the mounting instructions!



9. Dimensional drawings and suggested installation, SRS/M 60



The encoder may be pressed in or removed only by using the rear end of the shaft.
 Under no circumstances should you press on the housing!
 Follow the mounting instructions!

