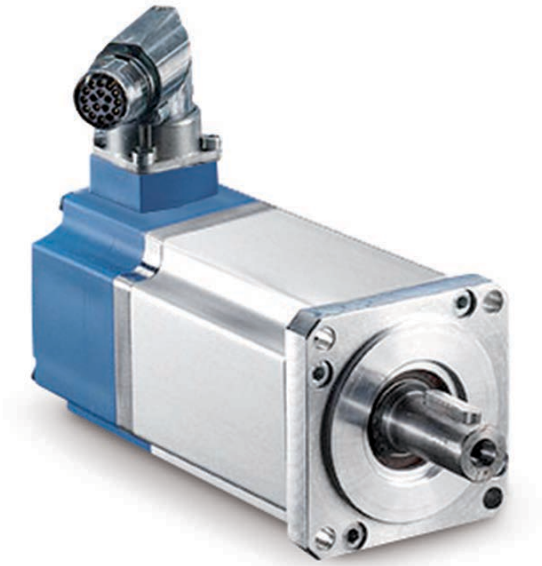
PRODUCT INFORMATION

EKS/EKM36

COMPACT MOTOR FEEDBACK SYSTEM FOR HIGHLY DYNAMIC SERVO DRIVES

Motor feedback systems rotary HIPERFACE DSL®

SICK
Sensor Intelligence.



What is HIPERFACE DSL®?

HIPERFACE DSL® is a purely digital protocol that requires a minimum of connection cables between frequency inverter and motor feedback system. The robustness of the protocol enables the connection to the motor feedback system via the motor connection cable. The interface complies with the RS485 standard with a transfer rate of 9.375 MBaud. Data transfer is undertaken synchronously to the controller cycle, which can be as low as 11.95 µs. The cable length between the frequency converter and the motor feedback system can be up to 100 m.

What are the advantages?

Controller side

- Analog components are superfluous.
- Simple implementation due to the application on an FPGA. This is specified with the validated IP core.
- Saves the need for a motor feedback connector plug.

Motor side

- Minimum space requirements due to the lack of a motor feedback connector plug.

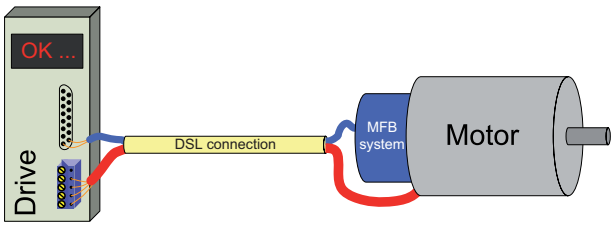
Overall system

- Reduced cabling requirement
- Data transfer for external sensors via the motor feedback interface.

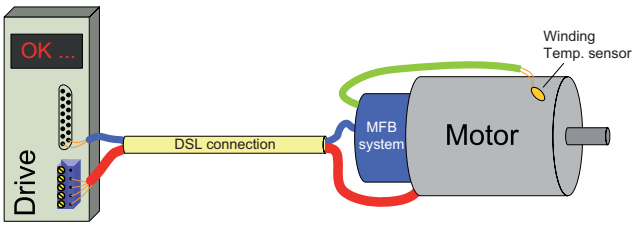
Your options

The most significant advantage of the protocol is the minimization in the number of wires. In doing so, it is possible to integrate the entire motor feedback communication into the motor cable. An additional option makes it possible for additional information to be transferred from external sensors (e.g. temperature sensors) via the motor feedback cable.

Integrated in the motor cable

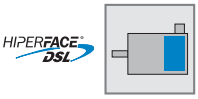


Connection type = J



Connection type = K

COMPACT MOTOR FEEDBACK SYSTEM FOR HIGHLY DYNAMIC SERVO DRIVES



Additional information

Product description

From a mechanical point of view, the EKS/EKM36 motor feedback system is based on the proven 36 mm design. This design is both compact and robust, and has been proven many times over in a wide range of applications and surroundings. In combination with an absolute location indicator system with a resolution of up to 20 Bits per revolution and a maximum of 4,096 revolutions, this design is unique in its class.

At a glance

- Motor feedback system with HIPERFACE DSL® Interface
- Compact, rugged design with 36 mm diameter
- Up to 20 bit resolution per revolution and 4,096 revolutions measurable with the multiturn system
- Option for connecting an external temperature sensor
- E²Prom with 8 kbyte of free memory space
- SIL2-certified (only valid for EKS/EKM36-2...)
- Service life histogram

Your benefits

- Saving all analog components on the controller part through exclusively digital data transmission
- Enormous cost saving thanks to the separate encoder cable no longer being necessary, data transmitted synchronously to the controller cycle
- Minimal cabling thanks to integration of the encoder communication into the motor cable
- Optimization of the controller circuit via automatic synchronization with the controller cycle

→ www.mysick.com/en/EKS_EKM36

For more information, simply 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.

Detailed technical data

Performance

	Singleturn		Multi-turn	
Resolution per revolution	18 bits	20 bits	18 bits	20 bits
Signal noise (see diagrams 1 and 2)	± 5"	± 4"	± 5"	± 4"
Number of absolutely encodable revolutions	1		4,096	
Measuring step per revolution	262,144	1,048,576	262,144	1,048,576
Error limits positional values Integral non linearity in angular seconds	±80	±60	±80	±60
Error limits positional values Differential non-linearity in angular seconds	±40			
Max. speed when switching on and resetting the motor feedback system	6000 min^{-1}			
Available memory area	8,192 bytes			

Interfaces

Code type for the absolute value	Binary
Code sequence	Increasing, when turning the shaft for clockwise rotation, looking in direction "A" (see dimensional drawing)
Interface signals HIPERFACE DSL®	Digital, RS485 [1]
Initialization time	Max. 500 ms, on reaching a permissible operating voltage
Measurement external temperature resistance	Output format: 32 bit value, without prefix Output unit: 1 Ω Measuring range: 0 - 209600 Ω Typical accuracy at –40 °C - +160 °C: NTC ±2 K; PTC ±3 K

[1] The IP core "DSL Master" must be implemented in order to connect a drive controller, see HIPERFACE DSL manual® (8013607)

Electrical data

Operating voltage range/supply voltage	7 - 12 V
Warm-up time voltage ramp	Max. 180 ms (duration of voltage ramp between 0 and 7.0 V)
Operating current	Max. 150 mA [2] (see diagram 3)
Output frequency for the digital position value	0 - 75 kHz

[2] When used with the suggested input circuit as described in HIPERFACE DSL ® manual (8013607)

Mechanical data

	Singleturn	Multi-turn
Dimensions	See dimensional drawings	
Mass	0.1 kg	
Rotor moment of inertia	4.5 gcm^2	
Maximum operating speed	12,000 RPM	9,000 RPM
Operating torque	0.2 Ncm	
Start up torque	0.3 Ncm	
Permissible shaft movement, static	± 0.1 mm (radial)	
Permissible shaft movement, dynamic	± 0.05 mm (radial)	
Permissible shaft movement, static	± 0.5 mm (axial)	
Permissible shaft movement, dynamic	± 0.1 mm (axial)	
Service life of ball bearings	3,6 x 10^9 revolutions	
Angular acceleration max.	5 x 10^5 rad/s^2	

Safety characteristics (only valid for SIL2 certified versions)

Safety integrity level [3]	SIL2 (IEC 61508), SILCL2 (EN 62061)
Category	3 (EN ISO 13849)
Test rate	1 h
Maximum demand rate	200 µs
Performance Level [3]	PL d (EN ISO 13849)
Safety relevant resolution	Channel 1 = 20 bit, channel 2 = 9 bit
PFH_D: Likelihood of a dangerous failure per hour [4]	4×10^{-8}
T_M (Mission Time)	20 years (EN ISO 13849)
$MTTF_D$: mean time to dangerous failure	500 years (EN ISO 13849)

[3] For more detailed information on the exact configuration of your machine/unit, please consult your relevant SICK branch office.

[4] The values displayed apply to a diagnostic degree of coverage of 90%, which must be achieved by the external drive system.

Ambient conditions

Working temperature range	–20 °C - +115 °C [5]
Storage temperature range	–40 °C - +125 °C
Relative air humidity / condensation	90% (condensation not permitted)
Resistance to shocks	100 g/6 ms (according to EN 60068-2-27)
Resistance to vibrations	50 g / 10- 2.000 Hz (according to EN 60068-2-6)
Enclosure rating	IP 40 according to IEC 60529-1 [6]
EMC [7]	According to EN 61000-6-2, EN 61000-6-4 and IEC 61326-3

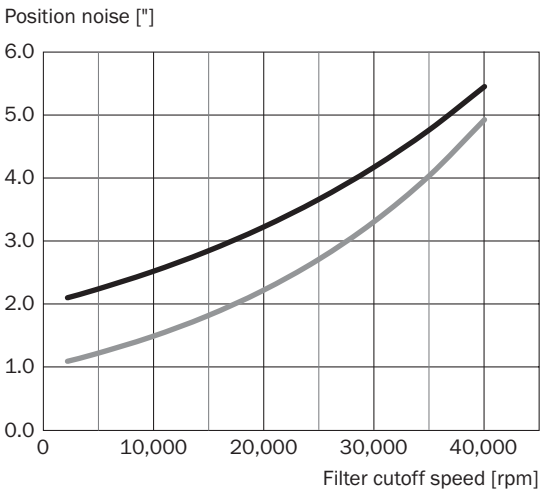
[5] Given typical thermal connection between motor flange and encoder stator coupling. The max. internal sensor temperature may not exceed 125 °C.

[6] With mating plug inserted and cover closed.

[7] 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. The GND-(0V) connection of the supply voltage is also grounded. If other shielding concepts are used, the user must perform his own tests.

Diagrams

Diagram 1



Signal noise is measured as 1 standard deviation (σ) of the value distribution. Position filter cutoff speed is set by resource 10Ah, see page 11.

Diagram 2

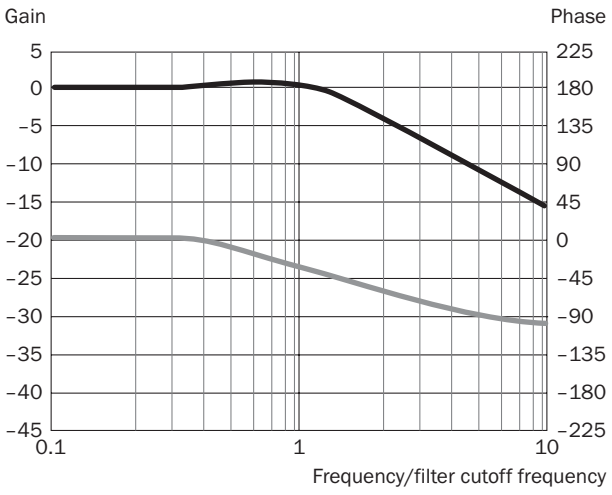
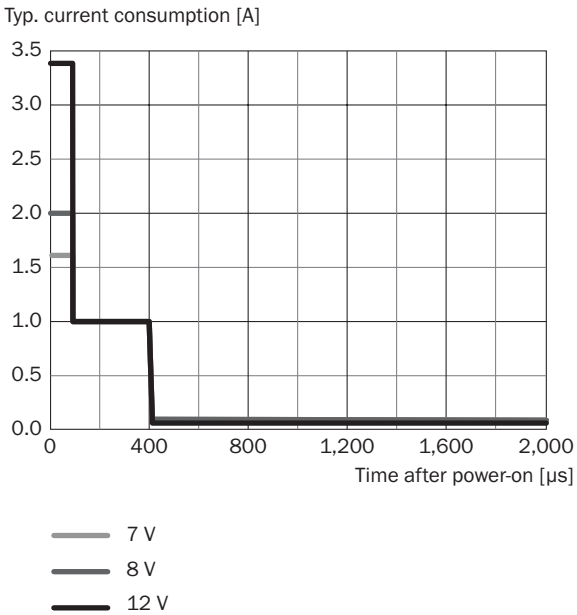
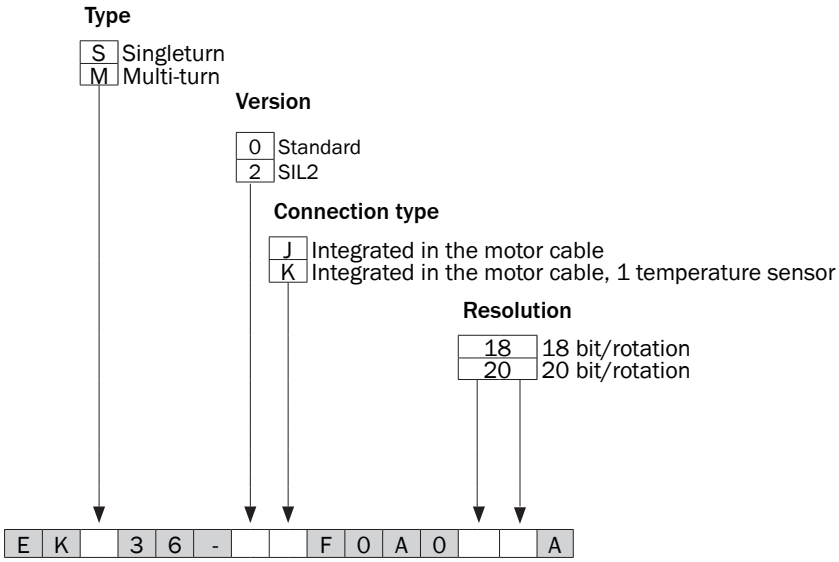


Diagram 3



Ordering information



Data acquisition Singleturn

- **Shaft version:** Conical shaft
- **Mechanical design:** Spring mounting plate, diam. 36
- **Electrical interface:** HIPERFACE DSL

Connection type	Model name	Part no.
Integrated in the motor cable	EKS36-0JF0A018A	1052016
Integrated in the motor cable, 1 temperature sensor	EKS36-0KF0A018A	1053848
Integrated in the motor cable	EKS36-0JF0A020A	1053852
Integrated in the motor cable, 1 temperature sensor	EKS36-0KF0A020A	1053856

Data acquisition Singleturn - safety

- **Shaft version:** Conical shaft
- **Mechanical design:** Spring mounting plate, diam. 36
- **Electrical interface:** HIPERFACE DSL
- **Safety system:** ✔

Functional Safety Type Approved TÜVRheinland® FS

Connection type	Model name	Part no.
Integrated in the motor cable	EKS36-2JF0A018A	1052022
Integrated in the motor cable, 1 temperature sensor	EKS36-2KF0A018A	1054315
Integrated in the motor cable	EKS36-2JF0A020A	1054319
Integrated in the motor cable, 1 temperature sensor	EKS36-2KF0A020A	1054323

Data acquisition Multiturn

- **Shaft version:** Conical shaft
- **Mechanical design:** Spring mounting plate, diam. 36
- **Electrical interface:** HIPERFACE DSL

Connection type	Model name	Part no.
Integrated in the motor cable	EKM36-0JF0A018A	1052017
Integrated in the motor cable, 1 temperature sensor	EKM36-0KF0A018A	1053849
Integrated in the motor cable	EKM36-0JF0A020A	1053853
Integrated in the motor cable, 1 temperature sensor	EKM36-0KF0A020A	1053857

Data acquisition Multiturn - safety

- **Shaft version:** Conical shaft
- **Mechanical design:** Spring mounting plate, diam. 36
- **Electrical interface:** HIPERFACE DSL
- **Safety system:** ✔

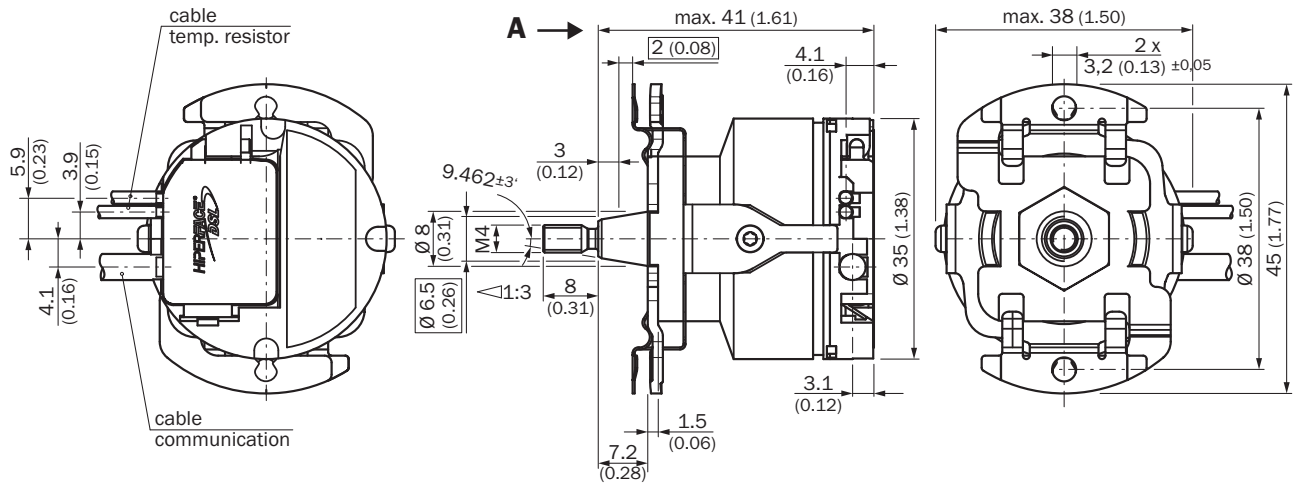
Functional Safety Type Approved TÜVRheinland® FS

Connection type	Model name	Part no.
Integrated in the motor cable	EKM36-2JF0A018A	1052023
Integrated in the motor cable, 1 temperature sensor	EKM36-2KF0A018A	1054316
Integrated in the motor cable	EKM36-2KF0A020A	1054324
Integrated in the motor cable, 1 temperature sensor	EKM36-2JF0A020A	1054320

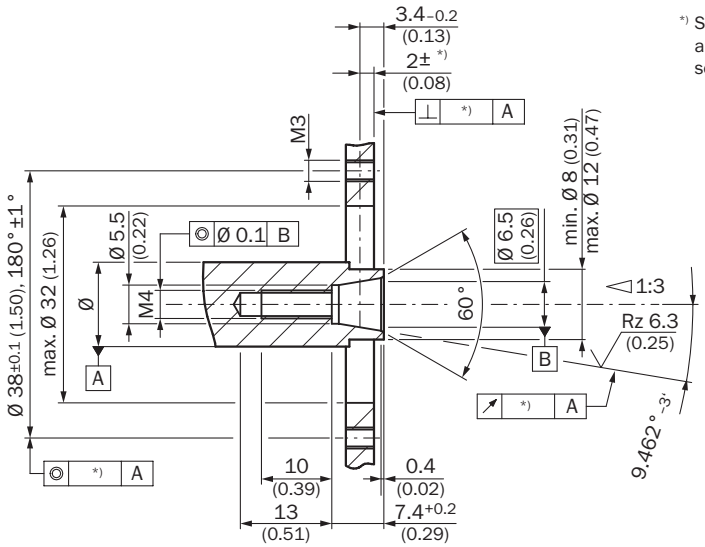
Dimensional drawings (dimensions in mm (inch))

EKx36-xJF0A0xxA

EKx36-xKF0A0xxA

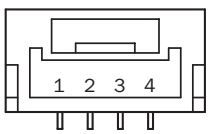


Mounting instruction (Dimensions in mm (inch))



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

Pin assignment supply / communication

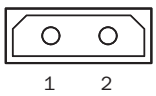


Integrated in the motor cable = J, K

PIN	Signal	Explanation
1		not connected
2	$+U_S$/DSL+	Power supply/DSL-Data
3	GND/DSL–	Ground connection/DSL-Data
4		not connected

Recommended outer diameter of stranded cable: 4 mm +0/–0.3 mm
Recommended mating connector: JST (GHR-04V-S)

Pin assignment temperature sensor



PIN	Signal	Explanation
1	T+	Thermistor connection
2	T–	Thermistor connection (Ground)

Recommended outer diameter of stranded cable: 2.2 mm ± 0.1 mm
Recommended mating connector: Harwin M80-8990205

Supported ressources for HIPERFACE DSL®

Resource Index	Function	Size (max.Offset)	Read access	Write access	Name
000h	Root node		0	-	ROOT
001h	Designation node		0	-	IDENT
002h	Monitoring node		0	-	MONITOR
003h	Administration node		0	-	ADMIN
004h	Counter node		0	-	COUNTER
005h	Data storage node		0	-	DATA
006h	Sensor hub nodes		0	-	SENSHUB
080h	Type of encoder	2	0	-	ENCTYPE
081h	Solution	4	0	-	RESOLUTN
082h	Range	4	0	-	RANGE
083h	Type code designation	18	0	-	TYPECODE
084h	Serial number	10	0	-	SERIALNO
085h	Firmware version number	20	0	-	FWREVNO
086h	Firmware date	8	0	-	FWDATE
087h	EEPROM size	2	0	-	EESIZE
0C0h	Temperature range	4	0	-	TEMPRNG
0C1h	Temperature	2	0	-	TEMPRTUR
0C2h	LED current range	4	0	-	LEDRANGE
0C3h	LED current	2	0	-	LEDCURR
0C4h	Supply voltage range	4	0	-	SUPRANGE
0C5h	Supply voltage	2	0	-	SUPVOLT
0C6h	Rotation speed range	2	0	-	SPEEDRNG
0C7h	Rotation speed	2	0	-	SPEED
0C8h	Lifetime	8	0	-	LIFETIME
0CCh	Error protocol	8	0	-	ERRORLOG
0CDh	Usage histogram	4	0	-	HISTOGRM
100h	Reset	0	-	0	RESET
101h	Determine position	8	-	2	SETPOS
104h	Determine access level	8	0	0	SETACCCES
105h	Change access key	8	-	0	CHNGEKEY
107h	Warning limits	8	0	2	UWARNING
108h	Reset to the factory setting	8	-	2	FACRESET
109h	User-defined encoder index	2	0	3	ENCIDENT
10Ah	Position filter setting	4	0	3	POSFILT
120h	Read counter	4	0	-	READCNT
121h	Increment counter, operational lifetime: max. 300,000 increments	0	-	0	INCCOUNT
122h	Reset the counter	0	-	2	RESETCNT
130h	Load file	8	-	0	LOADFILE
131h	Access file	File size	User-defined	User-defined	RWFILE
132h	File status	4	-	-	FILESTAT
133h	Create/delete/change file	8	-	User-defined	MAKEFILE
134h	Directory	8	0	-	DIR
200h	I/O access	4	0	0	ACCESSIO
201h	Manage I/0	4	0	2	MANAGEI0

Supported access levels

Access level	User	Standard access key
0	Execute (default setting)	– (no key required)
1	Operator	1111 (31 31 31 31h)
2	Maintenance	2222 (32 32 32 32h)
3	Authorized client	3333 (33 33 33 33h)
4	User service	4444 (34 34 34 34h)

Overview of warnings and fault indications

Error type	Error register	Error bit	Description
Position (incremental)	00h	0	A protocol reset was executed
	00h	1	Acceleration overflow, invalid position
	00h	2	Test running
	00h	4	Internal error in angular tracking, invalid position
	00h	5	Internal error in vector length, invalid position
	00h	6	Internal error in position counter, invalid position
	00h	7	Internal error in position synchronization, invalid position
Position (absolute)	01h	0	Error in absolute position in a rotation
	01h	1	Error 1 in absolute position in several rotations
	01h	2	Error 2 in absolute position in several rotations
	01h	3	Error 3 in absolute position in several rotations
Initialization	02h	0	Switch-on self-test undertaken (only safety versions)
	02h	1	Warning safety parameter: error could not be rectified (only safety versions)
	02h	2	Warning safety parameter: error could not be rectified (only safety versions)
	02h	3	Error calibration data
	02h	4	Internal communications error 1
	02h	5	Internal communications error 2
	02h	6	Internal general error
Test	03h	0	Critical temperature
	03h	1	Critical LED current
	03h	2	Critical supply voltage
	03h	3	Critical rotation speed
	03h	5	Critical overflow
	03h	4	Internal test error
Access to resources	04h	0	Invalid argument given during resource access procedure
	04h	1	Resource access refused due to incorrect access level
	04h	2	Internal error during resource access
	04h	3	Error when accessing a user file
User defined Warnings	07h	0	User-defined warning 0
	07h	1	User-defined warning 1
	07h	2	User-defined warning 2
	07h	3	User-defined warning 3

Accessories

Programming and configuration tools

	Model name	Part no.
Programming tool für HIPERFACE DSL®	PGT-09-S	1037530

Other mounting accessories

Mounting tools

Brief description	Model name	Part no.
Mounting tool	BEF-MW-EKX36	2060224

Plug connectors and cables

Connecting cable (socket-open)

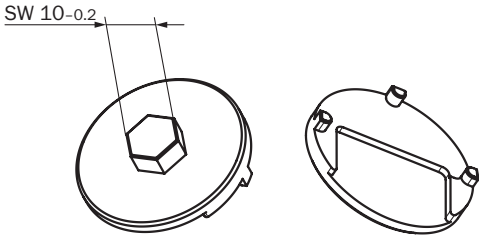
Brief description	Model name	Part no.
Socket, stranded cable, 4-pin, straight, cable, HIPERFACE®, unshielded, 0.2 m	DOL-0B04-G0M2XC1	2058333

Cable (open-open)

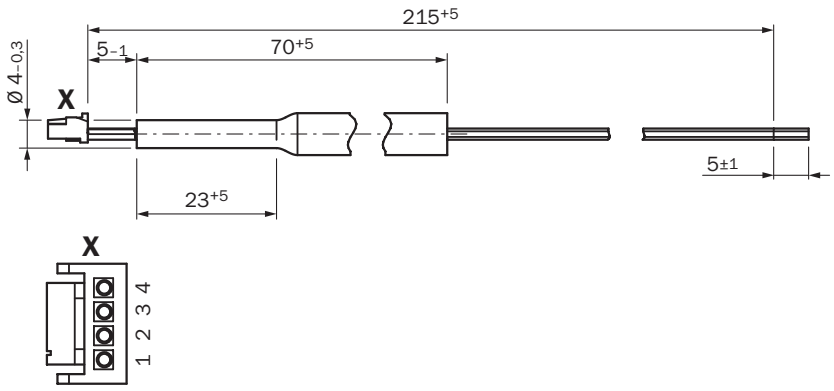
Brief description	Model name	Part no.
Cable, cable, HIPERFACE® DSL, suitable for drag chain, PUR, screened	LTG-3104-MW	6044358

Dimensional drawings (dimensions in mm)

BEF-MW-EKX36



DOL-0B04-G0M2XC1



8014131/2013-08-16 · ITL · Pre USmod int40

SICK AT A GLANCE

SICK is a leading manufacturer of intelligent sensors and sensor solutions for factory, logistics, and process automation. With more than 6,000 employees and over 40 subsidiaries worldwide, we are always close our customers. A unique range of products and services creates the perfect basis for controlling processes securely and efficiently, protecting individuals from accidents and preventing damage to the environment.

We have extensive experience in various industries and understand their processes and requirements. With intelligent sensors, we can deliver exactly what our customers need. In application centers in Europe, Asia and North America, system solutions are tested and optimized in accordance with customer specifications. All this makes us a reliable supplier and development partner.

Comprehensive services round out our offering: SICK LifeTime Services provide support throughout the machine life cycle and ensure safety and productivity.

For us, that is “Sensor Intelligence.”

Worldwide presence:

Australia, Belgium/Luxembourg, Brasil, Ceská Republika, Canada, China, Danmark, Deutschland, España, France, Great Britain, India, Israel, Italia, Japan, México, Nederland, Norge, Österreich, Polska, România, Russia, Schweiz, Singapore, Slovenija, South Africa, South Korea, Suomi, Sverige, Taiwan, Türkiye, United Arab Emirates, USA.

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

SICK AG | Waldkirch | Germany | www.sick.com

SICK
Sensor Intelligence.