Motor Feedback Systems for Electric Drives

## Maximum performance for all applications

SICK | STEGMANN

Highly precise Speed and Position Measurement

This is where the action is: Previously, three sensors were needed for commutation, position and speed resulting in many interfaces.
Nowadays, SICK-STEGMANN motor feedback systems offer these functions in one unit, with standardised electrical and mechanical interfaces.
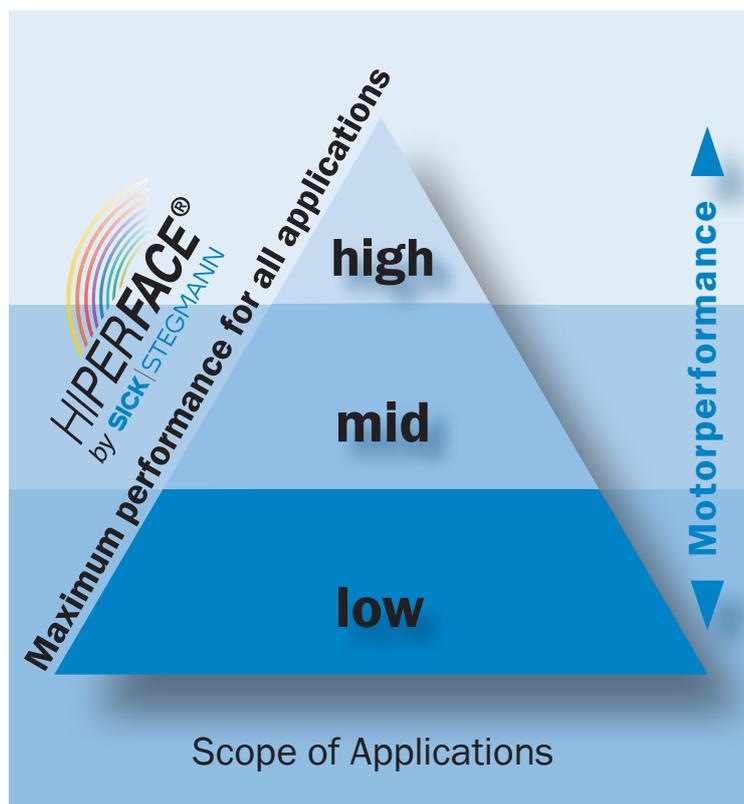
SICK-STEGMANN **motor feedback systems** meet critical requirements, such as temperature resistance, high resolution, multiturn design with mechanical gearbox, high interference immunity and, importantly, small dimensions, enabling short motor build lengths.

Via the electronic type label, and the integrated **HIPERFACE**® interface, the motor and its characteristics are automatically recognised – Plug & Play!

OVERVIEW
MOTOR FEEDBACK SYSTEMS

Incremental Encoder for asynchronous motors
Number of lines up to 65,536

- VFS60

DiCoder® for synchronous motors
Number of lines up to 4,096 and up to 32 pole pairs

- CKS36
- CNS50

SinCos® for synchronous motors
with HIPERFACE® Interface
up to 1,024 sine/cosine periods

- SEK/SEL37
- SEK/SEL52
- SKS/SKM36
- SRS/SRM50
- SCK/SCL25-53
- SRS/SRM64

HIPERFACE® by SICK|STEGMANN

STAND ALONE versions
with HIPERFACE® Interface
up to 1,024 sine/cosine periods

- SKS/SKM36
- SRS/SRM50

HIPERFACE® by SICK|STEGMANN

Length measuring systems and Distance Sensors
with HIPERFACE® Interface

- TTK70
- L230

measuring range up to 300 m

- DME4000/DME5000

HIPERFACE® by SICK|STEGMANN

Incremental Encoders
VFS60

The robust solution for rough ambient conditions

Incremental encoders are mainly used for asynchronous motors requiring no absolute rotor position. They are mainly used for speed control.

Incremental encoders generate impulses which correspond to position, angle and numbers of turns. They contain a disc with defined number of lines on it.

The number of lines on the disc determines the resolution capability.

The particular position is determined by counting these impulses from a reference point.

A reference run is required to determine the absolute position.

VFS60 series encoders are destined for arduous applications in harsh industrial environments, especially for mounting to asynchronous motors.
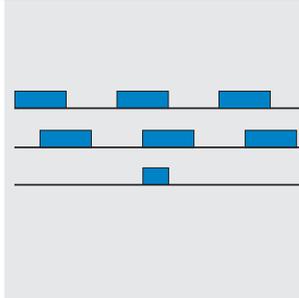
A class of its own. Programmable: Number of lines 1 up to 65,536; electrical interface TTL or HTL and zero pulse width 90°, 180° or 270°.

An Electrically insulated hollow shaft clamping arrangement is available for special applications, significantly increasing the interference immunity.

	PROGRAMMABLE	PROGRAMMABLE
	VFS60	**VFS60** with insulated hollow shaft clamping
	Number of lines up to 65,536	Number of lines up to 65,536
	Motor Feedback Systems	Motor Feedback Systems
	• Blind or through hollow shaft • Cable outlet axial/radial • Protection up to IP65 • Electrical interfaces TTL and HTL	• Through hollow shaft • Cable outlet axial/radial • Protection up to IP65 • Electrical interfaces TTL and HTL

Technical data		
Hollow shaft diameter		
Blind hollow shaft	8, 10, 12, 14 or 15 mm as well as 3/8" 1/2" and 5/8"	–
Through hollow shaft	10, 12, 14 or 15 mm as well as 3/8" and 1/2"	10, 12, 14 or 15 mm as well as 3/8" and 1/2"
Number of lines	up to 65,536	up to 65,536
Electrical Interfaces	TTL/RS422, 6 channel HTL/push-pull, 6 channel Programmable TTL or HTL	TTL/RS422, 6 channel HTL/push-pull, 6 channel Programmable TTL or HTL
Operating speed	up to 9,000 rpm^{-1}	up to 12,000 rpm^{-1}
Working temperature range	up to –20 ... +100 °C	up to –20 ... +100 °C
Max. output frequency		
TTL	up to 820 kHz	up to 820 kHz
HTL	up to 820 kHz	up to 820 kHz

For detailed information see www.sick.com
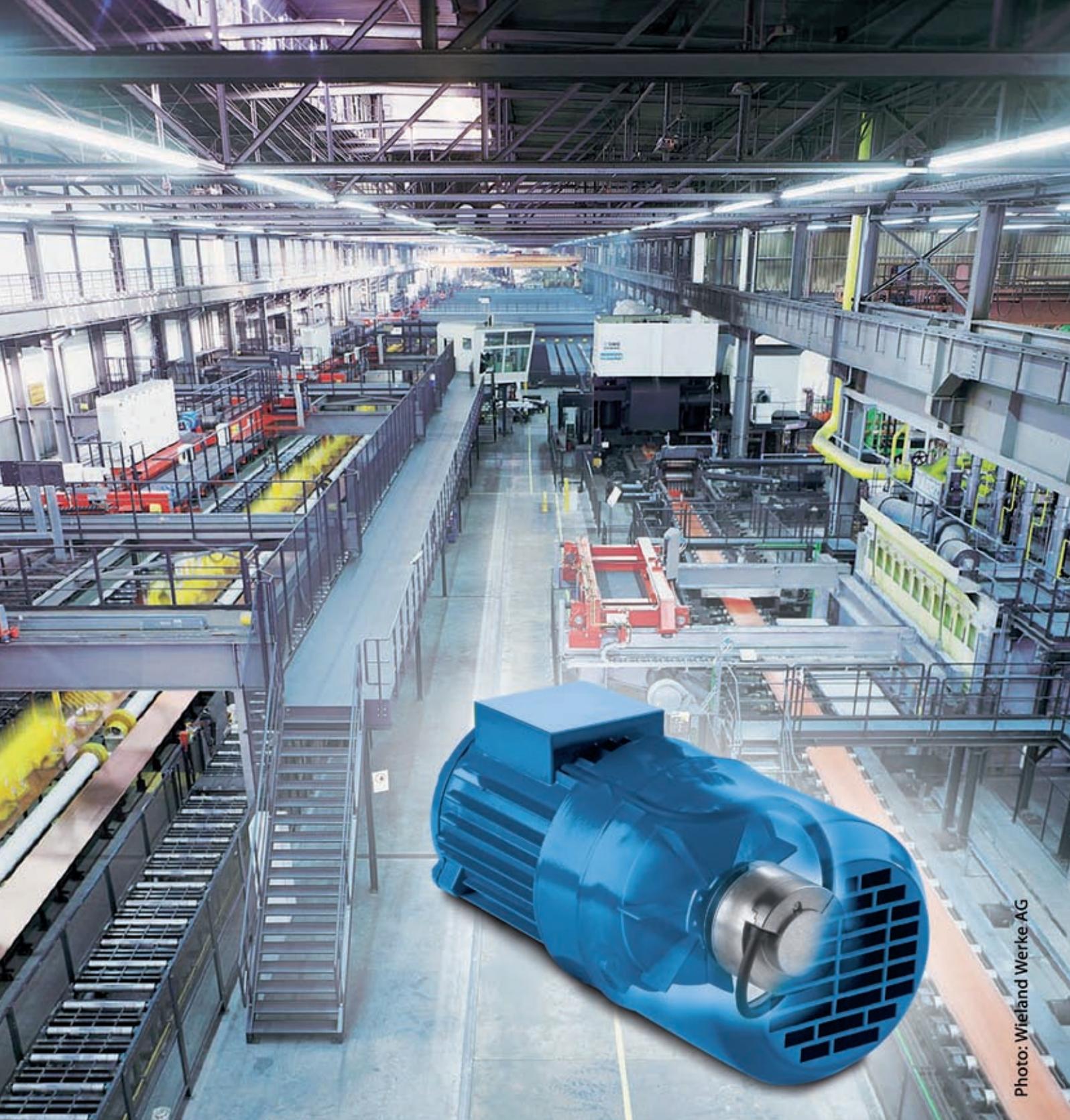
The VFS60 product range was specially designed for mounting to asynchronous motors. Even at it maximum operating speed the VFS60 incremental encoder offers previously unsurpassed freedom from vibration as well as optimum accurate running.

Motor Feedback Systems of the DiCoder® series

Shock and vibration resistant: ideal for fitting inside electric motors
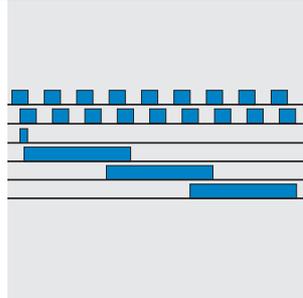
The **DiCoder**® series of motor feedback systems are used worldwide in many different applications. An incremental series containing versions with up to 4,096 lines and commutation signals.

The CKS36 encoder belongs to a new generation of optical encoders with Mini Disc technology: A very small code disc with a radius of only 2 mm enables holistic scanning. This leads to high shock and vibration resistance.

The unique feature of this encoder generation is the freely programmable number of lines and number of pole pairs, which can be programmed by the user.

CKS36

Number of lines up to 2,048 1-32 Pole pairs

Motor Feedback Systems

- Number of pole pairs: from 1 to 32
- Zero pulse 90° or 180°
- Working temperature range –20°C to +110°C
- Programmable

CNS50

Number of lines 1,000 to 4,096 2-8 Pole pairs

Motor Feedback Systems

- Output driver for incremental signals and commutation signals to EIA 422
- Two square wave signals (90° offset), reference pulse and the respective inverted signals
- Commutation signals R, S, T

Technical data		
Number of lines	1 to 2,048	1,000, 1,024, 2,000, 2,048 4,000, 4,096
Commutation signals	1 to 32 Pole pairs	2, 3, 4, 6, 8 Pole pairs
Interface signals: Incremental- and Commutation signals	according to EIA 422	according to EIA 422
Working speed	12,000 rpm^{-1}	6,000 rpm^{-1}
Working temperature range	–20 ... +110 °C	0 ... +100 °C
Max. output frequency	400 kHz	300 kHz
Operating voltage range	5 V ± 10 %	5 V ± 10 %
Parameterisation interface	I^{2}C-Bus	–

For detailed information see www.sick.com
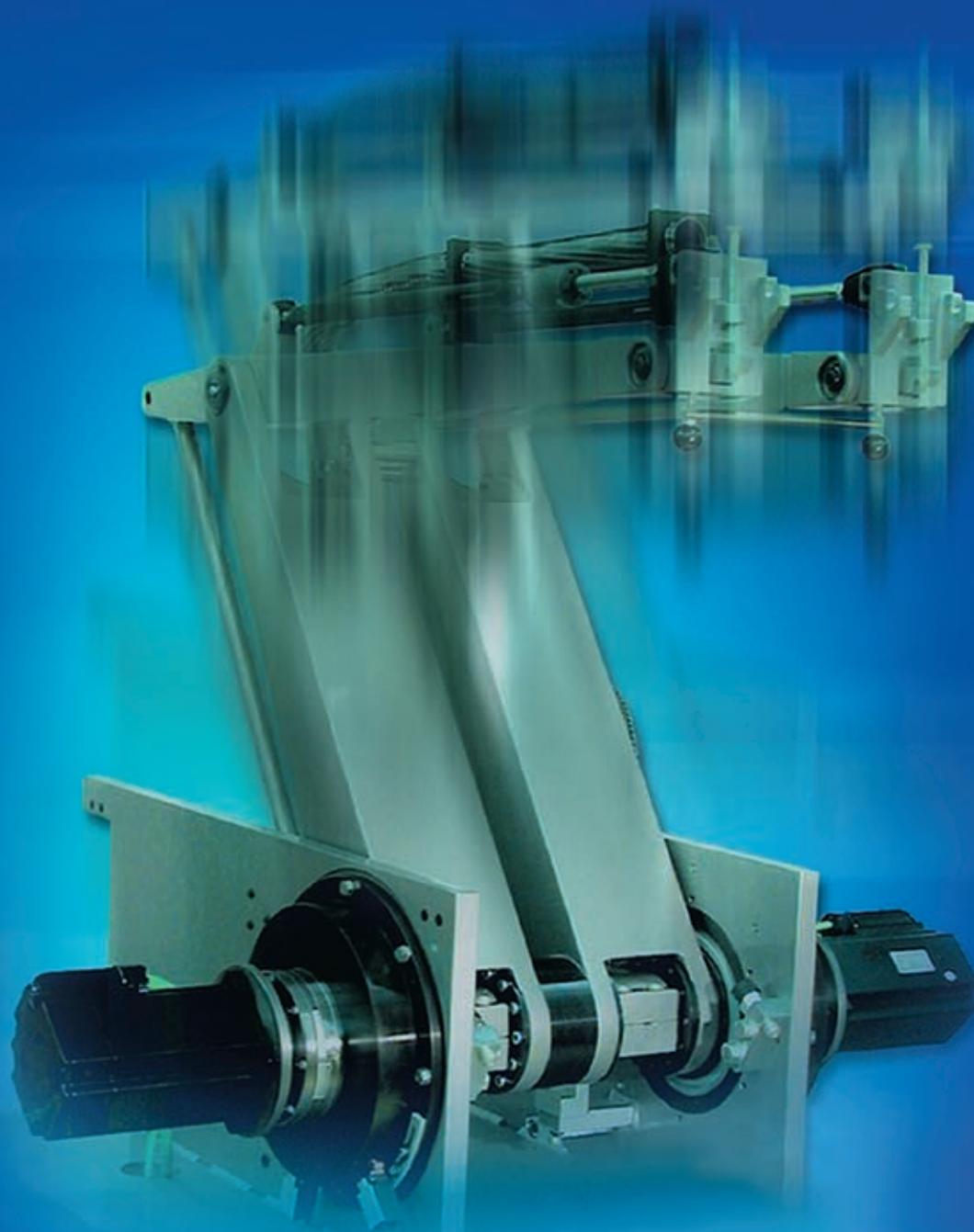
Speed control and precise positioning in production robots with
DiCoder® motor feedback systems from SICK-STEGMANN

HIPERFACE® – the universal interface


HIPERFACE® by SICK | STEGMANN
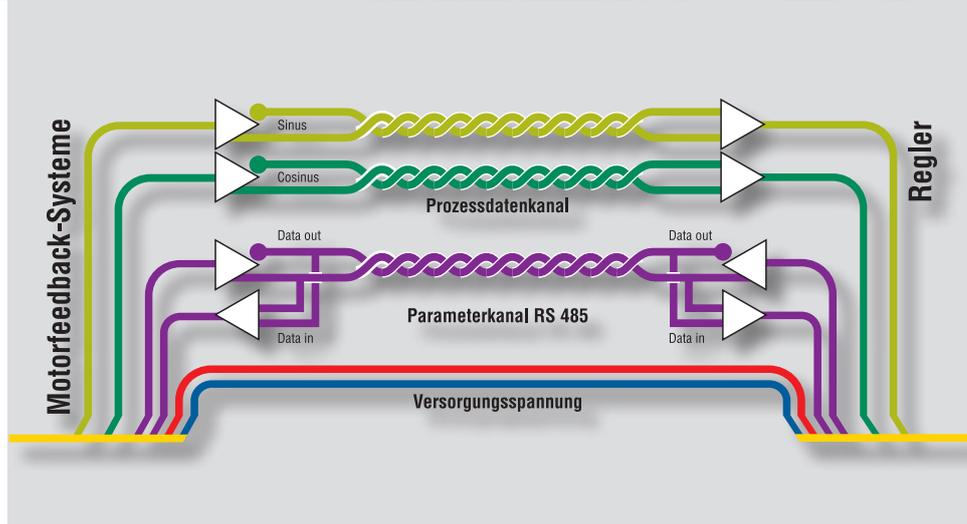
HIPERFACE® motor feedback systems are a mix of incremental encoders and absolute encoders and combine the benefits of both encoder types.

Initially, the absolute value is only formed when the device is powered up and is communicated to the external counter in the controller via the bus-enabled RS 485 parameter interface. From this absolute value, the controller continues to count incrementally using the analogue sine/cosine signals.

The use of highly-linear sine and cosine signals achieves the high resolution required for speed control (arctan formation within the controller).

However, the signal frequencies to be transmitted remain relatively low. For instance a unit with 512 periods per revolution, operating at a very high speed of 12,000 RPM, only generates an output frequency of 102.4 kHz which can be easily transmitted over a long distance.

HIPERFACE® retains only one interface with 8 lines, for reduced cabling work.

HIPERFACE® transmits the following data:
· **Commutation**
· **Absolute position**
· **Speed**
· **Data from the electronic type label**

Precision is key! Motor feedback systems ensure precise positioning in packaging robots.

For detailed information see www.sick.com

These renowned manufacturers offer you HIPERFACE®

ABB · ACM · ANALOG DEVICES · drive TECHNOLOGY · AEG Motion & Control · AMK Control your Motion.

ANDRIVE Antriebstechnik GmbH · BALDOR MOTORS AND DRIVES · BAUMÜLLER · BAUTZ · BECKHOFF · Beldrive Systems

bmp · B&R · Brusatori MOTORI ELETTRICI · contaves drives · CONTROL TECHNIQUES · DANAHER

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KEB ANTRIEBSTECHNIK · LAFERTGROUP · Lenord + Bauer · Lenze · LEROY SOMER · LTi DRiVES

MACON MOTION UNDER CONTROL · MAVILOR · mayr · MERKES SMALL MOTORS · metronix · MOOG

MOTOR POWER COMPANY · MTS Automation · num GROUPE SCHNEIDER · Octa com · oeMer motori elettrici sincrovert · OMRON

osai DYNAMIC EVOLUTION · OSWALD REGELBARE ELEKTROMOTOREN · Pacific SCIENTIFIC · Parker Divisione S.B.C. · QUIN · Rexroth Bosch Group

Rockwell Automation · SANYO DENKI · Schneider Electric · SEM · SEW EURODRIVE · SIEB & MEYER

SSB · STÖBER · WITTUR Electric Drives GmbH · WITTENSTEIN Motion Control GmbH · YASKAWA · ZIEHL-ABEGG

Motor Feedback Systems of the SinCos® series

With the innovative HIPERFACE® interface

HIPERFACE® *by* **SICK|STEGMANN**

The **SinCos**® product range from SICK-STEGMANN initiated the technological innovation for the most demanding requirements.

Electronic compatibility is ensured by the introduction of **HIPERFACE**® as the mandatory interface in respect of all physical parameters.
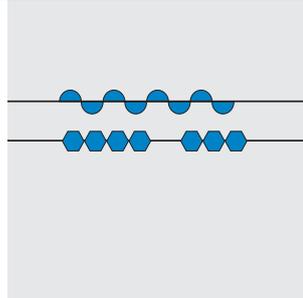
Use the benefits of **HIPERFACE**®:
- Only one speed controller interface for all applications
- Only one type of signal line between speed controller and signal encoder
- Manual parameterisation of the speed controller is no longer required (self-initialisation)

SEK/SEL37

16 sine/cosine periods

Motor Feedback Systems

- Tapered shaft
- Measurement step at interpolation of the sine/cosine signals with e.g. 12 bits = 20 angular seconds
- 4,096 revolutions can be measured (Multiturn)
- Programming of the positional value
- Electronic type label

SEK/SEL52

16 sine/cosine periods

Motor Feedback Systems

- Hollow shaft ø 12.7 mm tapered shaft, shoulder clamping ø 12.7 mm
- Measurement step at interpolation of the sine/cosine signals with e.g. 12 bits = 20 angular seconds
- 4,096 revolutions can be measured (Multiturn)
- Programming of the positional value
- Electronic type label

Technical data	SEK/SEL37	SEK/SEL52
Number of sine/cosine periods per revolution	16	16
Total number of steps via RS 485	Single SEK: 512 Multi SEL: 2,097,152 = 512 x 4,096	Single SEK: 512 Multi SEK: 2,097,152 = 512 x 4,096
Linearity		
integral	± 288 angular seconds	± 288 angular seconds
differential	± 144 angular seconds	± 72 angular seconds
Working speed*	6,000 rpm^{-1}	6,000 rpm^{-1}
Working temperature range	Single: –40 ... +115 °C Multi: –20 ... +115 °C	Single: –40 ... +110 °C Multi: –20 ... +115 °C
Operating voltage range	7 ... 12 V	7 ... 12 V
Type ID	Single SEK: 42h Multi SEL: 47h	Single SEK: 42h Multi SEL: 47h

For detailed information see www.sick.com

* up to which the absolute position can be reliably produced

SKS/SKM36	**SRS/SRM50**
128 sine/ cosine periods	**1,024 sine/ cosine periods**
Motor Feedback Systems	Motor Feedback Systems
• Tapered shaft • Measurement step at interpolation of the sine/ cosine signals with e.g. 12 bits = 2.5 angular seconds • 4,096 revolutions can be measured (Multiturn) • Programming of the positional value • Electronic type label	• Plug-in shaft or tapered shaft • Measurement step at interpolation of the sine/ cosine signals with e.g. 12 bits = 0.3 angular seconds • 4,096 revolutions can be measured (Multiturn) • Programming of the positional value • Electronic type label
128	1,024
Single SKS: 4,096	Single SRS: 32,768
Multi SKM: 16,777,216 = 4,096 x 4,096	Multi SRM: 134,217,728 = 32,768 x 4,096
± 80 angular seconds	± 45 angular seconds
± 40 angular seconds	± 7 angular seconds
SKS: 12,000 rpm^{-1}	6,000 rpm^{-1}
SKM: 9,000 rpm^{-1}	
−20 °C … +110 °C	−20 °C … +115 °C
7 … 12 V	7 … 12 V
Single SKS: 32h	Single SRS: 22h
Multi SKM: 37h	Multi SRM: 27h

SinCos® for speed control and synchronisation of the drive motors on printing rollers guarantees excellent printing results.

Motor Feedback Systems of the SinCos® series

With the innovative HIPERFACE® interface

HIPERFACE®
by SICK|STEGMANN

Depending upon the application, electric drives require the following data from the signal encoders, in the control loop:
- Commutation data
- Speed data
- Position data (absolute)
- Position data over several revolutions (absolute)
- Data from the electronic type label

All this data can be transmitted via **HIPERFACE®**.

SCK/SCL25-53

1,024 sine/cosine periods
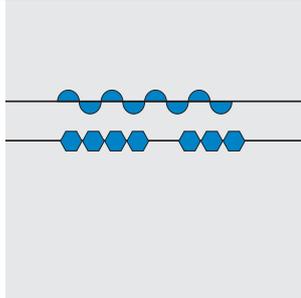
Motor Feedback Systems

- Hollow shaft diameters ø 25 to 53 mm
- Measurement step at interpolation of the sine/cosine signals with e.g. 12 bits = 0.3 angular seconds
- 4,096 revolutions can be measured (Multiturn)
- Programming of the positional value
- Electronic type label

SRS/SRM64

1,024 sine/cosine periods

Motor Feedback Systems

- Hollow shafts up to 14 mm in diameter
- Measurement step at interpolation of the sine/cosine signals with e.g. 12 bits = 0.3 angular seconds
- 4,096 revolutions can be measured (Multiturn)
- Programming of the positional value
- Electronic type label

Technical data		
Number of sine/cosine periods per revolution	1,024	1,024
Total number of steps via RS 485	Single SCK: 32,768 Multi SCL: 134,217,728 = 32,768 x 4,096	Single SRS: 32,768 Multi SRM: 134,217,728 = 32,768 x 4,096
Linearity		
integral	± 180 angular seconds	± 45 angular seconds
differential	± 12 angular seconds	± 7 angular seconds
Working speed*	6,000 rpm⁻¹	6,000 rpm⁻¹
Working temperature range	–10 ... +100 °C	–20 ... +110 °C
Operating voltage range	7 ... 12 V	7 ... 12 V
Type ID	Single SCK: 22h Multi SCL: 27h	Single SRS: 22h Multi SRM: 27h

For detailed information see www.sick.com

* up to which the absolute position can be reliably produced
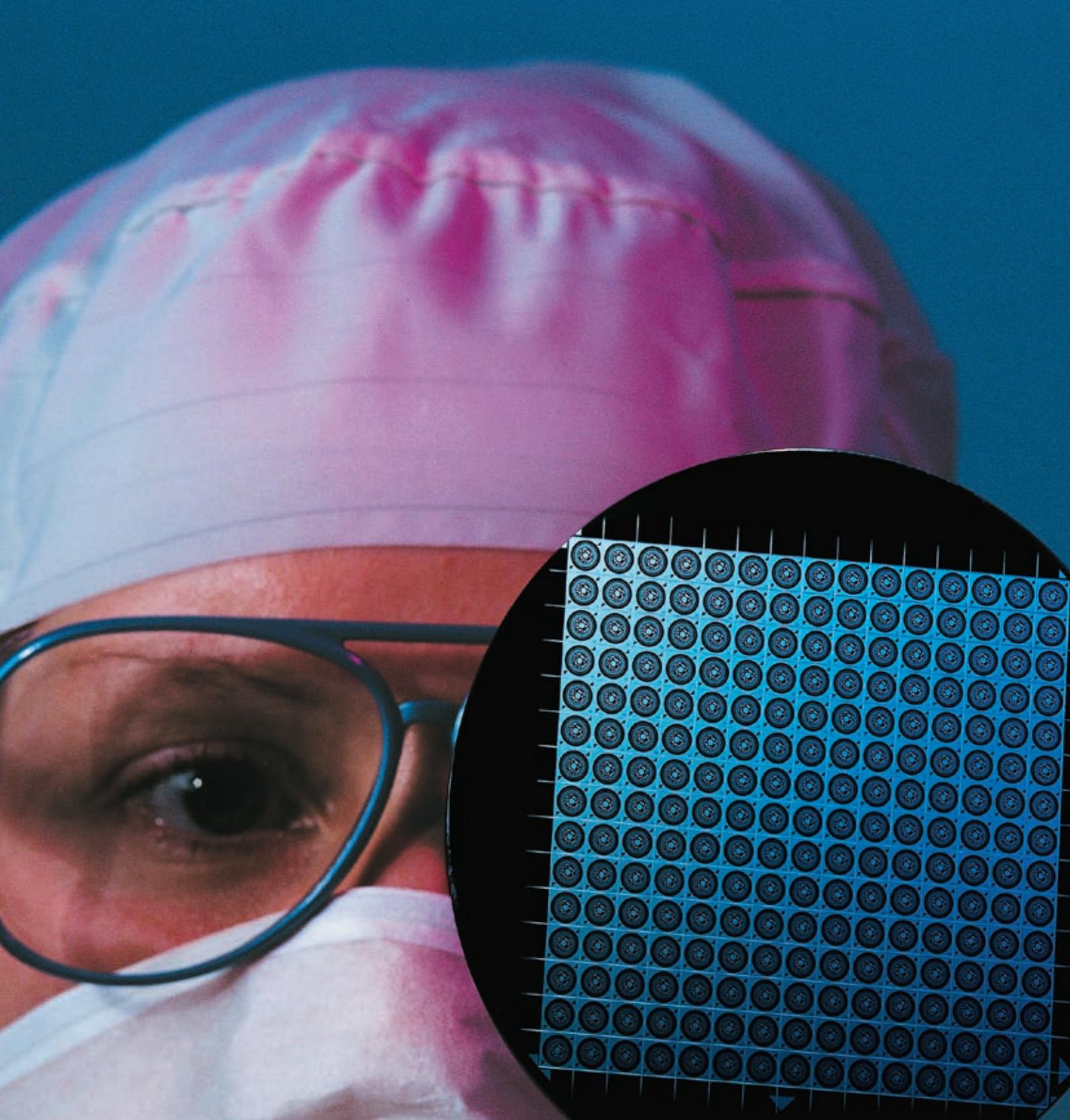
Precise and quick positioning of wafer handling robots – the result
is clearly evident!

Motor Feedback Systems of the SinCos® series STAND ALONE

With the innovative HIPERFACE®-interface

HIPERFACE®
by SICK | STEGMANN

Single- and Multiturn versions in the compact and robust metal housing are mainly used as master encoders. Stand alone devices and a 6 or 10 mm shaft which is connected to the application using a shaft coupling.

The master encoder is used e.g. as a master for the synchronisation of several axes. STAND-ALONE motor feedback systems are increasingly used in conventional encoder applications as these variants are compatible with commercial encoder mechanisms.
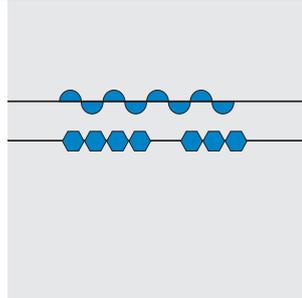
SKS/SKM36 STAND ALONE

128 sine/cosine periods

Motor Feedback Systems

- Solid shaft 6 mm
- Measurement step at interpolation of the sine/cosine signals with e.g. 12 bits = 2.5 angular seconds
- 4,096 revolutions can be measured (Multiturn)
- Programming of the positional value
- Electronic type label

SRS/SRM50 STAND ALONE

1,024 sine/cosine periods

Motor Feedback Systems

- Solid shaft 6 or 10 mm
- Measurement step at interpolation of the sine/cosine signals with e.g. 12 bits = 0.3 angular seconds
- 4,096 revolutions can be measured (Multiturn)
- Programming of the positional value
- Electronic type label

Technical data		
Number of sine/ cosine periods per revolution	128	1,024
Total number of steps via RS 485	Single SKS: 4,096 Multi SKM: 16,777,216 = 4,096 x 4,096	Single SRS: 32,768 Multi SRM: 134,217,728 = 32,768 x 4,096
Non linearity	± 120 angular seconds	± 52 angular seconds
Working speed*	6,000 min⁻¹	6,000 min⁻¹
Working temperature rage	−20 ... +100 °C	−20 ... +85 °C
Operating voltage range	7 ... 12 V	7 ... 12 V
Type ID	Single SKS: 32h Multi SKM: 37h	Single SRS: 22h Multi SRM: 27h

For detailed information see www.sick.com

* up to which the absolute position can be reliably produced

SRS/SRM50 STANDALONE

1,024 sine-/ cosine periods

Motor feedback system

- Square flange
- Full shaft 3/8"
- Measurement step at interpolation of the sine/ cosine signals with e.g. 12 bits = 0.3 angular seconds
- 4,096 revolutions measurable (multiturn)
- Programming of the position value
- Electronic type label

SRS/SRM50 STANDALONE

1,024 sine-/ cosine periods

Motor feedback system

- Blind hollow shaft 15 mm
- Measurement step at interpolation of the sine/ cosine signals with e.g. 12 bits = 0.3 angular seconds
- 4,096 revolutions measurable (multiturn)
- Programming of the position value
- Electronic type label

1,024	1,024
Single SRS: 32,768	Single SRS: 32,768
Multi SRM: 134,217,728 = 32,768 x 4,096	Multi SRM: 134,217,728 = 32,768 x 4,096
± 52 angular seconds	± 52 angular seconds
6,000 min^{-1}	3,000 min^{-1}
−20 ... +85 °C	−20 ... +85 °C
7 ... 12 V	7 ... 12 V
Single SRS: 22h	Single SRS: 22h
Multi SRM: 27h	Multi SRM: 27h

STAND ALONE motor feedback systems as control and line sensors in machines and installations where the advantages of the HIPERFACE® interface are put to good use.

Absolute, non contact length measuring system LinCoder®

With the inovative HIPERFACE®- interface

HIPERFACE®
by SICK | STEGMANN

The non-contact measuring system consists of a magnetic tape and a reading head. The magnetic reading head with its integrated evaluation electronics is moved over the magnetic tape and produces a positional output for a linear travel of up to 40 m. This system is used wherever high travelling speed and easy assembly determine the requirements for a reliable measuring system, e.g. in wood and glass processing, on palletisers, paper machinery and robots.

TTK70

Measurement lengths up to 4 m
Linear encoder
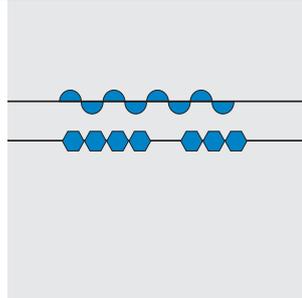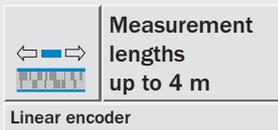
- Measurement lengths up to 4 m
- Non-contact length measuring system wear free
- Absolute position determination, no reference run
- IP65

L230

Measurement range 0.5 to 40 m
Linear encoder
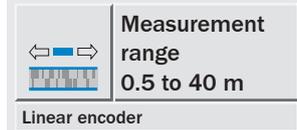
- Measurement lengths up to 40 m
- Non-contact length measuring system wear free
- Absolute position determination, no reference run
- IP65

Technical date		
Measurement length	Up to 4 m	0.5 to 40 m
Period length of the sine/ cosine periods	1 mm	5 mm
Resolution	0.24 µm	1.22 µm
System accuracy	± 10 µm	typ. ± 0.3 mm/m at 20 °C
Speed of travel	max. 10 m/s	max. 6 m/s
Working temperature range	–30 ... +85 °C	0 ... +70 °C
Operating voltage range	7 ... 12 V	7 ... 12 V
Type ID	FFh	82h

For detailed information see www.sick.com

Palletiser with an integrated LinCoder® L230 for reliable positioning in a harsh working environment.

Distance sensors DME in reflector mode

With the inovative HIPERFACE®-interface

HIPERFACE®
by SICK|STEGMANN

Distance measuring systems such as DME4000 and DME5000 are, for instance, used in automated warehousing technology for position determination of high-bay stackers. The sensor rides on the vehicle and permanently measures the run-time of an emitted laser light to the end of the shelf aisle and back.

Highly dynamic and accurate measuring and many other outstanding features distinguish this laser distance measuring system.
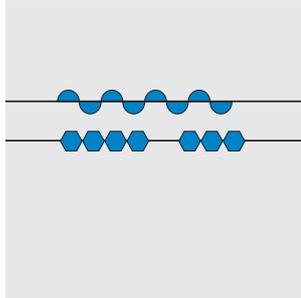
DME4000

Measuring range 0.15 to 130 m

Distance measuring device

- Very fast measuring time
- High accuracy and reproducibility
- Illuminated LC display with diagnostic information
- Alignment bracket with spring and red light

DME5000

Measuring range 0.15 to 300 m

Distance measuring device

- Very fast measuring time
- High accuracy and reproducibility
- Illuminated LC display with diagnostic information
- Alignment bracket with spring and red light

Technical date		
Measurement length	0.15 to 130 m	0.15 to 300 m
Period length of the sine/cosine periods	1; 2; 4; 8; 16 mm	1; 2; 4; 8; 16 mm
Resolution	0.05 ... 5 mm	0.05 ... 5 mm
Accuracy	± 3 mm; ± 5 mm	± 2 mm; ± 3 mm
Travelling speed	10 m/s	5 m/s; 10 m/s
Working temperature range	–40 °C ... +55 °C	–40 °C ... +55 °C
Operating voltage range	18 ... 30 V	18 ... 30 V
Type ID	1 mm: 90h	1 mm: 90h
	2 mm: 91h	2 mm: 91h
	4 mm: 92h	4 mm: 92h
	8 mm: 93h	8 mm: 93h
	16 mm: 94h	16 mm: 94h

For detailed information see www.sick.com
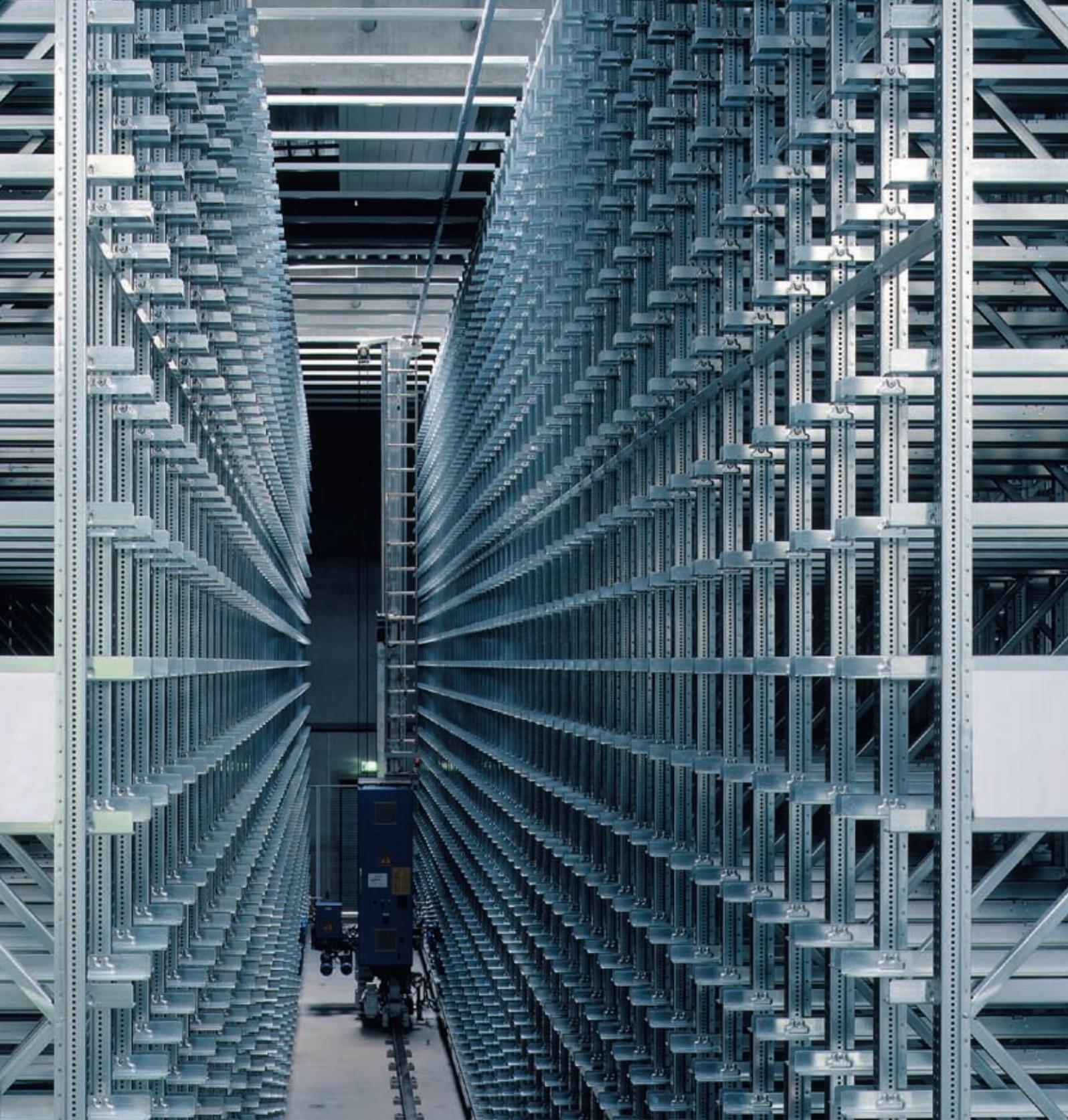
Precise distance measuring with DME devices forms the basis
for position recording on rack operating devices. This means that
even in an automated warehouse, every part is in the right place.

FACTORY AUTOMATION

With its intelligent sensors, safety systems, and auto ident applications, SICK realises comprehensive solutions for factory automation.

- Non-contact detecting, counting, classifying, and positioning of any types of object
- Accident protection and personal safety using sensors, as well as safety software and services

LOGISTICS AUTOMATION

Sensors made by SICK form the basis for automating material flows and the optimisation of sorting and warehousing processes.

- Automated identification with bar code and RFID reading devices for the purpose of sorting and target control in industrial material flow
- Detecting volume, position, and contours of objects and surroundings with laser measurement systems

PROCESS AUTOMATION

Analyzers and Process Instrumentation by SICK MAIHAK provides for the best possible acquisition of environmental and process data.

- Complete systems solutions for gas analysis, dust measurement, flow rate measurement, water analysis or, respectively, liquid analysis, and level measurement as well as other tasks

Worldwide presence with subsidiaries in the following countries:

Australia

Belgium/Luxembourg

Brasil

Ceská Republika

China

Danmark

Deutschland

España

France

Great Britain

India

Israel

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Republic of Korea

Republika Slovenija

România

Russia

Schweiz

Singapore

Suomi

Sverige

Taiwan

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Please find detailed addresses and additional representatives and agencies in all major industrial nations at **www.sick.com**

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