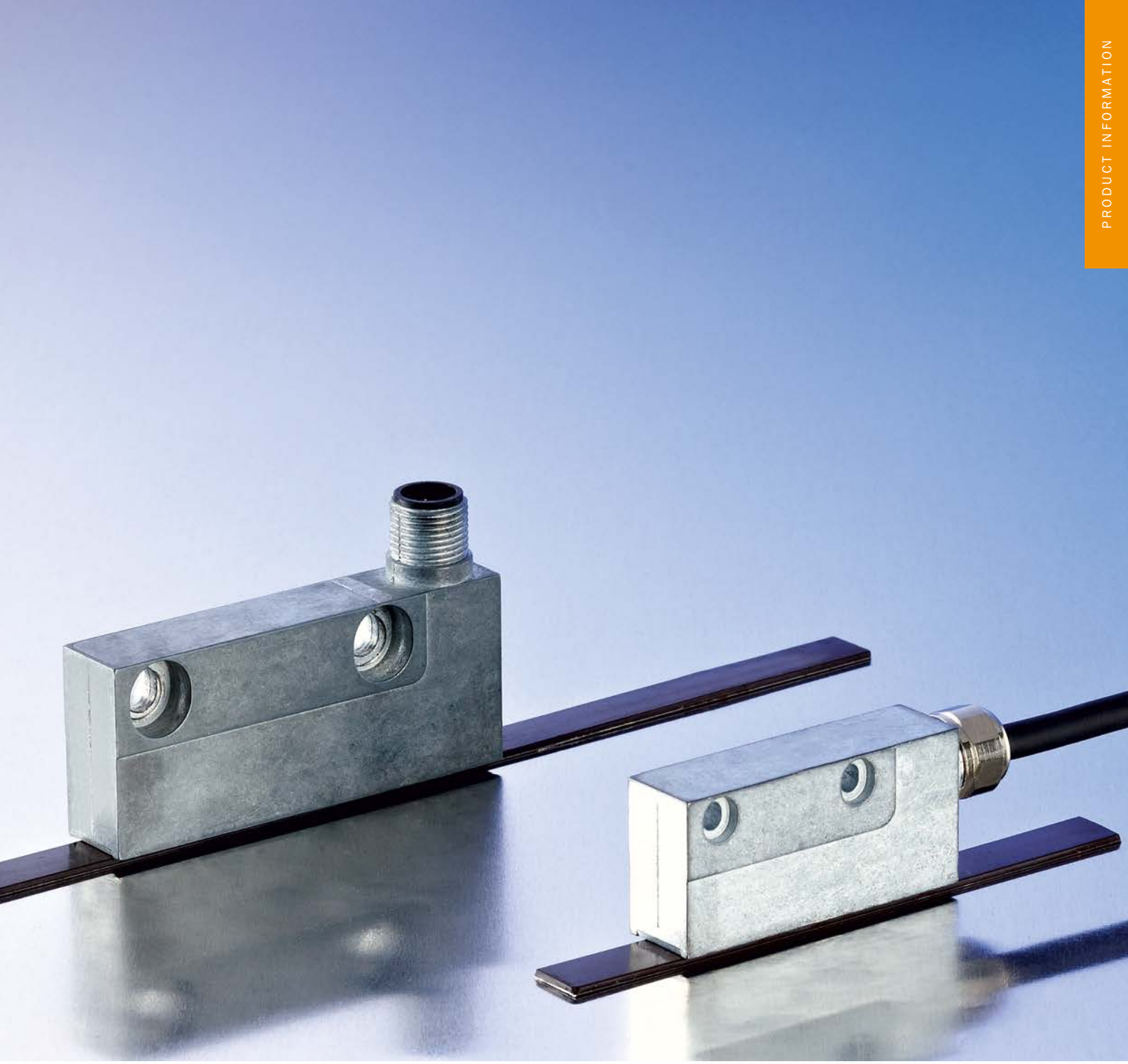
PRODUCT INFORMATION



TTK70 / TTK50

MEASURING THE SPEED AND POSITION WITH THE GREATEST POSSIBLE PRECISION

Motor feedback systems linear HIPERFACE®

SICK
Sensor Intelligence.

TOP-SPEED MEASUREMENT FOR LINEAR MOTORS

Product description

Precision, speed, dynamic, stiffness and a high level of control quality – these are the features that play an important part in high-end applications of drive technology. The TTK70 linear measuring system meets all these requirements.
It is a very compact motor feedback system with a HIPERFACE® interface. The magnetic principle of operation, the large measured lengths and the very high resolution open up a multitude of applications for absolute position determination on linear motors.
Inside, the TTK70 features the latest sensor and evaluation technology. The sensor board aligned with the measuring plane is equipped with hall sensors on two parallel tracks. Their arrangement corresponds to the division of the magnetic tape into an incremental and an absolute component.
To calculate the absolute position values during operation, the read head first records the absolute initial position via the Manchester code when the linear motor starts. Then all other actual positions of the drive are determined via the incremental position on the magnetic track or sine/cosine signals.

At a glance

- Absolute, non-contact, wear-free length measurement system for linear motors
- Measured lengths of up to 4 m
- Suitable for high traverse speeds of up to 10 m/s
- Reliable location positioning even in the event of condensation and contamination of the magnetic tape
- Electronic type label and programming of the position value
- Absolute location positioning, no reference run
- HIPERFACE® interface
- Conforms to RoHs

Your benefits

- Reference traverse no longer necessary due to absolute measuring system
- Maintenance-free thanks to non-contact measuring principle
- Simple integration of the system due to the HIPERFACE® interface
- Developed specifically for use in linear direct drives
- Also for use in rough ambient conditions

Additional information

→ www.mysick.com/en/TTK70

For more information, just enter the link or scan the QR code and get direct access to technical data, CAD design models, operating instructions, software, application examples and much more.

8015022/2016-11-08
Subject to change without notice

Detailed technical data

Performance

Measuring step	0.244 µm at interpolation of the sine/cosine signals with e.g. 12 Bit
Length of period	1 mm
Measuring length	Max. 4,000 mm
Magnetic strip length	Measurement length + 80 mm
System accuary (ambient temperature)	± 10 µm (+20 °C)
Repeat accuracy	< 5 µm
Measured value backlash	< 10 µm
System part	Read head

Interfaces

Type of code for the absolute value	Binary
Interface signals	Process data channel SIN, REFSIN, COS, REFCOS: analog, differential Parameter channel RS 485: digital
Available memory area	1,792 Byte (EEPROM 2048)

Mechanical data

Dimensions	See dimensional drawing
Mass	Read head 0.08 kg, magnetic tape 0.18 kg/m
Material	Read head die-cast zinc, magnetic tape 17410 hard ferrite 9/28 P
Piston speed	≤ 10 m/s
Operating speed up to which the absolute position can be reliably produced	1.3 m/s
Connection type	Connector M12 Cable outlet 500 mm

Electrical data

Electrical interface	HIPERFACE®
Operating voltage range/supply voltage	7 V DC ... 12 V DC
Recommended supply voltage	8 V DC
Operating power consumption (no load)	≤ 65 mA [1]

[1] 100 mA approx. during adjustment.

Ambient data

Working temperature range	–30 °C ... +80 °C
Storage temperature range	–40 °C ... +85 °C, without package
Relative humidity / condensation	100 %, condensation allowed
Resistance to shocks	30 g, 6 ms (EN 60068-2-27)
Resistance to vibration	20 g, 10 Hz ... 2,000 Hz (EN 60068-2-6)
EMC	(EN 61000-6-2, EN 61000-6-3) [1]
Enclosure rating	IP 65, with mating connector inserted (according to IEC 60529)
Temperature coefficient magnetic tape	(11 ± 1) µm/K/m
Maximum permitted ambient field strength	< 3 kA/m ... 4 kA/m (3.8 mT ... 5 mT): to guarantee compliance with the quoted accuracy values [2]
Maximum permitted field strength	< 150 kA/m (< 190 mT): to ensure that the magnetic tape is not permanently damaged

[1] The EMC according to the standards quoted is achieved when the motor feedback system with put-on mating connector is connected to the central earthing point of the motor controller via a cable screen and via the encoder housing extensive connected to the motor potential. Users must perform their own tests when other screening designs are used.

[2] The maximum permitted external field influence is reached when the position value deviates from the original value (without external field influence) by more than 5 µm. This value is reached when, at the sensor location, a field strength of 3 kA/m to 4 kA/m (3.8 mT to 5 mT) occurs in addition to the field strength of the magnetic tape.

Ordering information

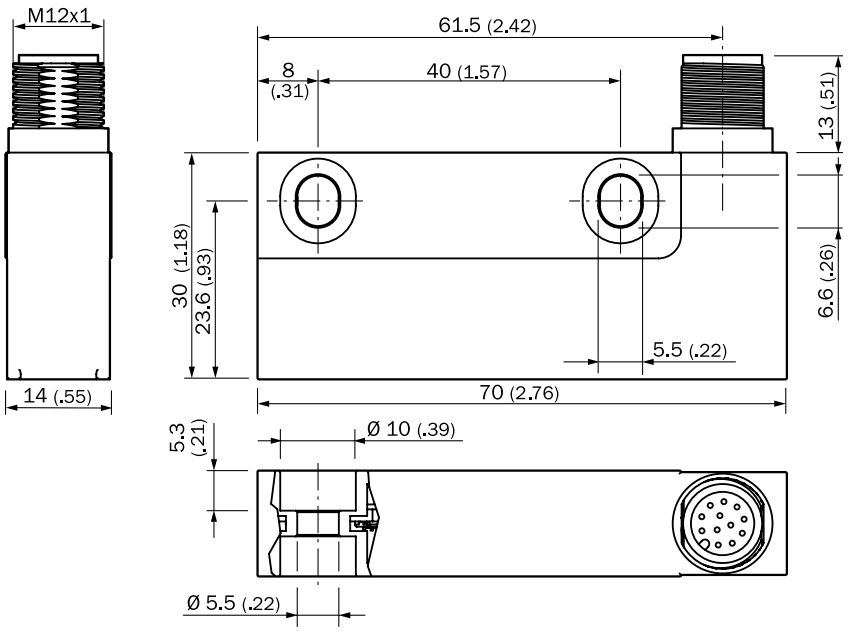
Description	Cable length	Model name	Part no.
Read head TTK70, connector M12	–	TTK70-HXAO-K02	1037434
Read head TTK70, cable outlet	0,5 m	TTK70-HXJ0-K02	1063567
Read head TTK70, cable outlet	1 m	TTK70-HXI0-K02	1068879

Description	Magnetic tape	Model name	Part no..
Magnetic tape with adhesive tape and cover band incl. [1]	0,5 m	MVM-0M5-2MC-MKLB	6037415
	1 m	MVM-01M-2MC-MKLB	6037417
	1,5 m	MVM-1M5-2MC-MKLB	6037418
	2 m	MVM-02M-2MC-MKLB	6037419
	2,5 m	MVM-2M5-2MC-MKLB	6037420
	3 m	MVM-03M-2MC-MKLB	6037421
	3,5 m	MVM-3M5-2MC-MKLB	6037422
	4 m	MVM-04M-2MC-MKLB	6037423

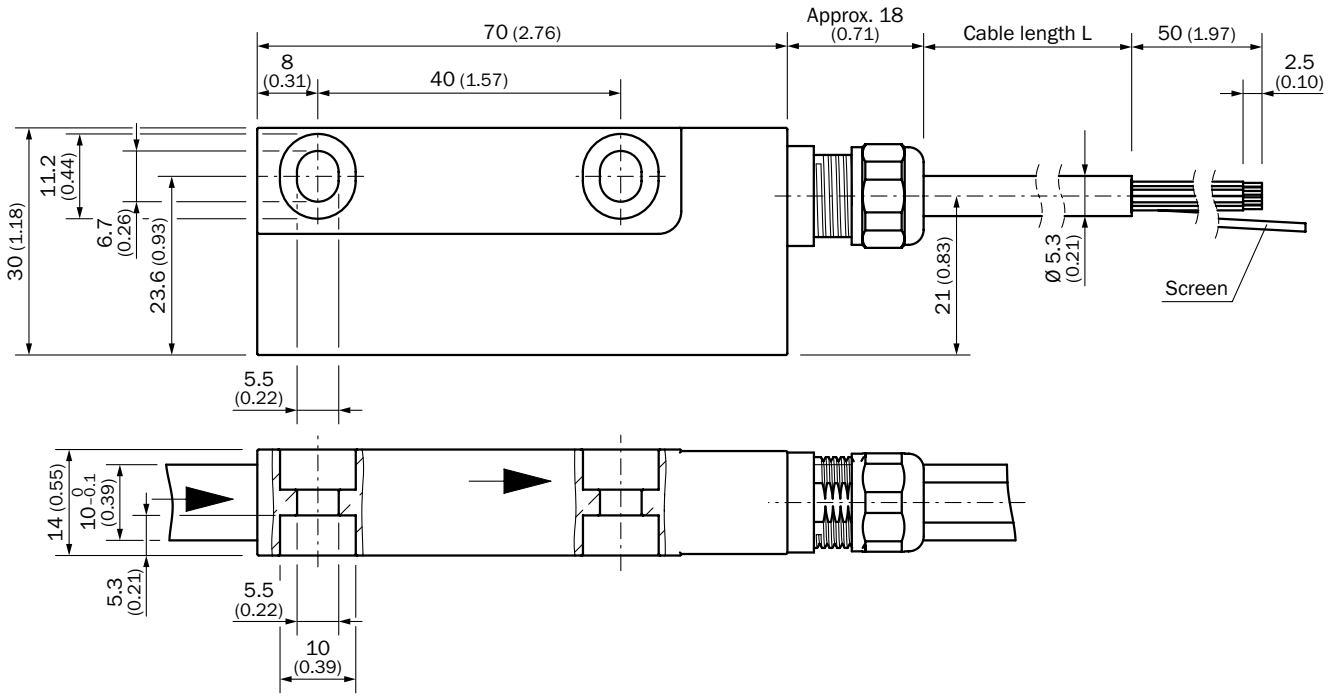
[1] Working temperature range –20 ... +100 °C, storage temperature range –30 ... +100 °C.

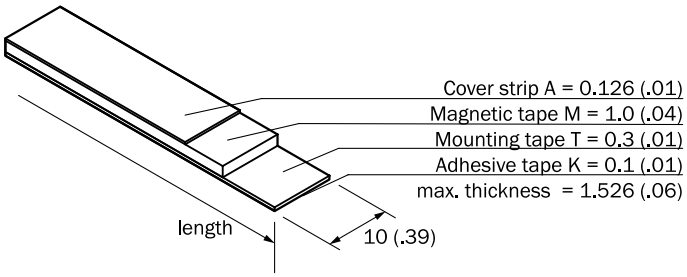
Dimensional drawings (Dimensions in mm (inch))

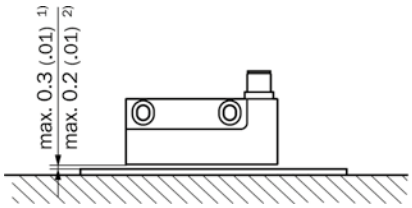
TTK70 connector M12

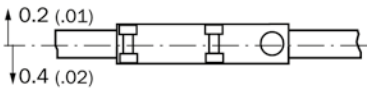


TTK70 cable outlet









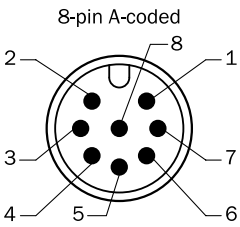
[1] Without cover strip.

[2] With cover strip.

General tolerances acc. to DIN ISO 2768-m

PIN and wire allocation

Connector 8-pin



View of the plug-in face

Pin	Color of wires	Signal	Explanation
1	Brown	REFSIN	Process data channel
2	White	+ SIN	Process data channel
3	Black	REFCOS	Process data channel
4	Pink	+ COS	Process data channel
5	Gray or yellow	Data +	RS-485 parameter channel
6	Green or purple	Data –	RS-485 parameter channel
7	Blue	GND	Ground connection
8	Red	$+U_S$	Encoder supply voltage
–	Copper braid	Screen	Housing potential. Screening via plug housing.

Electronically adjustable via Programming Tool.

TOP-SPEED MEASUREMENT FOR LINEAR MOTORS

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Inside, the TTK50 features the latest sensor and evaluation technology. The sensor board aligned with the measuring plane is equipped with hall sensors on two parallel tracks. Their arrangement corresponds to the division of the magnetic tape into an incremental and an absolute component.
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Additional information

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8015022/2016-11-08

Detailed technical data

Performance

Measuring step	0.244 µm at interpolation of the sine/cosine signals with e.g. 12 Bit
Length of period	1 mm
Measuring length	Max. 940 mm
Magnetic strip length	Measurement length + 60 mm
System accuary (ambient temperature)	± 10 µm (+20 °C)
Repeat accuracy	< 5 µm
Measured value backlash	< 10 µm

Interfaces

Type of code for the absolute value	Binary
Interface signals	Process data channel SIN, REFSIN, COS, REFCOS: analog, differential Parameter channel RS 485: digital
Available memory area	1,792 Byte (EEPROM 2048)

Mechanical data

Dimensions	See dimensional drawing
Mass	Read head 0.06 kg without cable, magnetic tape 0.18 kg/m
Material	Read head die-cast zinc, magnetic tape 17410 hard ferrite 9/28 P
Piston speed	≤ 10 m/s
Operating speed up to which the absolute position can be reliably produced	1.3 m/s
Connection type	Cable outlet 500 mm/1,000 mm/2,000 mm

Electrical data

Electrical interface	HIPERFACE®
Operating voltage range/supply voltage	7 V DC ... 12 V DC
Recommended supply voltage	8 V DC
Operating power consumption (no load)	≤ 55 mA [1]

[1] 100 mA approx. during adjustment.

Ambient data

Working temperature range	–30 °C ... +80 °C
Storage temperature range	–40 °C ... +85 °C, without package
Relative humidity / condensation	100 %, condensation allowed
Resistance to shocks	30 g, 6 ms (EN 60068-2-27)
Resistance to vibration	20 g, 10 Hz, 2,000 Hz (EN 60068-2-6)
EMC	(EN 61000-6-2, EN 61000-6-3) [1]
Enclosure rating	IP 65 (according to IEC 60529)
Temperature coefficient magnetic tape	(11 ± 1) µm/K/m
Maximum permitted ambient field strength	< 3 kA/m ... 4 kA/m (3.8 mT ... 5 mT): to guarantee compliance with the quoted accuracy values [2]
Maximum permitted field strength	< 150 kA/m (< 190 mT): to ensure that the magnetic tape is not permanently damaged

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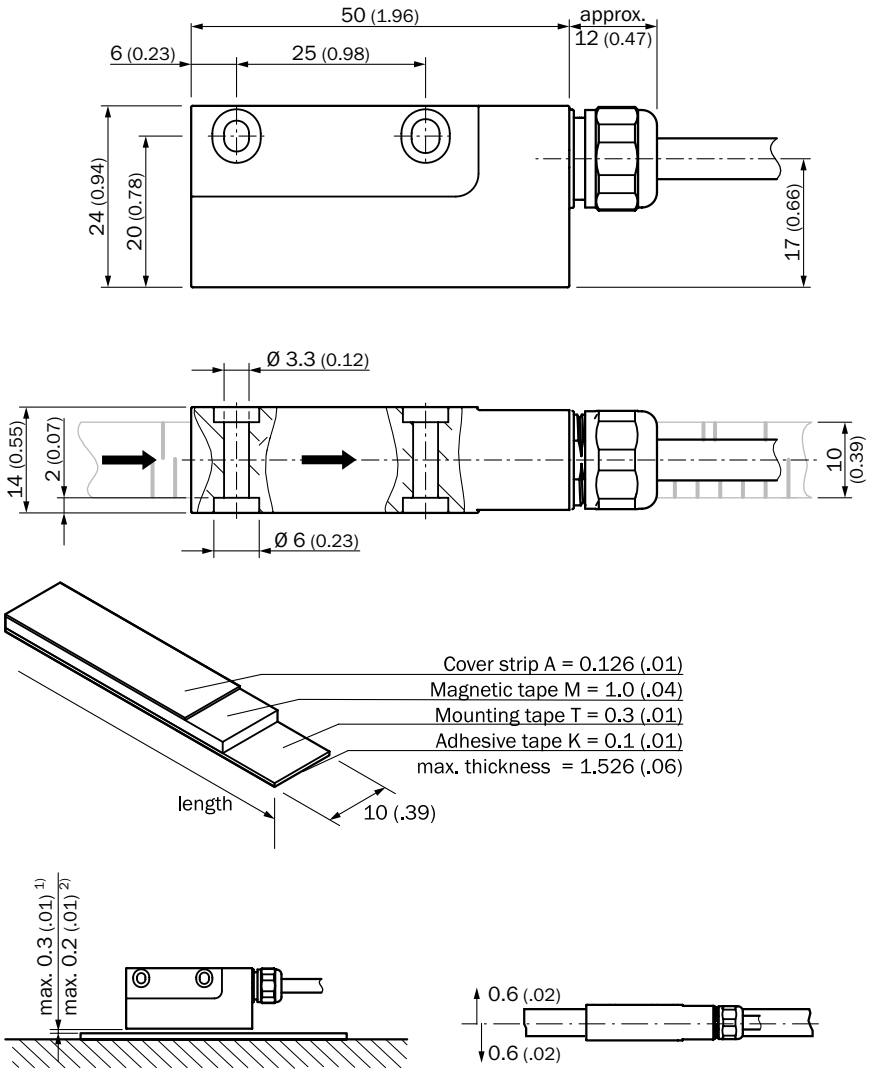
Ordering information

Description	Cable length	Model name	Part no.
Read head, cable outlet	0,5 m	TTK50-HXJ0K02	1057791
Read head, cable outlet	1,0 m	TTK50-HXI0K02	1057792
Read head, cable outlet	2,0 m	TTK50-HXQ0K02	1057793
Read head, cable outlet	5,0 m	TTK50-HXM0K02	1067934

Description	Magnetic tape	Model name	Part no..
Magnetic tape with adhesive tape and cover band incl. [1]	1,0 m	MVM-01M2MCMKLB	6049001

[1] Working temperature range –20 ... +100 °C, storage temperature range –30 ... +100 °C.

Dimensional drawings (Dimensions in mm (inch))



[1] Without cover strip.

[2] With cover strip.

General tolerances acc. to DIN ISO 2768-mk.

8015022/2016-11-08
Subject to change without notice

Wire allocation

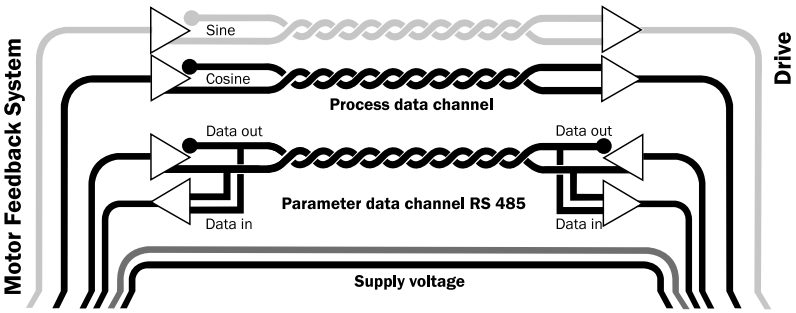
Cable

Color of wires	Signal	Explanation
Brown	REFSIN	Process data channel
White	+ SIN	Process data channel
Black	REFCOS	Process data channel
Pink	+ COS	Process data channel
Gray or yellow	Data +	RS-485 parameter channel
Green or purple	Data –	RS-485 parameter channel
Blue	GND	Ground connection
Red	+ U_S	Encoder supply voltage
Copper braid	Screen	Screen connected with encoder housing

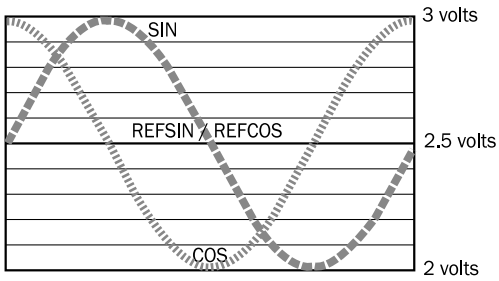
Electronically adjustable via Programming Tool.

Electrical interface

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



Signal specification of the process data channel



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 %.

Signal	Value [1]/units
Signal peak, peak V_{SS} of SIN, COS	0.9 ... 1.1 V
Signal offset REFSIN, REFCOS	2.2 ... 2.8 V

[1] Characteristics applicable to all permissible environmental conditions.

Type-specific settings

	TTK70	TTK50
Type ID (command 52h)	FFh	FFh
Free EEPROM [bytes]	1.792	1.792
Address	40h	40h
Mode_485 [1]	E4h	E4h
Codes 0 ... 3	55h	55h
Counter	0	0

[1] The linear length measuring system supports the following baud rates: 9600, 19200 and 38400.

Overview of commands supported

Command byte	Function	Code 0 [1]	TTK70, comments	TTK50, comments
42h	Read position (5 bits per sine/cosine period)		31.25 µm	31.25 µm
43h	Set position	■		
44h	Read analogue value		Channel number 48h	Channel number 48h
			Temperature [°C] [2]	Temperature [°C] [2]
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			
57h	Configure serial interface	■		
67h	Change serial interface temporary			
6Ah	Set position with internal synchronization	■	See page 14	See page 14
6Bh	Sensor adjustment (during commissioning)	■		

[1] 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.

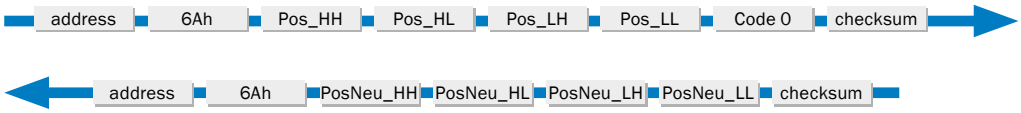
[2] The temperature value will be reliably formed approx. 2 s after power on/reset.

Overview of status messages

Error type	Status code	Description	TTK70	TTK50
	00h	The encoder has recognized no error	■	■
Initialization	01h	Adjustment data faulty	■	■
	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	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	20h	Sensor is not adjusted or is in adjustment mode	■	■
	21h	Distance magnetic tape/sensor too high	■	■
	23h	Positional error	■	■
Other	1Ch	Monitoring the value of the analogue signals (process data)	■	■
	1Eh	Encoder temperature critical	■	■
	08h	Counter overflow	■	■

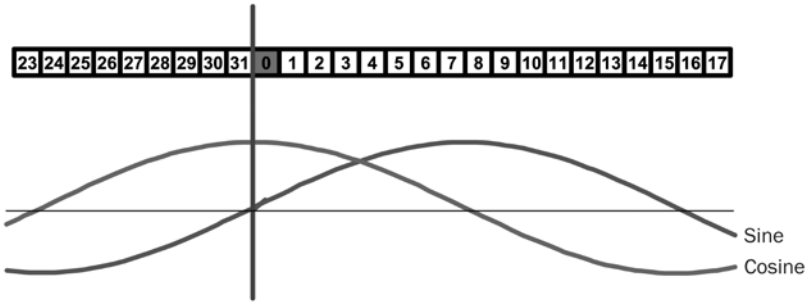
Further informations to the interface see HIPERFACE®-description part no. 8010701.

Set position with internal synchronization 6Ah



With this command, the encoder position is set such that the required position value points to the beginning of a period of the SIN signal. This is achieved by not changing, in contrast to the command “Set position” (43h), the lower 5 bits of the position value, as these are responsible for the interpolation within a period.
The position value given in the command is transmitted in the “unsigned long” format with the LSB right-aligned and saved to non-volatile memory. The value range is between 0 ... 127999 or 0 ... 31999 and must be interpreted as a multiple of 1/32 mm.

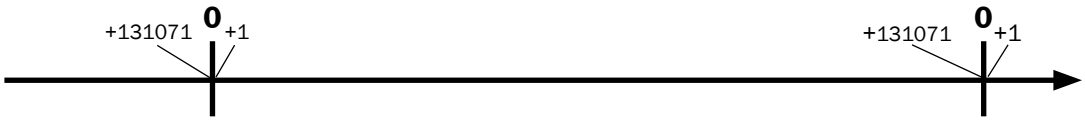
The following events trigger an error message:
- Number of transmitted command bytes wrong (WRONG_COMMAND_LENGTH, 0Ch)
- Wrong access code entered (ERR_ACCESS_CODE, 0Fh),
- Internal error occurred, which would lead to an invalid position value (ERR_INT_ANGLE_OFFSET, 02h),
- Encoder is not adjusted (ERR_NOT_CALIBRATED, 20h),
- Transmitted command argument is invalid (WRONG_ARGUMENT, 0Dh),
- Internal checksum error (ERR_CHKSUM, 06h)



5 LSB of the digital absolute position.

Codification magnetic tape TTK70

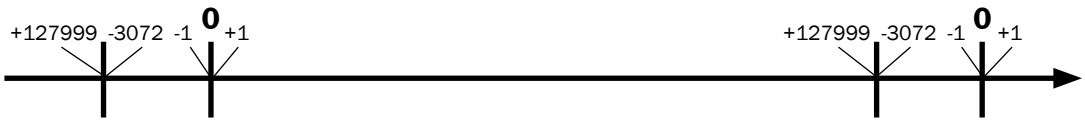
The absolute coding of the magnetic tape allows a max. measuring range of 4095.999 mm. As the resolution of the position data is 1/32 mm, the resulting numeric value for the maximum measuring range is 131072.



Internal position calculation TTK70

Position value (-3072 .. 00 .. +127999):

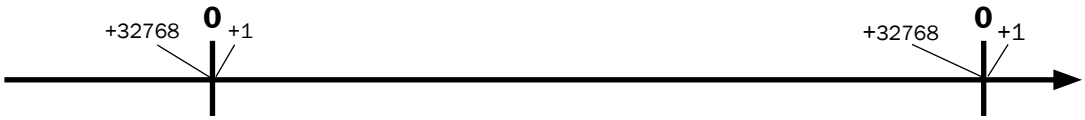
To avoid rapid jumps to the maximum value, around the 0 position, the max. measuring range is limited to 4000 mm (= 128000 * 1/32 mm). Therefore, in the negative direction of travel, a range of -96 mm (= -3072 * 1/32 mm) can be detected.



Due to the positional calculations performed inside the TTK70, during commissioning it is necessary to send the command “6Ah” (Position set with internal synchronisation) at the start of the magnetic tape.

Codification magnetic tape TTK50

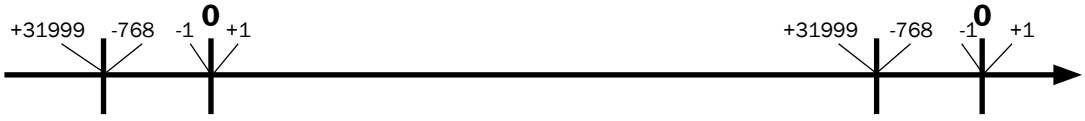
The absolute coding of the magnetic tape allows a max. measuring range of 1023.999 mm. As the resolution of the position data is 1/32 mm, the resulting numeric value for the maximum measuring range is 32768.



Internal position calculation TTK50

Position value (-768 .. 00 .. +31999):

To avoid rapid jumps to the maximum value, around the 0 position, the max. measuring range is limited to 1000 mm (= 32000 * 1/32 mm). Therefore, in the negative direction of travel, a range of -24 mm (= -768 * 1/32 mm) can be detected.



It is necessary to send the command “6Ah” (Position set with internal synchronisation) at the start of the magnetic tape due to the positional calculations performed inside the TTK50, during commissioning. To avoid that, the sensor produces a negative value, which the connected controller might not be able to interpret correctly, the tape is limited to a length of 1000 mm. The magnetization of the magnetic tape is such that the sensor only sends positive values. Due to this the maximum measuring range is restricted 940 mm.

Accessories

Programming and configuration tools

Description	Model name	Part no.
Programming Tool for TTK70/50 with HIPERFACE® interface	PGT-03-S	1034252

Cables and connectors

Male connector (ready to assemble)

Description	Contacts	Cable diameter	Model name	Part no.
Cable connector M12 male, 8-pin, straight, screened, for field assembly (adapter side) for TTK70/50	8	4 ... 8 mm	STE-1208-GA01	6044892

Female connector (ready to assemble)

Description	Contacts	Cable diameter	Model name	Part no.
Cable connector M12 female, 8-pin, straight, screened, for field assembly (adapter side) for TTK70/50	8	4 ... 8 mm	DOS-1208-GA01	6045001
Cable connector M12 female, 8-pin, angled, screened, for field assembly (adapter side) for TTK70/50	8	4 ... 8 mm	DOS-1208-WA	6043358

Cable (open–open)

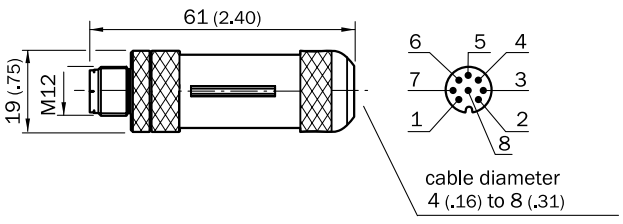
Description	Wires	Model name	Part no.
Cable HIPERFACE®, 8 wires, per metre 4 x 2 x 0.15 mm² for TTK70/50	8	LTG-2708-MW	6028361

Connecting cable (female connector–open)

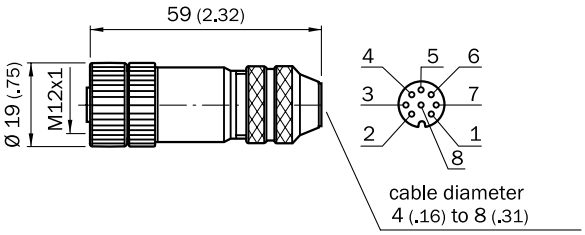
Description	Contacts	Cable length	Model name	Part no.
Female connector M12 female, 8-pin, straight, pre-wired with cable 8-wire, 4 x 2 x 0.25 mm² , screened, flexible (adapter side) for TTK70	8	2.0 m	DOL-1208-G02MAC1	6032866
		5.0 m	DOL-1208-G05MAC1	6032867
		10.0 m	DOL-1208-G10MAC1	6032868
		20.0 m	DOL-1208-G20MAC1	6032869
Right angled M12, 8-pin female connector, pre-wired with cable 8-cores, 4 x 2 x 0.25 mm² , screened, suitable for use in a drag chain (adapter side) for TTK70	8	2.0 m	DOL-1208-W02MAC1	6037724
		5.0 m	DOL-1208-W05MAC1	6037725
		10.0 m	DOL-1208-W10MAC1	6037726
		20.0 m	DOL-1208-W20MAC1	6037727

Dimensional drawings accessories (Dimensions in mm (inch))

STE-1208-GA01



DOS-1208-GA01



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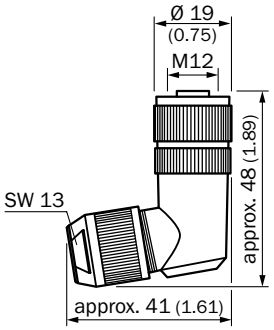

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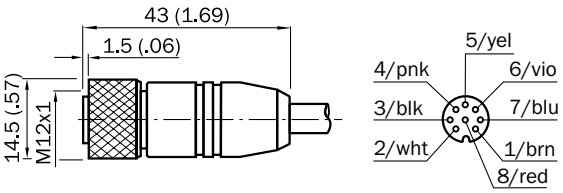

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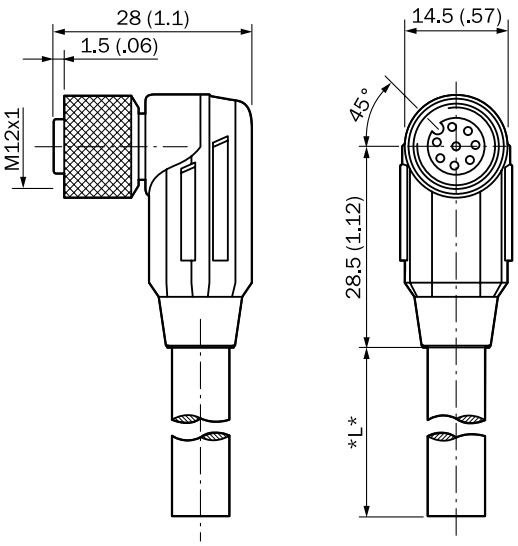

Notes

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