

SinCos[®] SEK90/SEK160: Motor Feedback Systems with HIPERFACE[®] interface

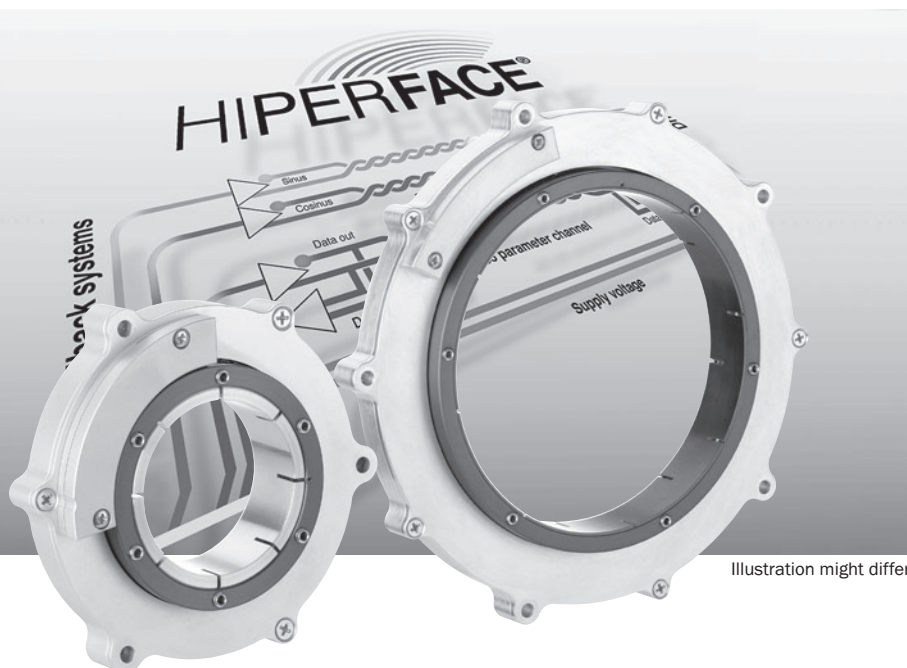


Illustration might differ

There is no need for toothed belts or transmission elements such as gears.

The holistic scanning almost completely compensates for any eccentricity errors, making the motor feedback systems extremely robust. Thanks to the capacitive principle of operation, the encoders do not require ball bearings. This significantly reduces wear and generation of heat. The design means the systems can be mounted easily without any additional mounting tools.



**64/128 sine/
cosine periods**

Motor Feedback Systems

The new SEK90 and SEK160 hollow-shaft Motor Feedback Systems with holistic system scanning have been designed to meet the special requirements of direct drives. They can be mounted directly on the drive shaft, and their small dimensions save on space and weight.

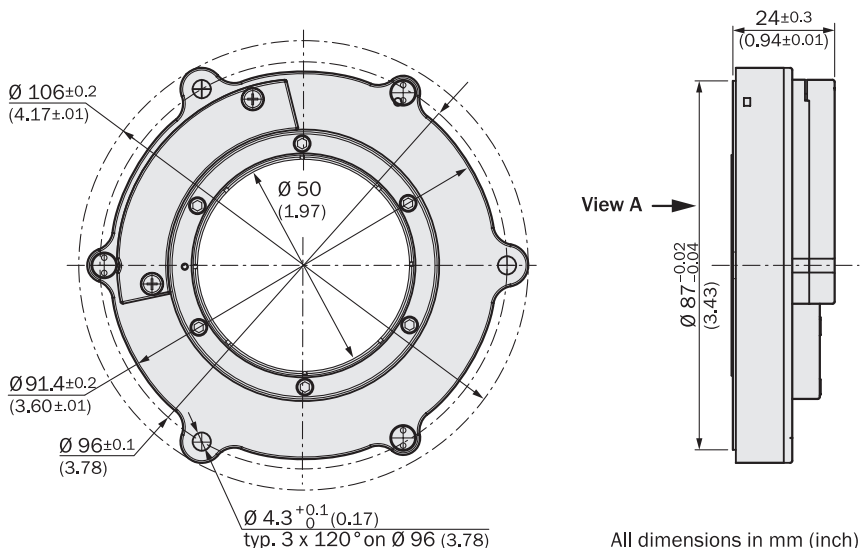
Whether for extruders on plastics machinery, use in the packaging industry, the automotive sector or the food and beverage industry – for motor manufacturers who work with the HIPERFACE[®] interface, the SEK90/SEK160 hollow-shaft Motor Feedback Systems offer a compact alternative.

64 sine/cosine periods

Motor Feedback Systems

- 64 sine/cosine periods per revolution
- Programming of the positional value
- Electronic type label

Dimensional drawing SEK90 with HIPERFACE®, hollow shaft



Proposed customer fitting SEK90 with HIPERFACE®, hollow shaft

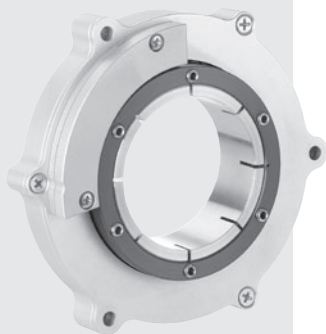
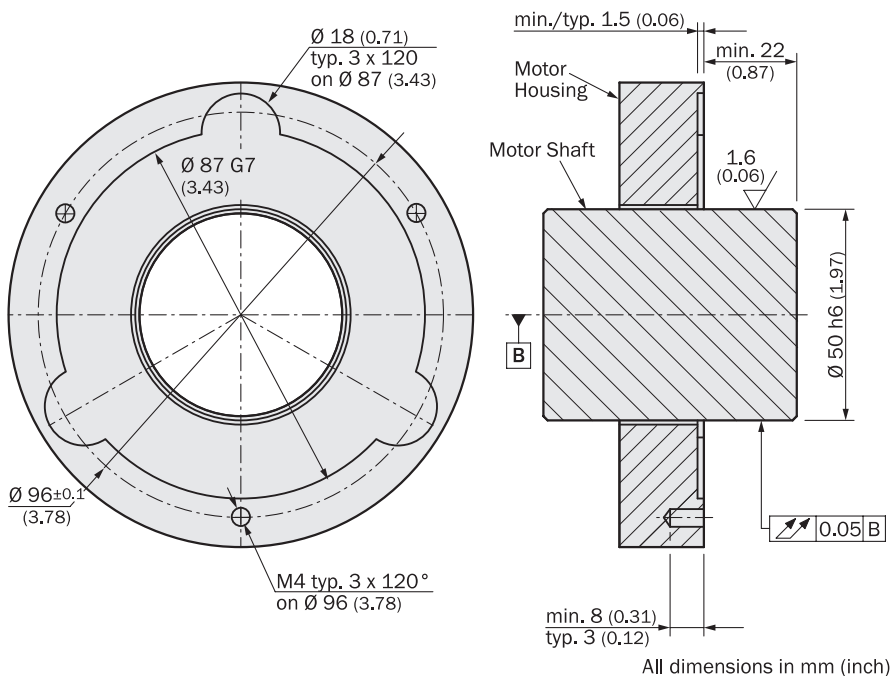
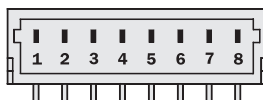


Illustration might differ

Pin and wire allocation

PIN	Signal	Colour of wires	Explanation
1	U _S	red	Supply voltage 7 ... 12 V
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.



Accessories

Connection systems (page 8)

Programming Tool (page 9)

Technical data to DIN 32878		SEK90 with HIPERFACE®, hollow shaft diameter	50 mm
Number of sine/cosine periods		64	
Number of the absolute ascertainable revolutions			
	Single SEK	1	
Dimensions		mm (see dimensional drawing)	
Mass		0.13 kg	
Moment of inertia to the rotor		$3.4 \times 10^{-5} \text{ kgm}^2$	
Code type for the absolute value		Binary	
Code sequence for clockwise shaft rotation, looking in direction "A" (see dimensional drawing)		Increasing	
Measurement step at interpolation of the sine/cosine signals with e.g. 12 bits		5 angular seconds	
Error limits for evaluating the sine/cosine signals			
	integral non-linearity	± 72 angular seconds ¹⁾	
Non-linearity within a sine/cosine period			
	differential non-linearity	± 45 angular seconds ¹⁾	
Working speed up to which the absolute position can be reliably produced		3,000 min ⁻¹	
Max. operating speed		3,000 min ⁻¹	
Max. angular acceleration		$5 \times 10^5 \text{ rad/s}^2$	
Permissible radial shaft movement ²⁾			
	static	± 0.2 mm	
	dynamic	± 0.05 mm	
Permissible axial shaft movement ²⁾		± 0.5 mm	
Working temperature range		-30 to +115 °C	
Storage temperature range (without package)		-50 to +125 °C	
Permissible relative humidity (condensation not permitted)		90%	
Resistance			
	to shocks (according to EN 60068-2-27)	100 g/6 ms	
	to vibration (according to EN 60068-2-6)	30 g/10 to 2,000 Hz	
Enclosure rating to IEC 60529 ³⁾		IP 40	
EMC ⁴⁾			
Operating voltage range		7 to 12 V	
Recommended supply voltage		8 V	
Max. operating current, no load		150 mA	
Available memory area within EEPROM 2048 ⁵⁾		1,792 Byte	
Interface signals			
	Process data channel = SIN, REFSIN, COS, REFCOS	Analog, differential	
	Parameter channel = RS485	Digital	
	Latency	100 μs	

¹⁾ At nominal position ± 0.1 mm and 20 °C

²⁾ Relative to the installation position, as described in the assembly instructions (order no. 8013609) and on page 2

³⁾ With mating connector inserted and closed cover

⁴⁾ To EN 61000-6-2 and EN 61000-6-3

The EMC according to the standards quoted is achieved when the motor feedback system is mounted in an electrically conductive housing, which is connected to the central earthing point of the motor controller via a cable screen. Users must perform their own tests when other screen designs are used.

⁵⁾ If applying the electronic type label, in connection with numeric controllers, attention should be paid to Patent EP 425 912 B 2; application of the electronic type label in connection with speed regulation is exempt

Ordering information

SEK90 with HIPERFACE®, hollow shaft

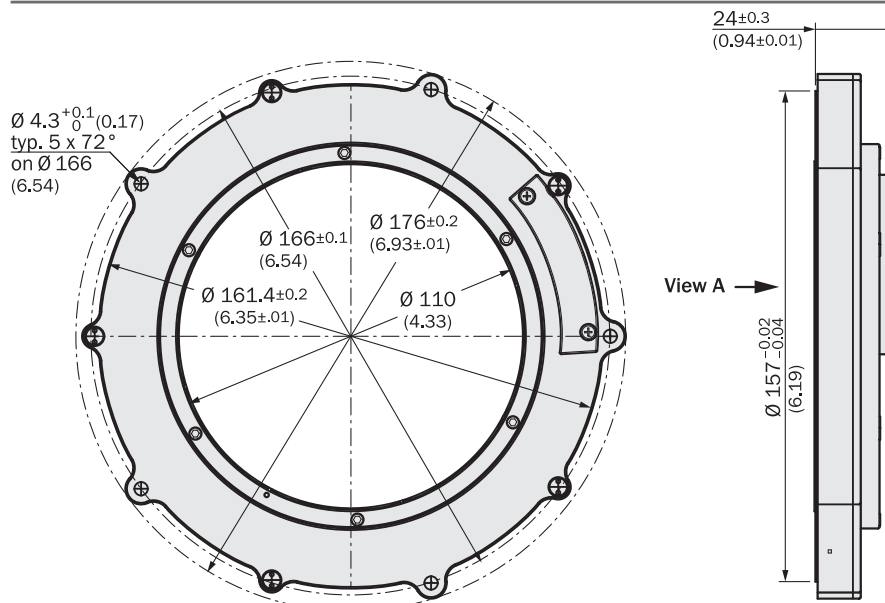
Type	Part no.	Description
SEK90-HN050AK02	1038271	Singleturn, hollow shaft 50 mm

128 sine/cosine periods

Motor Feedback Systems

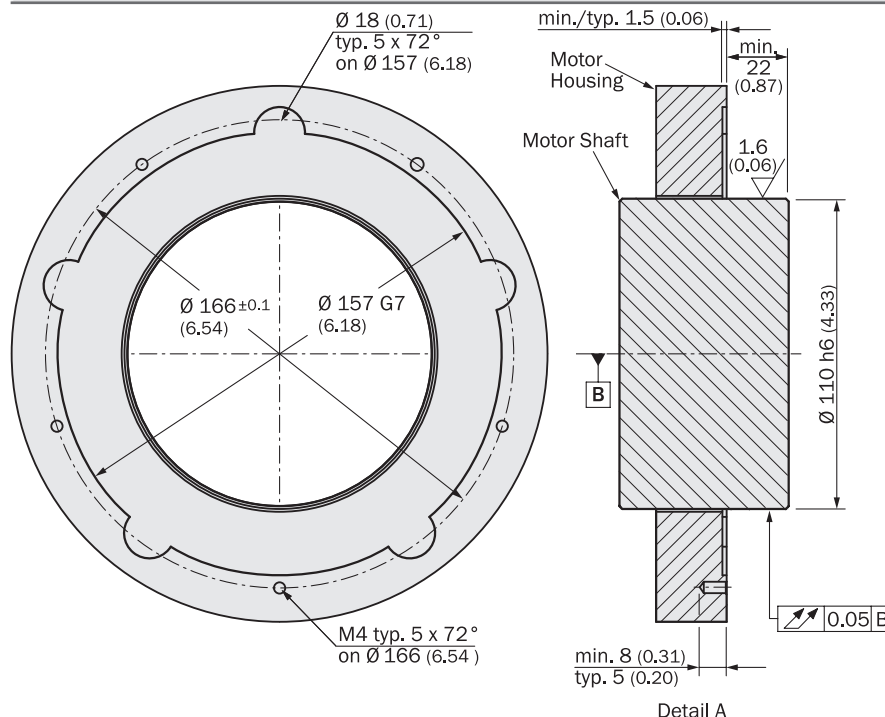
- 128 sine/cosine periods per revolution
- Programming of the positional value
- Electronic type label

Dimensional drawing SEK160 with HIPERFACE®, hollow shaft



All dimensions in mm (inch)

Proposed customer fitting SEK160 with HIPERFACE®, hollow shaft



All dimensions in mm (inch)

Pin and wire allocation

PIN	Signal	Colour of wires	Explanation
1	U _S	red	Supply voltage 7 ... 12 V
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.

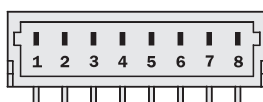


Illustration might differ

Accessories

Connection systems (page 8)

Programming Tool (page 9)

Technical data to DIN 32878		SEK160 with HIPERFACE®, hollow shaft diameter	110 mm
Number of sine/cosine periods		128	
Number of the absolute ascertainable revolutions			
	Single SEK	1	
Dimensions		mm (see dimensional drawing)	
Mass		0.270 kg	
Moment of inertia to the rotor		$28.6 \times 10^{-5} \text{ kgm}^2$	
Code type for the absolute value		Binary	
Code sequence for clockwise shaft rotation, looking in direction "A" (see dimensional drawing)		Increasing	
Measurement step at interpolation of the sine/cosine signals with e. g. 12 bits		2.5 angular seconds	
Error limits for evaluating the sine/cosine signals			
	integral non-linearity	± 36 angular seconds ¹⁾	
Non-linearity within a sine/cosine period			
	differential non-linearity	± 21 angular seconds ¹⁾	
Working speed up to which the absolute position can be reliably produced		$1,500 \text{ min}^{-1}$	
Max. operating speed		$1,500 \text{ min}^{-1}$	
Max. angular acceleration		$2.8 \times 10^4 \text{ rad/s}^2$	
Permissible radial shaft movement ²⁾			
	static	$\pm 0.2 \text{ mm}$	
	dynamic	$\pm 0.05 \text{ mm}$	
Permissible axial shaft movement ²⁾		$\pm 0.5 \text{ mm}$	
Working temperature range		$-30 \text{ to } +115 \text{ }^\circ\text{C}$	
Storage temperature range (without package)		$-50 \text{ to } +125 \text{ }^\circ\text{C}$	
Permissible relative humidity (condensation not permitted)		90%	
Resistance			
	to shocks (according to EN 60068-2-27)	100 g/6 ms	
	to vibration (according to EN 60068-2-6)	30 g/10 to 2,000 Hz	
Enclosure rating to IEC 60529 ³⁾		IP 40	
EMC ⁴⁾			
Operating voltage range		7 to 12 V	
Recommended supply voltage		8 V	
Max. operating current, no load		150 mA	
Available memory area within EEPROM 2048 ⁵⁾		1,792 Byte	
Interface signals			
	Process data channel = SIN, REFSIN, COS, REFCOS	Analog, differential	
	Parameter channel = RS485	Digital	
	Latency	100 μs	

¹⁾ At nominal position $\pm 0.1 \text{ mm}$ and $20 \text{ }^\circ\text{C}$

²⁾ Relative to the installation position, as described in the assembly instructions (order no. 8013609) and on page 4

³⁾ With mating connector inserted and closed cover

⁴⁾ To EN 61000-6-2 and EN 61000-6-3

The EMC according to the standards quoted is achieved when the motor feedback system is mounted in an electrically conductive housing, which is connected to the central earthing point of the motor controller via a cable screen. Users must perform their own tests when other screen designs are used.

⁵⁾ If applying the electronic type label, in connection with numeric controllers, attention should be paid to Patent EP 425 912 B 2; application of the electronic type label in connection with speed regulation is exempt

Ordering information

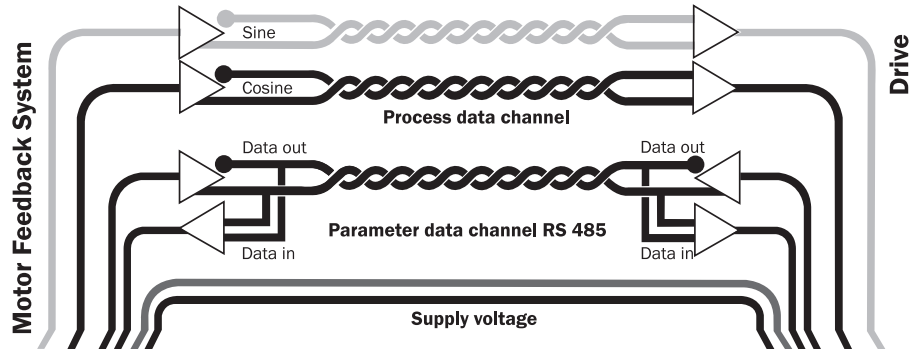
SEK160 with HIPERFACE®, hollow shaft

Type	Part no.	Description
SEK160-HN110AK02	1038272	Singleturn, hollow shaft 110 mm

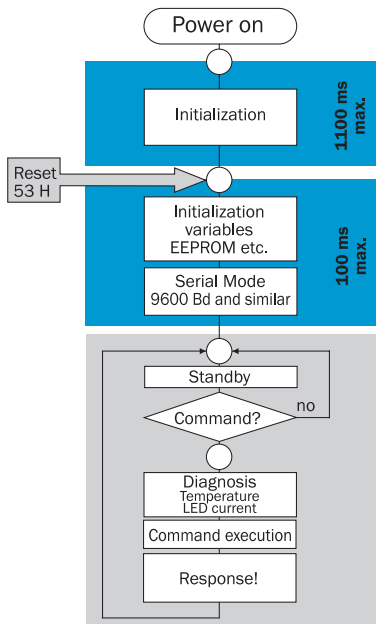


Electrical interface

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

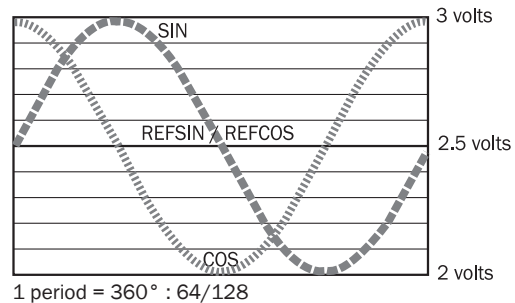


HIPERFACE® Starting time



Signal specification of the process data channel

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



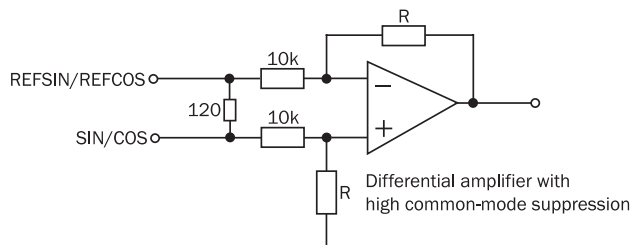
Access to the process data used for speed control, i.e. to the sine and cosine signals, is practically always "online". When the supply voltage is applied, the speed controller has access to this information at any time.

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

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



CAUTION:
No **RS485** communication is possible during the phases highlighted in blue. After a software reset, it will take approx. 150 ms until the SIN/COS signals reach an amplitude of $1 V_{pp} \pm 20\%$.



Type-specific settings	SEK90/SEK160
Type ID (command 52h)	FFh
Free EEPROM [bytes]	1,792
Address	40h
Mode_485 ^{1) 2)}	E4h
Codes 0 ... 3	55h
Counter	0

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

²⁾ When using the Motor Feedback Systems SEK90/SEK160, 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			SEK90	SEK160
Command byte	Function	Code 0 ³⁾	Comments	Comments
42h	Read position (5 bits per sine/cosine period)		11 bits	12 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 = FFh	Encoder type = FFh
53h	Encoder reset			
55h	Allocate encoder address	•		
56h	Read serial number and program version			

Overview of status messages				
Error type	Status code	Description	SEK90	SEK160
	00h	The encoder has recognised no error	•	•
Initialisation	01h	Faulty compensating data	•	•
	02h	Faulty internal angular offset	•	•
	03h	Data field partitioning table damaged	•	•
	04h	Analog limit values not available	•	•
	05h	Internal I ² C 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	•	•

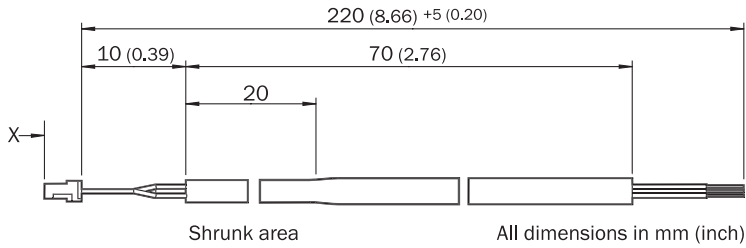
Further informations to the interface see HIPERFACE®-description part no. 8010701

Connection systems

Dimensional drawings and ordering information

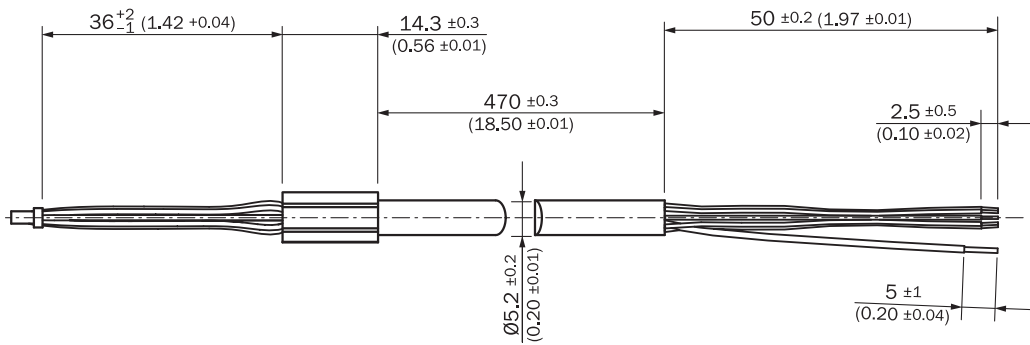
Stranded cable/connector, straight, 8 wires, 8 x 0.15 mm²

Type	Part no.	Contacts	Wire length
DOL-0J08-GOM2XB6	2031086	8	0.2 m



Cable HIPERFACE®, 8 wires, 4 x 2 x 0.15 mm² screened

Type	Part no.	Contacts	Wire length
DOL-0J08G0M5XB6	2056250	8	0.5 m



Cable HIPERFACE®, 8 wires, per metre 4 x 2 x 0.15 mm²

Type	Part no.	Wires
LTG-2708-MW	6028361	8

Programming Tool

Programming Tool for HIPERFACE® devices		
Type	Part no.	Motor Feedback System
PGT-03-S	1034252	SEK90/SEK160

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