SEK34/SEL34
Motor Feedback Systems

The compact motor feedback system for motors
with a flange size of 40 mm

SICK
Sensor Intelligence.
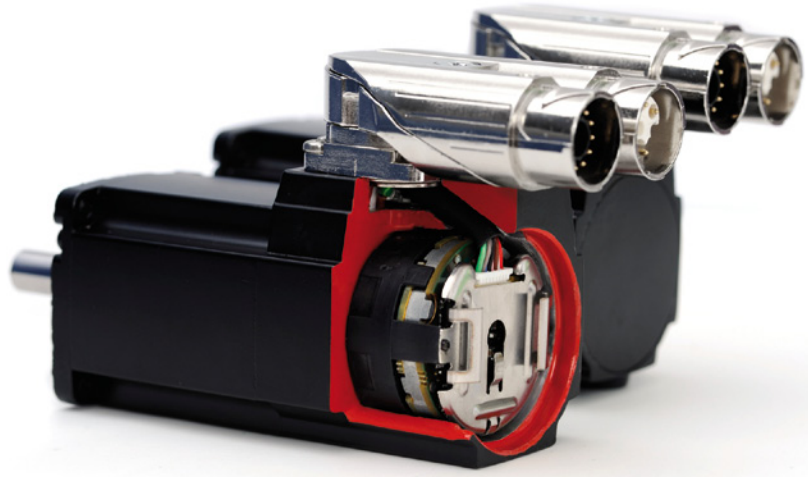
The solution for motors with a flange size of 40 mm

In motion industry, a clear trend toward increasingly smaller motors has become apparent in recent years. SICK is promoting this development, presenting the motor feedback systems SEK/SEL34, which are an innovative solution for motors with a flange size of 40 mm – compact and reliable with all the advantages of the HIPERFACE® interface. The SEK/SEL34 product family is the first motor feedback system for compact motors with a real multiturn. The mechanical gears have proved itself in many products and established its reliability.

With the new fixing concept the encoder system can be mounted in several ways. The motor manufacturer can thus decide whether to attach the motor feedback system via the two spring elements of the cover or via two screws through the flange.
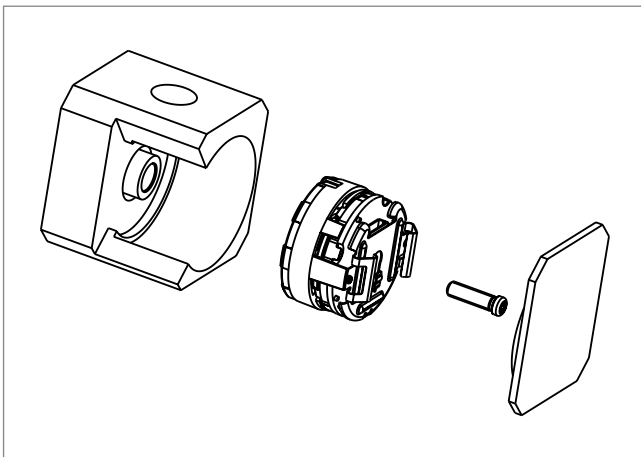

Clamp of the spring elements
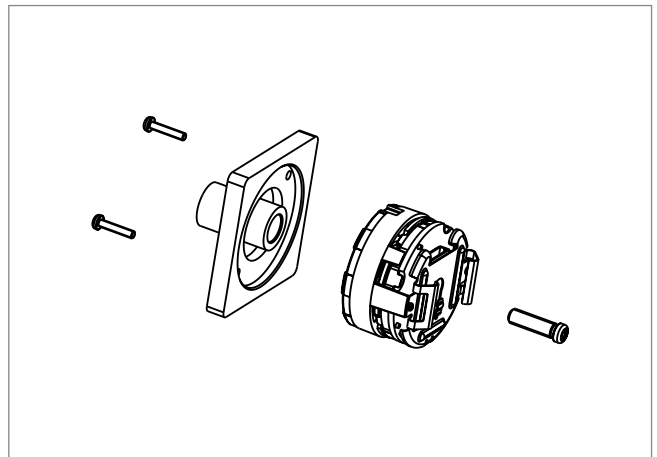
Screw connection through the motor flange

Capacitive sensor technology

The products of the SEK/SEL34 family are based on bearing-less capacitive sensor technology. The sensor technology consists of a transmitter, a rotor and a receiver. An electric field, which is influenced by the star-shaped rotor, is generated between the transmitter and receiver. This results in a holistic scanning system whose accuracy is influenced neither by radial or axial tolerances nor by angle tolerances. For this reason ball bearings are not necessary. Moreover, the strengths of the servo motors, such as accuracy and dynamics, are supported and emphasized by the very accurate capacitive operating principle.
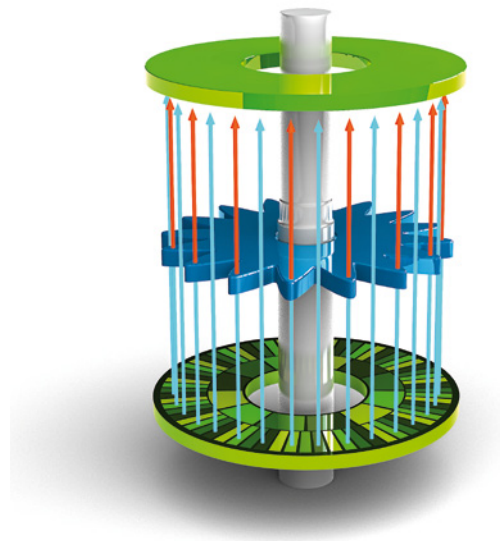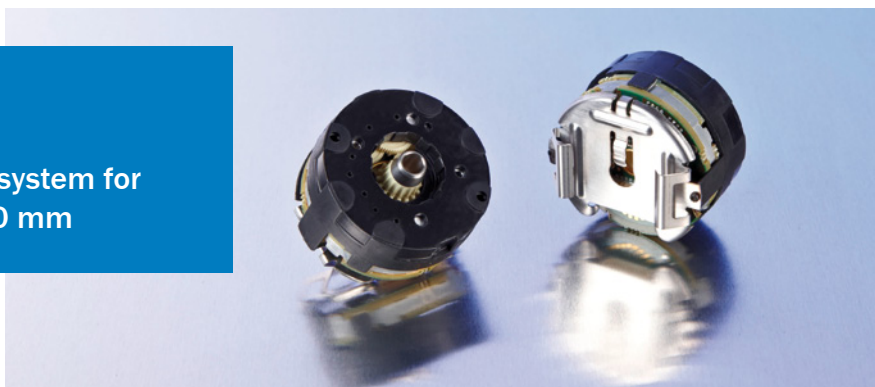
The flexible capacitive sensor technology

The capacitive sensor technology is very flexible due to its measuring principle. In this way both very compact products such as the SEK/SEL34 with an outside diameter of 34 mm and products with a large hollow shaft diameter up to 210 mm such as the SEK260 can be realized.

| SEK34/SEL34 | SEK37/SEL37 | SEK52/SEL52 | SEK90 | SEK160 | SEK260 |

The compact motor feedback system for motors with a flange size of 40 mm

Product description

The new SEK/SEL34 motor feedback systems with holistic scanning were designed specially for the needs of motors with a flange size of 40 mm. The SEL34 is impressive thanks to its compact design with real multiturn and a mechanical drive. The centerpiece of the product family is a bearing-free, capacitive sensor element. The holistic scanning system almost completely compensates for eccentricity errors and is very robust.

Dispensing with consumable parts ensures that error sources are ruled out as much as possible. Thanks to the capacitive measuring system, ball bearings can be dispensed with, thus making it possible to significantly reduce wear and heat build-up. The SEK/SEL34 motor feedback systems unite extreme robustness, the multiturn system and all the advantages of the HIPERFACE® interface in a very compact design.

At a glance

- Motor feedback systems for the basic performance range
- Special design for motors with a flange size of 40 mm
- 16 sine/cosine periods per revolution
- Absolute position with a resolution of 512 increments per revolution and 4,096 revolutions with the multiturn system
- Programming of the position value
- Electronic type label
- HIPERFACE® interface
- Conforms to RoHS

Your benefit

- The small dimension allows manufacturers of low-power and minimal-power motors to considerably reduce the size of their motors
- The SEK/SEL34 motor feedback systems are excellently suited for use under rough environmental conditions
- The capacitive principle of measurement with holistic scanning allows for high axial and radial tolerances

Additional information

Detailed technical data

Performance

	SEK34	SEL34
Measuring step	20 angular seconds (at interpolation of the sine/cosine signals with e.g. 12 bit)	
Total number of steps	512 (via RS485)	2,097,152 (via RS485)
Number of sine/cosine periods	16	
Number of the absolute ascertainable revolutions	1	4,096
Integral non-linearity	± 288 angular seconds (error limits for evaluating sine/cosine signals) Typical values at nominal position ± 0.1 mm and 20 °C	
Differential non-linearity	± 144 angular seconds (error limits for evaluating sine/cosine signals) Typical values at nominal position ± 0.1 mm and 20 °C	
Available memory area	1,792 B (EEPROM 2,048) [1]	

[1] If the electronic type label is used in effective combination with numeric controls, patent EP 425 912 B 2 must be observed; this does not apply if the effective connection is established using speed controllers.

Mechanical data

Working speed	6,000 min^{-1}, up to which the absolute position can be reliably produced
Operating speed	12,000 min^{-1}
Mass	0.04 kg
Dimensions	See dimensional drawing
Moment of inertia of the rotor	1 gcm^2
Max. angular acceleration	500,000 rad/s^2
Shaft version	Tapered shaft
Connection type	Connector, 8-pin, radial
Permissible shaft movement	
Axial	± 0.3 mm
Radial	± 0.15 mm

Electrical data

Operating current without load	< 50 mA
Operating voltage range /supply voltage	7 V ... 12 V DC
Recommended supply voltage	8 V DC

Interfaces

Electrical interface	HIPERFACE®
Type of code for absolute value	Binary
Code sequence	Increasing, for clockwise shaft rotation, looking in direction "A" (see dimensional drawing)
Interface signals	Process data channel = SIN, REFSIN, COS, REFCOS analog, differential Parameter channel = RS485: digital

Ambient data

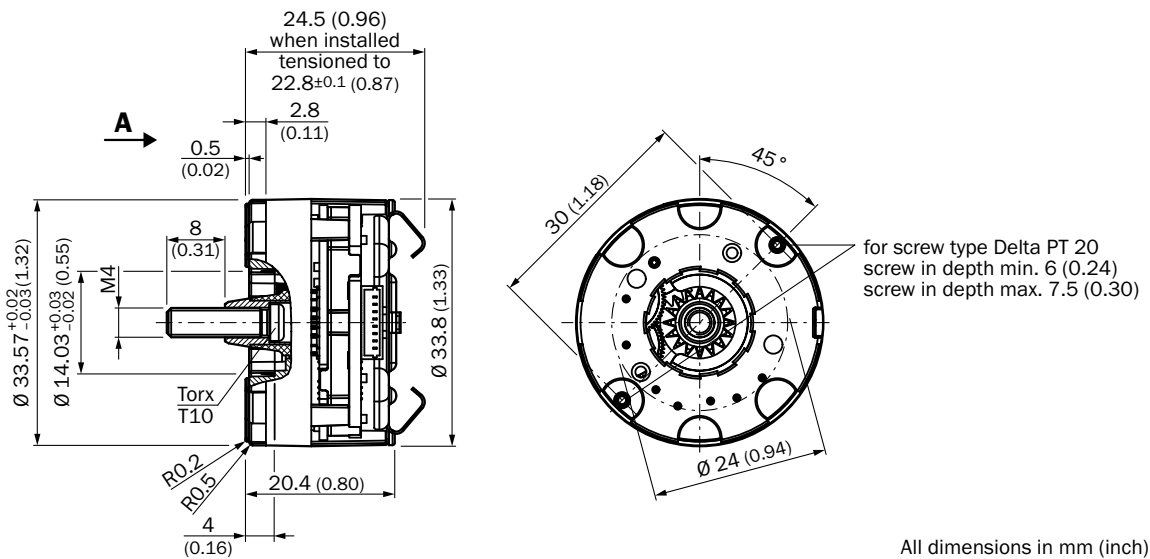|	SEK34	SEL34
Enclosure rating according to IEC 60529	IP 20, built-on version, with mating connector inserted and closed cover	
Relative humidity/condensation	90 %, condensation not permitted	
Working temperature range	–40 °C ... + 115 °C	–20 °C ... + 115 °C
Storage temperature range (without packaging)	–50 °C ... + 125 °C	
Resistance		
To shocks according to EN 60068-2-27	100 g/10 ms	
To vibration according to EN 60068-2-6	50 g/10 ... 2,000 Hz	
EMV [1] [2]	According to EN 61000-6-2 and EN 61000-6-3	

[1] With mating plug inderted and cover closed.

[2] EMC in accordance with the standards stated is guaranteed if the motor feedback system is mounted in an electrically conductive housing that is connected with the motor controller's central grounding point via a cable shiedling. The GND-(0V) connection of the supply voltage is also grounded there. If other shielding concepts are used, users must perform their own tests.

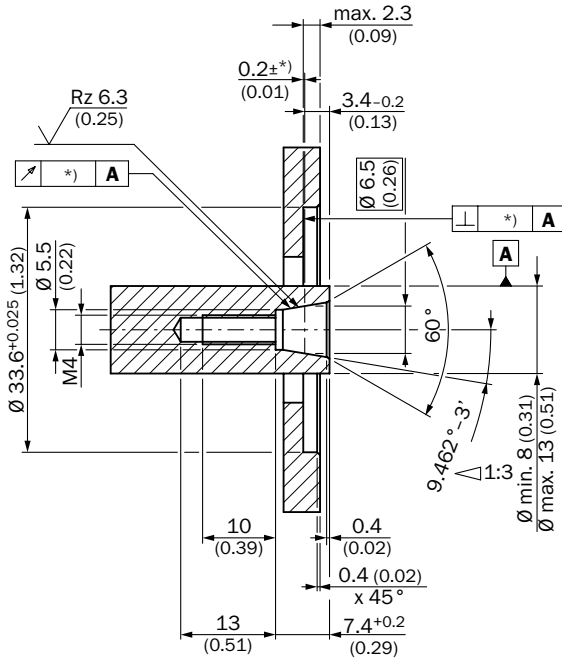## Ordering information

Version	Model name	Part no.
Singleturn	SEK34-HFB0K02	1053402
Multiturn	SEL34-HFB0K02	1053403

Dimensional drawings

for screw type Delta PT 20
screw in depth min. 6 (0.24)
screw in depth max. 7.5 (0.30)
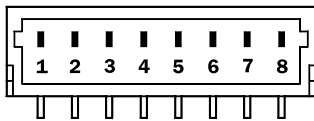
All dimensions in mm (inch)

Proposed customer fitting

*) Size of tolerance reduce the
allowed movement of the shaft,
see data sheet.

All dimensions in mm (inch)

PIN and wire assignment

PIN	Signal	Color of wires	Explanation
1	U_S	Red	7 … 12 V supply voltage
2	+ SIN	White	Process data channel
3	REFSIN	Brown	Process data channel
4	+ COS	Pink	Process data channel
5	REFCOS	Black	Process data channel
6	GND	Blue	Ground connection
7	Data +	Grey or yellow	RS485-parameter channel
8	Data –	Green or purple	RS485-parameter channel

The GND-(0V) connection of the supply voltage has no connection to the housing..

Electrical interface

HIPERFACE®
by **SICK**

- • Safe data transmission
- • High information content
- • Electronic type label
- • Only 8 leads
- • Bus-enabled parameter channel
- • Process data channel in real time

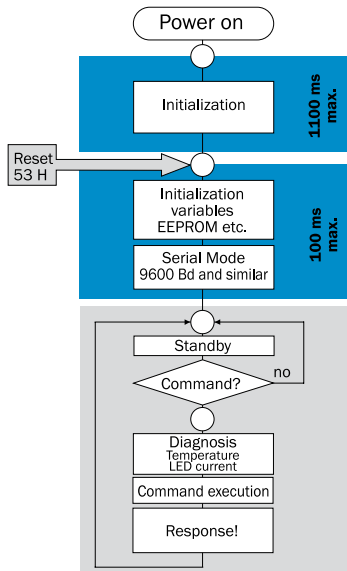**Motor Feedback System**

Sine
Cosine
Process data channel

Data out — Data out
Parameter data channel RS 485
Data in — Data in

Supply voltage

Drive
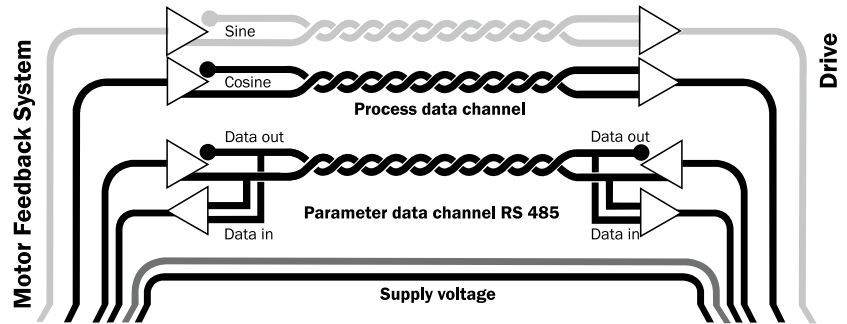
HIPERFACE® Starting time

Power on

Initialization — 1100 ms max.

Reset 53 H

Initialization variables EEPROM etc. — 100 ms max.
Serial Mode 9600 Bd and similar

Standby
Command? — no
Diagnosis
Temperature
LED current
Command execution
Response!

CAUTION:
No **RS485 communication** is possible during the phases highlighted in blue

Further informations to the interface see HIPERFACE®-description part no. 8010701

Signal specification of the process data channel

Signal diagram for clockwise rotation of the shaft, looking in direction "A"

SIN
REFSIN / REFCOS
COS

3 volts
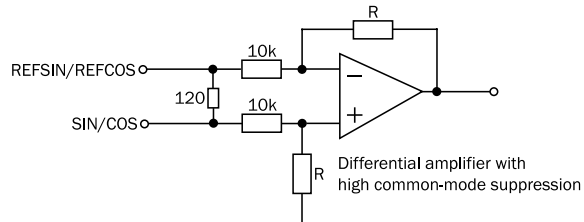2.5 volts
2 volts

1 period = 360° : 16
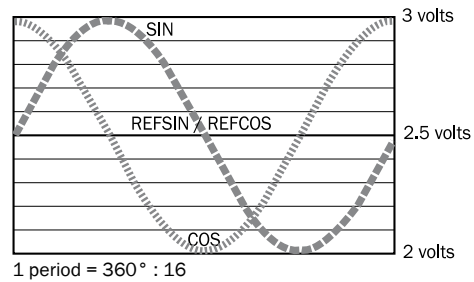
Access to the process data used for speed control, i.e. to the sine and cosine signals, is practically always "online". When the supply voltage is applied, the speed controller has access to this information at any time.

Sophisticated technology guarantees stable amplitudes of the analogue signals across all specified environmental conditions, with a maximum variation of only ± 20 %.

Characteristics applicable to all permissible environmental conditions

Signal	Value/Units
Signal peak, peak V_{ss} of SIN, COS	0.8 ... 1.2 V
Signal offset REFSIN, REFCOS	2.2 ... 2.8 V

Recommended receiver circuit for sine and cosine signals

REFSIN/REFCOS
10k
R
SIN/COS
120
10k
R

Differential amplifier with high common-mode suppression

HIPERFACE®
by **SICK**

Type-specific settings		SEK34	SEL34
Type ID (command 52h)		42h	47h
Free EEPROM [bytes]		1,792	1,792
Address		40h	40h
Mode_485 [1) 2)]		E4h	E4h
Codes 0 ... 3		55h	55h
Counter		0	0

[1)] The baud rate 9600 is set by default. Other baud rates cannot be selected.

[2)] When using the motor feedback systems SEK34/SEL34, please ensure that the controller's auto-baud function is not enabled, since these motor feedback systems compensate for minor variations when transmitting at a baud rate of 9600.

[3)] The commands thus labelled include the parameter "Code 0". Code 0 is a byte inserted into the protocol, for additional safeguarding of vital system parameters against accidental overwriting. When shipped, "Code 0" = 55h.

[4)] Temperature compatible with SCx (encoder temperature [°C] *2.048 – 40)

| Overview of commands supported			SEK34	SEL34
Command byte	Function	Code 0 [3)]	Comments	Comments
42h	Read position (5 bits per sine/cosine period)		9 bits	21 bits
43h	Set position	•		
44h	Read analogue value		Channel number F0h [4)] and 48h	Channel number F0h [4)] and 48h
			Temperature [°C]	Temperature [°C]
46h	Read counter			
47h	Increase counter			
49h	Reset 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 code			
50h	Read encoder status			
52h	Read out name plate		Encoder type = 42h	Encoder type = 47h
53h	Encoder reset			
55h	Allocate encoder address	•		
56h	Read serial number and program version			

Overview of status messages			SEK34	SEL34
Error type	Status code	Description		
	00h	The encoder has recognised no error	•	•
Initialisation	01h	Faulty compensating data	•	•
	02h	Faulty internal angular offset	•	•
	03h	Data field partitioning table damaged	•	•
	04h	Analogue limit values not available	•	•
	05h	Internal I²C bus not operational	•	•
	06h	Internal checksum error	•	•
Protocol	07h	Encoder reset occurred as a result of program monitoring	•	•
	09h	Parity error	•	•
	0Ah	Checksum of the data transmitted is incorrect	•	•
	0Bh	Unknown command code	•	•
	0Ch	Number of data transmitted is incorrect	•	•
	0Dh	Command argument transmitted is not allowed	•	•
Data	0Eh	The selected data field must not be written to	•	•
	0Fh	Incorrect access code	•	•
	10h	Size of data field stated cannot be changed	•	•
	11h	Word address stated, is outside data field	•	•
	12h	Access to non-existent data field	•	•
Position	1Fh	Speed too high, no position formation possible	•	•
	20h	Singleturn position unreliable	•	•
	21h	Positional error Multiturn		•
	22h	Positional error Multiturn		•
	23h	Positional error Multiturn		•
Other	1Ch	Monitoring the value of the analogue signals (process data)	•	•
	1Eh	Encoder temperature critical	•	•
	08h	Counter overflow	•	•

Further informations to the interface see HIPERFACE®-description part no. 8010701

Accessories

Plug connectors and cables

Description	Contacts	Wire length	Model name	Part no.
Stranded cable, straight, 8-wires, 8 x 0.15 mm²	8	0.2 m	DOL-0J08-G0M2XB6	2031086

shrunk area

All dimensions in mm (inch)
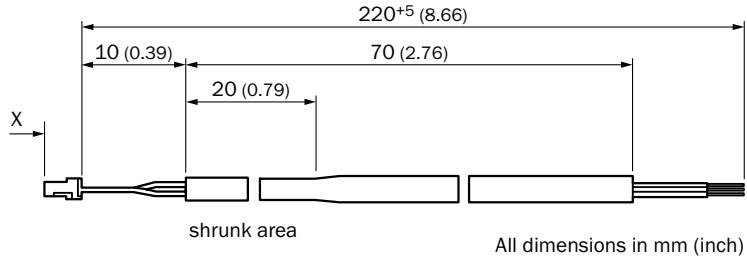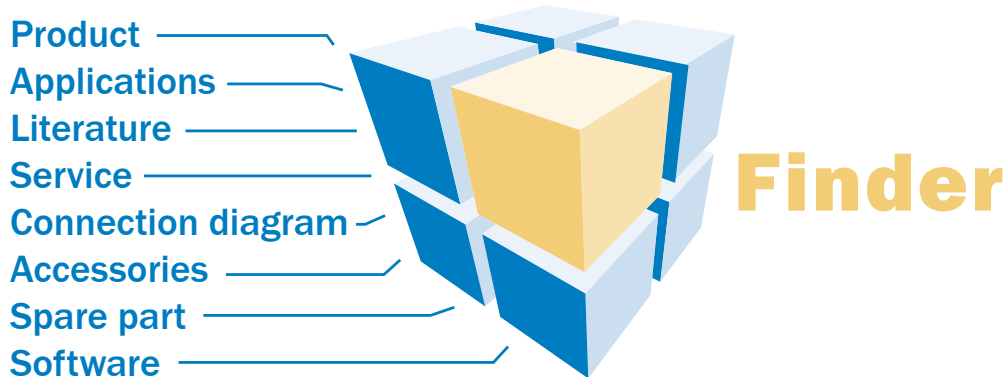
Description	Wires	Wire length	Model name	Part no.
Cable HIPERFACE®, 8-wires, 4 x 2 x 0.15 mm²	8	Cut material	LTG-2708-MW	6028361

Programming/configuration tool

Description	Model name	Part no.
Programming tool for HIPERFACE® devices SEK34/SEL34, consists of a set with software and hardware	PGT-03-S	1034252

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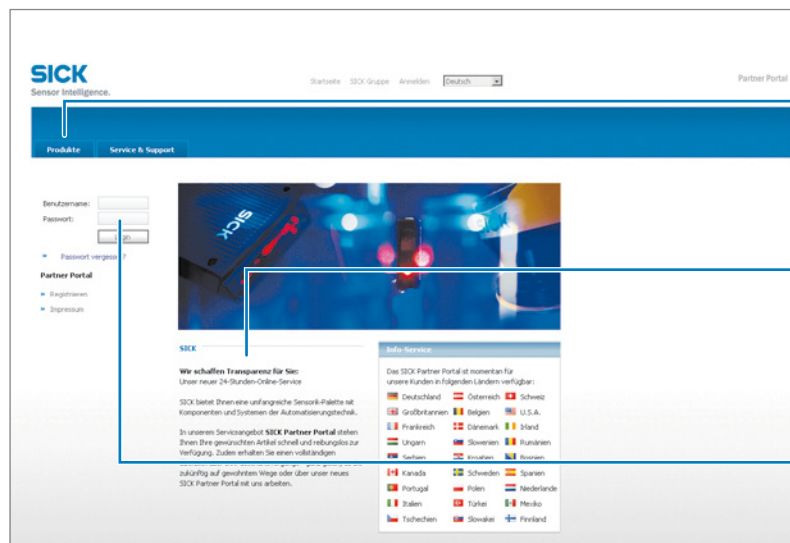
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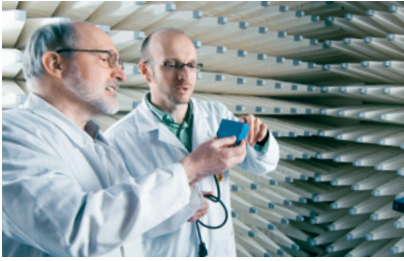Determine the price and possible delivery date of your desired product simply and quickly.

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SICK at a glance

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With a staff of more than 5,800 and nearly 50 subsidiaries and representations worldwide, SICK is one of the leading and most successful manufacturers of sensor technology. The power of innovation and solution competency have made SICK the global market leader. No matter what the project and industry may be, talking with an expert from SICK will provide you with an ideal basis for your plans – there is no need to settle for anything less than the best.

Unique product range

- Non-contact detecting, counting, classifying, positioning and measuring of any type of object or media
- Accident and operator protection with sensors, safety software and services
- Automatic identification with bar code and RFID readers
- Laser measurement technology for detecting the volume, position and contour of people and objects
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