

# M8 AND M12 CONNECTIVITY FOR INDUSTRIAL APPLICATIONS

THE SOLUTION FOR UNCONTAMINATED AND SPECIAL ENVIRONMENTS



## CONNECTING EVERYWHERE

Industrial automation is demanding, not only of sensor solutions. The connectors used also have to have the resilience and performance to meet the daily challenges of harsh industrial environments.

SICK provides a wide range of connectivity solutions for the many requirements of industrial automation. You benefit from more than just a comprehensive portfolio of accessories:

You also save time and money, thanks to our simple order process and swift delivery of sensors with suitable connectors.



Applications in harsh environments are especially demanding when it comes to plug connectors and cables. Cleaning agents, oils, and lubricants, and heavy mechanical contamination demand different connectors which have special features designed precisely for the specific requirements. In SICK's wide portfolio you will always find a solution for the following fields of application:

- Connectivity for hygienic and washdown zones
- · Connectivity for zones with oils, coolants, or lubricants
- Connectivity for zones with chemicals and for all fields of application with no mechanical, chemical, or other contamination.



### CONNECTIVITY FOR HYGIENIC AND WASHDOWN ZONES



\*) PP variants. \*\*) PVC variants.

### The challenge

As the connectors are used in cold stores and washdown zones, they must be highly resistant to chemical, thermal, and mechanical contamination. Complying with hygiene requirements is the highest priority. Using a suitable mounting tool ensures a watertight connection between the sensor and cable  $\rightarrow$  page 40.

#### The SICK solution

#### PVC cables

- Absolute impermeability provided by dual-action (axial and radial) profile seal.
- The special profile seal on these connecting cables provides even better impermeability than a classic O-ring seal.
- Good shock and vibration resistance up to 50 g with the dual action interlock.
- Integrated fixed stop prevents the plug connector from being screwed too tight

### **Essential features**

The connectors for this area feature → IP enclosure ratings IP69K for protection from the effects of high pressure cleaning and steam cleaning. The Ecolab certification also indicates that the cables for this zone are particularly resistant to aggressive acidic and alkaline cleaning agents. In addition, these cables have coupling nuts made of stainless steel (V4A).

#### PP cables

- · Consistent use of FDA approved materials
- Hygienic design based on EHEDG recommendations. Designed with very smooth surfaces and no gaps to prevent dirt getting trapped.
- Very high temperature resistance: -40 °C ... +105 °C
- Suitable for drag chains
- Resistant to lactic acid, → microbes and hydrolysis

Connectivity for hygienic and washdown zones									
	6								
Cable material	PVC overmolded with PUR	PP							
Cable jacket color	Gray	White							
Enclosure rating	IP65, IP67, IP69K	IP67, IP69K							
Knurled nut material	Stainless steel (V4A/1.4404)	Stainless steel (V4A/1.4404)							
Temperature range	-30 °C +80 °C for fixed installation -5 °C +80 °C for flexible use	<ul> <li>-40 °C +105 °C for fixed installation</li> <li>-25 °C +105 °C for flexible use</li> </ul>							
Certifications	Ecolab <sup>1)</sup> , CSA, UL	Ecolab <sup>2)</sup> , FDA							
Hygienic design	No	Yes							

<sup>1)</sup> Cleaning agents tested: P3-topactive DES, P3-topax 19, P3-topax 56, P3-topax 66, and P3-topax 99. All other cleaning agents must be tested before use to assess resistance to chemicals.

<sup>2)</sup> Cleaning agents tested: P3-topax 52, P3-topax 66, P3-topax 91, P3-topactive 200, and P3-topactive DES. All other cleaning agents must be tested before use to assess resistance to chemicals.

# CONNECTIVITY FOR ZONES WITH OILS, COOLANTS, OR LUBRICANTS



### The challenge

The action of cutting oils and cooling lubricants on system components is extremely aggressive. To prevent sensor failure it is important for the connectors to have a high resistance to these aggressive substances.

### **Essential features**

Because they are used in a harsh environment the connectors must be resistant to oils and lubricants, able to withstand heavy mechanical loads, and → suitable for drag chains.

### The SICK solution

#### PUR cables

- · High resistance to oils, coolants and lubricants
- Good wear resistance
- Suitable for drag chains
- Resistant to microbes and hydrolysis

- Flame resistant and self extinguishing
- Free of paint wetting impairment substances (-> PWIS free)
- → Silicone free
- → Halogen free
- UL approval

Cc	onnectivity for zones with oils, coolants, or lubricants
Cable material	PUR
Cable jacket color	Black
Enclosure rating	IP65, IP66K, IP67
Knurled nut material	Nickel plated zinc die cast
Temperature range	-40 °C +80 °C for fixed installation -25 °C +80 °C for flexible use -25 °C + 85 °C, head
Certifications	UL, CE <sup>1)</sup>

<sup>1)</sup> Applies to variants that are subject to the Low Voltage Directive. For more detailed information, see the product data sheet at www.sick.com.

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### CONNECTIVITY FOR UNCONTAMINATED APPLICATIONS



### The challenge

PVC connectors can be used for all standard applications. This means all applications involving no cleaning processes or other challenges.

They can support a large variety of industrial applications. As the PVC material is highly resistant to chemicals these standard connectors can also be used in processes involving chemical cleaning, once they have been tested.

#### **Essential features**

Connectors which are easy to use are a great advantage in all industrial applications. One factor that contributes to this is the fact that PVC cables are easy to strip.

For fields of application with low to moderate contamination and flexible applications not involving forced guidance or tensile stress, the most important requirement for connectors is cost efficiency. They must be suitable for use in both dry and humid rooms.

### The SICK solution

#### → PVC cables

- Very easy to strip because of the nature of the jacket and the conductor insulation
- Free of paint wetting impairment substances (PWIS-free)
- Flame resistant and self extinguishing
- Excellent price/performance ratio
- UL approval

Silicone free

Connectivity for uncontaminated applications							
Cable material	PVC						
Cable jacket color	Gray						
Enclosure rating	IP65, IP66K, IP67						
Knurled nut material	Nickel plated zinc die cast						
Temperature range	-30 °C +80 °C for fixed installation -5 °C +80 °C for flexible use -25 °C + 85 °C, head						
Certifications	UL, CE <sup>1)</sup>						

<sup>1)</sup> Applies to variants that are subject to the Low Voltage Directive. For more detailed information, see the product data sheet at www.sick.com.

# COST-EFFECTIVENESS AND FLEXIBILITY FOR INSTALLATION ON SITE



### The challenge

If it is difficult to plan the wiring for a machine because the requirements are unclear or keep changing, connecting cables and ready to assemble plug connectors together provide a good deal of flexibility and latitude in planning. Depending on the requirements a great variety of cable lengths can be produced and connectors can be matched to the conditions on site. This flexibility saves machine and system operators time and money.

### **Essential features**

SICK plug connectors use the widespread screw connection as standard. However, the portfolio also includes special plug connectors with insulation displacement connection or Pierce connection. Both types of connection can save a lot of time during installation.

### The SICK solution

#### Field wireable connectors

- M8 and M12 designs
- Many straight and angled variants

- Housing materials: e.g., zinc die cast, PBT or TPE
- Enclosure ratings up to IP69K available (screwed together)

	Field wireable connectors							
Enclosure rating	IP65, IP67, IP68, IP69K							
Housing materials	Zinc die cast, PBT or TPE							
Temperature range	-40 °C +85 °C or −25 °C +90 °C							
Certifications	UL							

### CONNECTIVITY FROM SICK – THE BENEFITS ARE CLEAR



#### Security – for maximum productivity

You can rely on SICK: First class product quality and safe sensor and cable connections ensure very high machine availability.



#### Service - SICK is available for you on site

One of SICK's strengths is its global presence. If necessary, our experts will visit you at your site to advise you about the right connectors for your sensors. We have high product availability, allowing us to deliver our products fast and worldwide. Your satisfaction is our goal.



#### Flexibility – customized solutions

Sometimes even a wide range of standard products for passive connectivity cannot fulfill all the specific requirements and application conditions in the automation industry. For these cases, SICK also offers customized modifications and solutions, for example new length variants or new connector/cable combinations.

### SELECTION GUIDE

			Те	mperati	ure rang	<b>e</b> <sup>1)</sup>					Features	;		
	For	flexible	use		For fix	ed insta	llation							
	-5 °C+80 °C	-25 °C +80 °C	-25 °C +105 °C	-25 °C +90 °C	-30 °C +80 °C	-40 °C+80 °C	-40 °C +85 °C	-40 °C+105 °C	Suitable for drag chains	Resistant to lactic acid	Resistant to hydrolysis and microbes	Hygienic design	Shielded variants available	
PVC overmolded with PUR (for food and beverage zones)														
PP														
PUR														
PVC														
Field wireable connectors														

<sup>1)</sup> For detailed information on temperature ranges for individual products see the product section starting on page **→** Page 10.

<sup>2</sup> SICK offers ready to assemble plug connectors with enclosure rating IP67 as standard versions. Special versions are also available with other enclosure ratings.

<sup>3)</sup> Applies to variants that are subject to the Low Voltage Directive. For more detailed information, see the product data sheet at www.sick.com.

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### Performance – SICK adapts its products to your wishes

Our standard products have all the relevant certificates. In addition to the standard portfolio, SICK will provide you with solutions which match your customers' needs exactly. SICK has the perfect combination of sensors and connectors to guarantee outstanding sensor performance.



#### Price - the best products at low cost

For SICK, complying with all the applicable product standards is a matter of course. Plus, SICK offers you an outstanding price/performance ratio.

-		Enclosu	re rating		Certifications						Fields of application			
	IP65	IP66K	1967	Иреэк	UL	Ecolab	Compliant with FDA	CSA	CE	Hygienic and washdown zones	Zones with oils, coolants, or lubricants	Uncontaminated fields of application	Flexibility during installation of the machine on site	
														<b>→</b> 10
														<b>→</b> 10
									3)					<b>→</b> 17
									3)					<b>→</b> 27
			2)											<b>→</b> 33



**Ordering information** 

Other device versions available here -> www.sick.de/plug\_connectors\_and\_cables

### Connecting cables with M8 female connector, PP

Cable material	Temperature resistance	Certifications	Tightening torque	Туре
PP	-40 °C +105 °C, for fixed installation	Ecolab. FDA	0.6 Nm	Female connector, M8, 3-pin
PP	-25 °C +105 °C, for flexible use	ECOIDD, FDA	0.0 MIII	Female connector, M8, 4-pin

Туре	Figure	Enclo- sure rating	Current carrying capacity	Rated voltage	Head A connection type	Head B connection type	Length of cable	Туре	Part no.
		IP67/			Female connector, M8, 3-pin, straight	Open cable end	2 m	DOL-0803-G02MRN	6058504
Female	<u>ی</u>	IP67/ IP69K	4 A	≤ 60 V	<u>3/BU</u> <u>3/BU</u> <u>1/BN</u>		10 m	DOL-0803-G10MRN	6058506
connec- tor, M8, 3-pin		IP67/			Female connector, M8, 3-pin, angled, with	Open cable	2 m	DOL-0803-W02MRN	6058507
		IР67/ 4 А ≤ 60 IР69К		≤ 60 V	≤ 60 V LED		10 m	DOL-0803-W10MRN	6058509

### CONNECTIVITY Hygienic and washdown zones

Туре	Figure	Enclo- sure rating	Current carrying capacity	Rated voltage	Head A connection type	Head B connection type	Length of cable	Туре	Part no.
_					Female connector, M8, 3-pin,		2 m	DOL-0803-L02MRN	6058787
Female connec- tor, M8, 3-pin		IP67/ IP69K	4 A	≤ 60 V	angled, with LED	Open cable end	5 m	DOL-0803-L05MRN	6058788
3-piii					3/BU		10 m	DOL-0803-L10MRN	6058789
					Female connector,		2 m	DOL-0804-G02MRN	6058510
		IP67/	΄ //Δ	≤ 30 V	M8, 4-pin, straight	Open cable end	5 m	DOL-0804-G05MRN	6058511
	6	IP69K			4/BK 2/WH 3/BU 1/BN		10 m	DOL-0804-G10MRN	6058512
							25 m	DOL-0804-G25MRN	6058513
		IP67/			Female connector, M8, 4-pin, angled	Open cable end	2 m	DOL-0804-W02MRN	6058514
Female connec-							5 m	DOL-0804-W05MRN	6058515
tor, M8, 4-pin		IP69K	4 A	≤ 30 V	4/BK 2/WH 3/BU 1/BN		10 m	DOL-0804-W10MRN	6058517
4 pm	Cool				3/BU SI 1/BN		25 m	DOL-0804-W25MRN	6058518
				4 A $\leq$ 30 V Female connector, M8, 4-pin, straight, with LED $\frac{4/BK}{3/BU}$	connector,		2 m	DOL-0804-L02MRN	6058790
	E	IP67/ IP69K	4 A		with LED	Open cable end	5 m	DOL-0804-L05MRN	6058791
							10 m	DOL-0804-L10MRN	6058792

### Connecting cables with M8 female connector, PVC

Cable material	Temperature resistance	Certifications	Tightening torque	Туре
DVC	-30 °C +80 °C, for fixed installation	Ecolab, CSA,	0.4 Nm	Female connector, M8, 3-pin
PVC	-5 °C +80 °C, for flexible use	UL	0.4 MM	Female connector, M8, 4-pin

#### Suitable torque wrench

Figure	Description	Туре	Part no.
and the second s	M08 torque wrench (AF10, 0.4 Nm)	TOOL-TW04M08AF10	5337210

Туре	Figure	Enclo- sure rating	Current carrying capacity	Rated voltage	Head A connection type	Head B connection type	Length of cable	Туре	Part no.
					Female connector,		2 m	DOL-0803-G02MNI	6059177
		IP65/ IP67/	4 A	≤ 60 V	M8, 3-pin, straight	Open cable	5 m	DOL-0803-G05MNI	6059178
	(e)	IP69K	4 4	<u> </u>	3/ви <u>4/вк</u> 1/ви	end	10 m	DOL-0803-G10MNI	6059179
Female connec-							25 m	DOL-0803-G25MNI	6059191
tor, M8, 3-pin					Female connector,		2 m	DOL-0803-W02MNI	6059187
		ір65/ ір67/ ір69к	4 A	≤ 60 V	M8, 3-pin, angled	Open cable end	5 m	DOL-0803-W05MNI	6059188
					3/BU1/BN		10 m	DOL-0803-W10MNI	6059190
							25 m	DOL-0803-W25MNI	6059192
		IP65/ IP67/ IP69K	4 A	≤ 30 V	Female connector, M8, 4-pin, straight <u>4/BK</u> 2/WH 3/BU / 1/BN	Open cable end	2 m	DOL-0804-G02MNI	6059193
							5 m	DOL-0804-G05MNI	6059194
	G						10 m	DOL-0804-G10MNI	6059195
Female connec-							25 m	DOL-0804-G25MNI	6059196
tor, M8, 4-pin					Female connector,		2 m	DOL-0804-W02MNI	6059197
	0	IР65/ IР67/ IР69К	4 A	≤ 30 V	M8, 4-pin, angled	Open cable	5 m	DOL-0804-W05MNI	6059198
					4/BK 2/WH 3/BU 1/BN	end	10 m	DOL-0804-W10MNI	6059199
					<u>-,-,-,-,-,-,-,-,-,-,-,-,-,-,-,-,-,-,-,</u>		25 m	DOL-0804-W25MNI	6059200

Cable n	naterial	Tempera	ature resista	nce	Certifications	Tightening torque	5	Туре		
Ρ	Ρ	-40 °C +105 -25 °C +1	°C, for fixed 05 °C, for fle		Ecolab, FDA	1 Nm		Female connector, M12, 4-pin Female connector, M12, 5-pin		
Туре	Figure	e Enclo- sure rating	Current carrying capacity	Rated voltage	Head A connection type	Head B connection type	Length of cable	Туре	Part no.	
	6				Female		2 m	DOL-1204-G02MRN	6058291	
		1507/			connector, M12, 4-pin,		5 m	DOL-1204-G05MRN	6058476	
		IP67/ IP69K	4 A	≤ 250 V	straight	Open cable end	10 m	DOL-1204-G10MRN	6058478	
		0			<u>1/BN</u> 0 0 0 <u>3/BU</u>		15 m	DOL-1204-G15MRN	2092884	
	<u></u>				<u>4/BK 5/n.c.</u>		25 m	DOL-1204-G25MRN	6058480	
					Female connector,		2 m	DOL-1204-W02MRN	6058474	
Female con-		IP67/	1 0	4 A ≤ 250 V	M12, 4-pin, angled	Open cable	5 m	DOL-1204-W05MRN	6058477	
nector, M12,		IP69K	4 A		<u>1/BN</u> 2/WH	end	10 m	DOL-1204-W10MRN	6058479	
4-pin					4/BK 5/n.c.		25 m	DOL-1204-W25MRN	6058481	
					Female connector,		2 m	DOL-1204-L02MRN	6058482	
		IP67/		< 24.14	M12, 4-pin, angled, with LED	Open cable	5 m	DOL-1204-L05MRN	6058483	
	5	IP69K	4 A	≤ 24 V	$\frac{1/BN}{2} \sim \frac{2/WH}{2}$	end	10 m	DOL-1204-L10MRN	6058484	
					4/BK 5/n.c.		25 m	DOL-1204-L25MRN	6058485	
_					Female connector,		2 m	DOL-1205-G02MRN	6058494	
Female con-		IP67/	4.4		M12, 5-pin, straight	Open cable end	5 m	DOL-1205-G05MRN	6058495	
nector, M12, 5-pin		IP69K	4 A	≤ 60 V	1/BN 2/WH		10 m	DOL-1205-G10MRN	6058496	
0-pin	000 0000	~			<u>4/BK</u> <u>5/GY</u>		25 m	DOL-1205-G25MRN	6058497	

### Connecting cables with M12 female connector, PP

### Connecting cables with M12 female connector, PVC

Cable material	Temperature resistance	Certifications	Tightening torque	Туре
PVC	-30 °C +80 °C, for fixed installation	Ecolab, CSA, UL	0.6 Nm	Female connector, M12, 4-pin
	-5 °C +80 °C, for flexible use		0.0 Mm	Female connector, M12, 5-pin

#### Suitable torque wrench

Figure	Description	Туре	Part no.
	M12 torque wrench (AF14, 0.6 Nm)	TOOL-TW06M12AF14	5329575

Туре	Figure	Enclo- sure rating	Current carrying capacity	Rated voltage	Head A connection type	Head B connection type	Length of cable	Туре	Part no.
					Female connector,		2 m	DOL-1204-G02MNI	6052613
		IP65/ IP67/	4 A	≤ 250 V	M12, 4-pin, straight	Open cable	5 m	DOL-1204-G05MNI	6052615
	1	IP69K	4 A	≤ 250 V	3/BU 5/n.c. 4/BK	end	10 m	DOL-1204-G10MNI	6052617
Female con- nector,					2/WH 1/BN		25 m	DOL-1204-G25MNI	6052619
M12, 4-pin	6				Female connector,		2 m	DOL-1204-W02MNI	6052614
		IP65/ IP67/ IP69K	4 A	≤ 250 V	M12, 4-pin, angled	Open cable	5 m	DOL-1204-W05MNI	6052616
					3/BU 5/n.c. 4/BK	end	10 m	DOL-1204-W10MNI	6052618
					2/WH 1/BN		25 m	DOL-1204-W25MNI	6052620
		IP65/	4 A	≤ 250 V	Female connector,	Open cable	2 m	DOL-1204-L02MNI	6052621
Female con-					M12, 4-pin, angled, with LED		5 m	DOL-1204-L05MNI	6052622
nector, M12, 4-pin		IP67/ IP69K			<u>3/BU</u> <u>3/BU</u> <u>5/n.c.</u> 4/BK	end	10 m	DOL-1204-L10MNI	6052623
	<b>V</b>				2/WH 1/BN		25 m	DOL-1204-L25MNI	6052624
_					Female connector,		2 m	DOL-1205-G02MNI	6052625
Female con- nector,		IP65/ IP67/	4 A	≤ 250 V	M12, 5-pin, straight	Open cable	5 m	DOL-1205-G05MNI	6052626
M12, 5-pin	6	IP67/ IP69K	4 A		3/BU 5/GY	end	10 m	DOL-1205-G10MNI	6052627
					2/WH 1/BN		25 m	DOL-1205-G25MNI	6052628

Cable n	naterial		Tempera	ature resista	nce	Certifications	torque	5	Туре			
Р	Р			°C, for fixed 05 °C, for fle		Ecolab, FDA	1 Nm	1	Female connector, M12, 4-pin			
Туре	Figur	e	Enclo- sure	Current carrying	Rated voltage	Head A connection	Head B connection	Length of cable	Туре	Part no.		
		II IP			rating	capacity		Female connector,	type Male connector,	0.6 m	DSL-1204-BOM6RN	6058501
			ІР67/ ІР69К	4 A	≤ 250 V	M12, 4-pin, angled	M12, 4-pin, straight	2 m	DSL-1204-B02MRN	6058502		
Female con-	con- 🔜					(00) <u>3/BU</u>	<u>3/BU</u> <u>4/BK</u> <u>2/WH</u> <u>1/BN</u>	5 m	DSL-1204-B05MRN	6058503		
nector, M12, 4-pin						Female connector,	Male connector,	0.6 m	DSL-1204-G0M6RN	6058498		

M12, 4-pin, M12, 4-pin,

straight

(•

<u>2/WH</u>

<u>] 1/BN</u>

2 m

5 m

DSL-1204-G02MRN

DSL-1204-G05MRN

6058499

6058500

straight

<u>1/BN</u>2/WH 3/BU 4/BK 5/n.c. 4/BK

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### Connection cables with M12 female and male connector, PP

### Connection cables with M12 female and male connector, PVC

4 A

≤ 250 V

IP67/

IP69K

Cable material	Temperature resistance	Certifications	Tightening torque	Type head A	Type head B
PVC	-30 °C +80 °C, for fixed installation	tallation Ecolab, CSA,	0.6 Nm	Female connector, M12, 4-pin, straight	Male connector, M12, 4-pin, straight
PVC	-5 °C +80 °C, for flexible use	UL	0.0 11	Female connector, M12, 4-pin, angled	Male connector, M12, 4-pin, straight

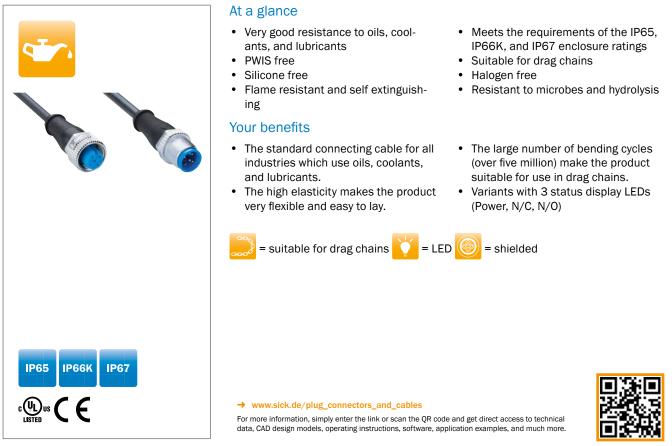
#### Suitable torque wrench

Ochle westericl

Figure	Description	Туре	Part no.
and the second s	M12 torque wrench (AF14, 0.6 Nm)	TOOL-TW06M12AF14	5329575

### Hygienic and washdown zones CONNECTIVITY

Туре	Figure	Enclo- sure rating	Current carrying capacity	Rated voltage	Head A connection type	Head B connection type	Length of cable	Туре	Part no.
	<b>N N</b>			≤ 250 V	Female connector, M12, 4-pin,	Male connector, M12, 4-pin,	0.6 m	DSL-1204-G0M6NI	6052629
		IP65/ IP67/ IP69K	4 A		straight	straight	2 m	DSL-1204-G02MNI	6052630
Female con- nector,					2/WH 1/BN	2/WH 3/BU	5 m	DSL-1204-G05MNI	6052631
M12, 4-pin	00	ір65/ ір67/ 4 ір69к			Female connector, M12, 4-pin,	Male connector, M12, 4-pin,	0.6 m	DSL-1204-B0M6NI	6052632
			4 A	≤ 250 V	angled	straight	2 m	DSL-1204-B02MNI	6052633
					2/WH 1/BN	2/WH 3/BU	5 m	DSL-1204-B05MNI	6052634



### **Ordering information**

Other device versions available here -> www.sick.de/plug\_connectors\_and\_cables

#### Suitable torque wrenches

For more information → see page 40

Figure	Description	Туре	Part no.
	M08 torque wrench (AF9, 0.4 Nm)	TOOL-TW06M08AF09	5337207
	M12 torque wrench (AF13, 0.6 Nm)	TOOL-TW06M12AF13	5337208

### Connecting cables with M8 female connector, PUR

Cable material	Temperature resistance	Certifications	Tightening torque	Туре
	-25 °C 85 °C, head		0.4 Nm	Female connector, M8, 3-pin
PUR, halogen free	-40 °C +80 °C, for fixed installation -25 °C +80 °C, for flexible use	UL	0.4 Mm	Female connector, M8, 4-pin

### Zones with oils, coolants, or lubricants CONNECTIVITY

Туре	Figure	Enclo- sure rating	Current carrying capacity	Rated voltage	Head A connection type	Head B connection type	Length of cable	Туре	Part no.
					Female		1 m	YF8U13-010UA1XLEAX	2094779
	_				connector,		2 m	YF8U13-020UA1XLEAX	2094782
		IP65/ IP66K/	4 A	60 V	M8, 3-pin, straight	Open cable	3 m	YF8U13-030UA1XLEAX	2094787
	<b>N</b>	IP667	4 A	00 V	Ū	end	5 m	YF8U13-050UA1XLEAX	2094788
	GBO				4/BK-€ 3/BU		10 m	YF8U13-100UA1XLEAX	2094789
	Good				2/ 2.1		20 m	YF8U13-200UA1XLEAX	2094790
Female connec- tor, M8, 3-pin					Female connector, M8, 3-pin,		2 m	YG8U13-020UA1XLEAX	2094794
		IP66K/ IP67	4 A	60 V	angled	Open cable end	5 m	YG8U13-050UA1XLEAX	2095586
	eege				4́/BK – 3/BU –		10 m	YG8U13-100UA1XLEAX	2095588
					Female connector, M8, 3-pin,		2 m	YI8U13-020UA1XLEAX	2095593
		IP65/ IP66K/ IP67	4 A	24 V	angled, with LED	Open cable end	5 m	YI8U13-050UA1XLEAX	2095594
					1/BN - 4/BK - 3/BU -		10 m	YI8U13-100UA1XLEAX	2095595
					Female connector, M8, 4-pin,		2 m	YF8U14-020UA3XLEAX	2094791
		IP65/				Onen cablo	5 m	YF8U14-050UA3XLEAX	2094792
	Тр66К/	4 A	60 V	straight	Open cable end	10 m	YF8U14-100UA3XLEAX	2094793	
		IP67			3/BU4/BK		15 m	YF8U14-150UA3XLEAX	2095580
	<u> </u>				1/BN2/WH		20 m	YF8U14-200UA3XLEAX	2095582
		IP65/ IP66K/	4 A	30 V	Female connector, M8, 4-pin, straight,	Open cable	5 m	YF8U24-050UB4XLEAX	2096200
Female connec-		IP67			shielded 3/BU 1/BN 2/WH	end	10 m	YF8U24-100UB4XLEAX	2096201
tor, M8, 4-pin					Female connector,		2 m	YG8U14-020UA3XLEAX	2095589
		IP65/ IP66K/ IP67	4 A	60 V	M8, 4-pin, angled	Open cable end	5 m	YG8U14-050UA3XLEAX	2095590
	0000				2/WH 2/BK 3/BU		10 m	YG8U14-100UA3XLEAX	2095591
					Female connector, M8, 4-pin,		2 m	YI8U14-020UA3XLEAX	2095596
		IP65/ IP66K/ IP67	4 A	24 V	angled, with LED	Open cable end	5 m	YI8U14-050UA3XLEAX	2095597
					2/WH 4/BK - 1/BN 3/BU		10 m	YI8U14-100UA3XLEAX	2095598

### Connecting cables with M12 female connector, PUR

Cable material	Temperature resistance	Certifications	Tightening torque	Туре
				Female connector, M12, 3-pin
DUD belegen free	-25 °C 85 °C, head		O.C.Nm	Female connector, M12, 4-pin
PUR, halogen free	-40 °C +80 °C, for fixed installation -25 °C +80 °C, for flexible use	UL, CE 1)	0.6 Nm	Female connector, M12, 5-pin
				Female connector, M12, 8-pin

 $^{\mbox{\tiny 1)}}$  Applies to cables with a rated voltage > 75 V DC.

Туре	Figure	Enclo- sure rating	Current carrying capacity	Rated voltage	Head A connection type	Head B connection type	Length of cable	Туре	Part no.
					Female		1.5 m	YF2A13-015UB1XLEAX	2095603
		IP65/			connector, M12, 3-pin,	Open cable	2 m	YF2A13-020UB1XLEAX	2095604
Female	<b>V</b>	IP66K/ IP67	4 A	250 V	straight	end	5 m	YF2A13-050UB1XLEAX	2095605
con- nector,					4/BK 5/n.c. ↓ 1/BN ⊲ 3/BU ↓ 2/n.c.		10 m	YF2A13-100UB1XLEAX	2095606
M12,					Female		2 m	YG2A13-020UB1XLEAX	2095752
3-pin		IP65/			connector, M12, 3-pin,		5 m	YG2A13-050UB1XLEAX	2095753
		IP66K/	4 A	250 V	angled	Open cable end	10 m	YG2A13-100UB1XLEAX	2095754
		IP67			3/BU	chu	15 m	YG2A13-150UB1XLEAX	2095755
					3/BU 2/n.c. 1/BN 5/n.c.		20 m	YG2A13-200UB1XLEAX	2095756
					Fomolo		2 m	YF2A14-020UB3XLEAX	2095607
					Female connector,		5 m	YF2A14-050UB3XLEAX	2095608
		IP65/ IP66K/ 4 A 250 IP67	250 V	M12, 4-pin,	Open cable	10 m	YF2A14-100UB3XLEAX	2095609	
	<b>*</b> (0)		4 A	250 V	straight	end	15 m	YF2A14-150UB3XLEAX	2095610
	90-				4/BK 5/n.c. ↓ 1/BN ⊲ 3/BU ↓ 2/WH		20 m	YF2A14-200UB3XLEAX	2095611
	0000				5/60 - C 2/WH		25 m	YF2A14-250UB3XLEAX	2095615
	IP65/ IP66K/		60 V	Female connector, M12, 4-pin, straight,	Open cable	5 m	YF2A24-050UB4XLEAX	2095729	
Female con-		ГР66Ќ/ IP67			4/BK 5/n.c. 3/BU	end	10 m	YF2A24-100UB4XLEAX	2095730
nector,							1.2 m	YG2A14-012UB3XLEAX	2095765
M12, 4-pin					Female		2 m	YG2A14-020UB3XLEAX	2095766
4-biii		IP65/			connector, M12, 4-pin,	On an askis	5 m	YG2A14-050UB3XLEAX	2095767
		IP66K/	4 A	250 V	angled	Open cable end	10 m	YG2A14-100UB3XLEAX	2095768
		IP67			3/BU 2/WH 1/BN 5/n.c.		15 m	YG2A14-150UB3XLEAX	2095769
	000				1/BN 5/n.c.		20 m	YG2A14-200UB3XLEAX	2095770
	Good						25 m	YG2A14-250UB3XLEAX	2095771
					Female connector,		2 m	YI2A14-020UB3XLEAX	2095836
		IP65/ IP66K/ IP67	4 A	24 V	M12, 4-pin, angled, with	Open cable end	5 m	YI2A14-050UB3XLEAX	2095837
					LED		10 m	YI2A14-100UB3XLEAX	2095838
					3/BU 2/WH 1/BN 5/n.c.		25 m	YI2A14-250UB3XLEAX	2095839

### Zones with oils, coolants, or lubricants CONNECTIVITY

Туре	Figure	Enclo- sure	Current carrying	Rated voltage	Head A connection	Head B connection	Length of cable	Туре	Part no.
		rating	capacity	vonage	type	type	Cable		
							2 m	YF2A15-020UB5XLEAX	2095617
					Female		5 m	YF2A15-050UB5XLEAX	2095618
		IP65/			connector, M12, 5-pin,	Onen eshle	9 m	YF2A15-090UB5XLEAX	2095846
		IP66K/ IP67	4 A	125 V	straight	Open cable end	10 m	YF2A15-100UB5XLEAX	2095619
		1907			4/BK 5/GY 3/BU 2/WH		15 m	YF2A15-150UB5XLEAX	2095620
					3/BU _> 2/WH		20 m	YF2A15-200UB5XLEAX	2095614
	Geod						30 m	YF2A15-300UB5XLEAX	2095621
					Female connector,		1.5 m	YF2A25-015UB6XLEAX	2095833
		IP65/			M12, 5-pin,		3 m	YF2A25-030UB6XLEAX	2095834
		IP66K/	4 A	60 V	straight, shielded	Open cable end	5 m	YF2A25-050UB6XLEAX	2095733
Female con-		IP67					10 m	YF2A25-100UB6XLEAX	2095734
nector,					4/BK 5/GY 3/BU → 1/BN ⊲ 2/WH		20 m	YF2A25-200UB6XLEAX	2095738
M12, 5-pin					Female				
		1005/			connector,		2 m	YG2A15-020UB5XLEAX	2095772
		IP65/ IP66K/	4 A	60 V	M12, 5-pin, angled	Open cable	5 m	YG2A15-050UB5XLEAX	2095773
		IP67			3/BU ~ ( (B)/	end			
					3/BU 2/WH 1/BN 5/GY		10 m	YG2A15-100UB5XLEAX	2095774
					Female connector, M12, 5-pin, angled,		3 m	YG2A25-030UB6XLEAX	2095791
		IP65/ IP66K/		60 V		Open cable	5 m	YG2A25-050UB6XLEAX	2095792
		IP667		00 V	shielded	end	10 m	YG2A25-100UB6XLEAX	2095793
					3/BU 2/WH 1/BN 5/GY	00		0005705	
					1/BN -> 0/ 01		20 m	YG2A25-200UB6XLEAX	2095795
					Female connector,		2 m	YF2A18-020UA5XLEAX	2095652
		IP65/			M12, 8-pin,		5 m	YF2A18-050UA5XLEAX	2095653
		IP66K/	2 A	30 V	straight	Open cable end	10 m	YF2A18-100UA5XLEAX	2095654
	<b>V</b>	IP67			7/BU - 8/RD 6/PK - 8/RD	ona	15 m	YF2A18-150UA5XLEAX YF2A18-200UA5XLEAX	2095679 2095680
					7/BU 6/PK 5/GY 4/YE 8/RD 1/WH 2/BN 3/GN		20 m 30 m	YF2A18-300UA5XLEAX	2095681
					Female		30 111	TIZAIO-3000A3AEEAA	2000001
Female	_				connector,		5 m	YF2A28-050UA6XLEAX	2095835
con-		IP65/			M12, 8-pin, straight,	Onen eshle			
nector, M12,		IP66K/	2 A	30 V	shielded	Open cable end	10 m	YF2A28-100UA6XLEAX	2095749
8-pin		IP67			7/BU - 8/RD				
					6/PK - 1/WH 5/GY - 2/BN 4/YE - 3/GN		15 m	YF2A28-150UA6XLEAX	2095750
					Female				
					connector,		2 m	YG2A18-020UA5XLEAX	2095779
		IP65/	2 4	30 V	M12, 8-pin, angled	Open cable end	5 m	YG2A18-050UA5XLEAX	2095780
		IP66K/ IP67	2 A	30 V	4/YE → ~ 5/GY		5 111	TOZATO-0500ASALEAA	2033780
					3/GN - 8/RD 2/BN - 6/PK 1/WH - 7/BU		10 m	YG2A18-100UA5XLEAX	2095781
	000 <sup>0</sup>				1/WH → └ 7/BU				

### CONNECTIVITY Zones with oils, coolants, or lubricants

Туре	Figure	Enclo- sure rating	Current carrying capacity	Rated voltage	Head A connection type	Head B connection type	Length of cable	Туре	Part no.
					Female connector, M12, 8-pin,		2 m	DOL-1208-G02MAC1	6032866
		IP67	2 A	≤ 36 V AC/	straight, shielded	Open cable end,	5 m	DOL-1208-G05MAC1	6032867
		IFOT	2 A	DC	<u>4/РК 5/YE</u> 3/ВК 000 7/ВU	shielded	10 m	DOL-1208-G10MAC1	6032868
					2/WH 1/BN 8/RD		20 m	DOL-1208-G20MAC1	6032869
					Female connector.		2.5 m	DOL-127SG2M5E- 25KM0	2076540
Female	con- cctor, 112,			≤ 30 V	M12, 8-pin,		5 m	DOL-127SG05ME25KM0	2076541
con-		IP65/ IP67	2 A		straight, shielded	Open	7.5 m	DOL-127SG7M5E25KM0	2076542
M12, 8-pin					<u>1/WH</u> 2/BN	cable end, shielded	10 m	DOL-127SG10ME- 25KM0	2076543
					<u>7/BU 6 3/GN</u> <u>6/PK 4/YE</u>		15 m	DOL-127SG15ME- 25KM0	2076544
	<sup>2</sup>				8/Shield 5/GY		20 m	DOL-127SG20ME25KM0	2076545
					Female connector, M12, 8-pin,		7.5 m	DOL-127SW7M5E- 25KM0	2076549
		IP65/ IP67 2 /	2 A	≤ 30 V	angled, shielded	Open cable end, shielded	10 m	DOL-127SW10ME- 25KM0	2076550
					7/BU 6 3/GN 6/PK 9 4/YE 8/Shield 5/GY		15 m	DOL-127SW15ME- 25KM0	2076551

### Connecting cables with M12 male connector, PUR

Cable material	Temperature resistance	Certifications	Tightening torque	Туре
	–25 °C 85 °C, head			Male connector, M12, 4-pin
PUR, halogen free	-40 °C +80 °C, for fixed installation	UL, CE <sup>1)</sup>	0.6 Nm	Male connector, M12, 5-pin
	-25 °C +80 °C, for flexible use			Male connector, M12, 8-pin

 $^{\scriptscriptstyle 1)}$  Applies to cables with a rated voltage > 75 V DC.

Туре	Figure	Enclo- sure rating	Current carrying capacity	Rated voltage	Head A connection type	Head B connection type	Length of cable	Туре	Part no.
					Male connector.		2 m	YM2A14-020UB3XLEAX	2095867
		IP65/ IP66K/	4 A	250 V	M12, 4-pin, straight	Open cable	5 m	YM2A14-050UB3XLEAX	2095858
Male	Male	IP67	4 A		Ū	end	10 m	YM2A14-100UB3XLEAX	2095859
con-	000 000				3/BU 4/BK Д 2/WH 4 1/BN		15 m	YM2A14-150UB3XLEAX	2095866
nector, M12, 4-pin			4.0	4.4. 050.1/	Male connector, M12, 4-pin, angled	Open cable	5 m	YN2A14-050UB3XLEAX	2096628
	<u>میں</u>	IP66K/ 4 A IP67	250 V	1/BN 2/WH 3/BU Ф 4/BK	end	10 m	YN2A14-150UB3XLEAX	2096629	

### Zones with oils, coolants, or lubricants CONNECTIVITY

Туре	Figure	Enclo- sure rating	Current carrying capacity	Rated voltage	Head A connection type	Head B connection type	Length of cable	Туре	Part no.
					Male connector,		1 m	YM2A15-010UB5XLEAX	2095104
		IP65/	4.6	10E V	M12, 5-pin, straight	Open cable	2 m	YM2A15-020UB5XLEAX	2095840
	<b>1</b>	IP66K/ IP67	4 A	125 V		end	5 m	YM2A15-050UB5XLEAX	2095842
Male con-					3/BU 5/GY 4/BK → 2/WH ⊲ 1/BN		10 m	YM2A15-100UB5XLEAX	2095843
nector, M12, 5-pin		IP65/ IP66K/ IP67	4 A	60 V	Male connector, M12, 5-pin, straight, shielded	Open cable end	5 m	YM2A25-050UB6XLEAX	2096684
					Male connector,		1 m	YM2A18-010UA5XLEAX	2095871
		IP65/			M12, 8-pin, straight	Open cable	2 m	YM2A18-020UA5XLEAX	2095868
	<b>*</b>	IP66K/ IP67	2 A	30 V	_	end	5 m	YM2A18-050UA5XLEAX	2095869
Male con-	000 000				4/YE 5/GY 6/PK 7/BU		10 m	YM2A18-100UA5XLEAX	2095870
nector, M12, 8-pin		IP65/ IP66K/ IP67	2 A	30 V	Male connector, M12, 8-pin, angled, shielded 1/WH 2/BN 5-7/BU 2/BN 5-2 5/GY 8/RD 4/YE	Open cable end	10 m	YN2A28-100UA6XLEAX	2095794
		IP65/		6 00 V	Male connector, M12, 8-pin, straight, shielded	Open	5 m	STL-127SG05ME25KM0	2075982
Male con-	<ul><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li></ul>	IP67	2 A	≤ 30 V	2/BN 1/WH 3/GN 7/BU 4/YE 6/PK 8/Shield 5/GY	cable end, shielded	15 m	STL-127SG15ME25KM0	2075983
con- nector, M12, 8-pin		) () IP65/	2 A	≤ 30 V	Male connector, M12, 8-pin, angled, shielded	Open cable end,	5 m	STL-127SW05ME25KM0	2075985
		IP67	2 A	- 30 V	2/BN 1/WH 3/GN 7/BU 4/YE 6/PK 8/Shield 5/GY	shielded	15 m	STL-127SW15ME25KM0	6021831

Cable material	Temperature resistance	Certifications	Tightening torque	Type head A	Type head B
				Female connector, M8, 3-pin,	Male connector, M8, 3-pin
DUD belogen free	-25 °C 85 °C, head		0.4 Nm (M8)	Female connector, M8, 3-pin	Male connector, M12, 3-pin
PUR, halogen free	-40 °C +80 °C, for fixed installation -25 °C +80 °C, for flexible use	UL	0.6 Nm (M12)	Female connector, M8, 4-pin	Male connector, M8, 4-pin
				Female connector, M8, 4-pin	Male connector, M12, 4-pin

### Connection cables with M8 female and male connector, PUR

Туре	Figure	Enclo- sure rating	Current carrying capacity	Rated voltage	Head A connection type	Head B connection type	Length of cable	Туре	Part no.
							0.3 m	YF8U13-C30UA1M8U13	2095961
							0.5 m	YF8U13-C50UA1M8U13	2096300
							0.6 m	YF8U13-C60UA1M8U13	2096298
					Female connector,	Male connector,	1 m	YF8U13-010UA1M8U13	2096301
Female connec-	$\sim$	IP65/			M8, 3-pin,	M8, 3-pin,	1.5 m	YF8U13-015UA1M8U13	2096302
tor, M8,	- No No	IP66K/ IP67	4 A	60 V	straight	straight	2 m	YF8U13-020UA1M8U13	2096304
3-pin		IFOT			4/ВК - (9 3/BU 4/ВК - (9 4) 1/BN	3/BU	2.5 m	YF8U13-025UA1M8U13	2096305
					1/BN	1/BN - 9 1, 511	3 m	YF8U13-030UA1M8U13	2096306
							5 m	YF8U13-050UA1M8U13	2096308
	- CO.						10 m	YF8U13-100UA1M8U13	2096309
							20 m	YF8U13-200UA1M8U13	2096310
	<b>&gt;</b> >	IP65/ IP66K/ IP67	4 A	60 V	Female connector, M8, 3-pin, straight 4/BK	Male connector, M8, 3-pin, angled $\underbrace{1/BN}_{4/BK}$	0.1 m	YF8U13-C10UA1N8U13	2095990
Female					Female connector,	Male connector,	0.6 m	YF8U13-C60UA1M2A13	2096134
connec- tor, M8,	No No	IP65/ IP66K/ IP67	4 A	60 V	M8, 3-pin, straight	M12, 3-pin, straight	2 m	YF8U13-020UA1M2A13	2096169
3-pin	200 000				4/BK - € 3/BU ⊲ 1/BN	1/BN ℃ 4/BK > ℃ 3/BU	5 m	YF8U13-050UA1M2A13	2096170
		IP65/		60.1	Female connector, M8, 3-pin, angled	Male connector, M12, 3-pin, straight	0.6 m	YG8U13-C60UA1M2A13	2095747
		IP66K/ IP67	4 A	60 V	1/BN 4/BK -	1/BN → 2/BK	2 m	YG8U13-020UA1M2A13	2095748

### Zones with oils, coolants, or lubricants CONNECTIVITY

Туре	Figure	Enclo- sure rating	Current carrying capacity	Rated voltage	Head A connection type	Head B connection type	Length of cable	Туре	Part no.
		1505 (			Female connector,	Male connector,	0.6 m	YF8U14-C60UA3M8U14	2096346
	No No	IP65/ IP66K/ IP67	4 A	60 V	M8, 4-pin, straight	M8, 4-pin, straight	2 m	YF8U14-020UA3M8U14	2096347
	ccol				3/BU 1/BN → 4/BK 4 2/WH	4/BK ≥/WH ∞ 3/BU 1/BN	5 m	YF8U14-050UA3M8U14	2096348
Female			4 A	60 V	Female connector,	Male connector,	0.6 m	YF8U14-C60UA3M2A14	2096135
connec- tor, M8,	N. N.	IP65/ IP66K/ IP67			M8, 4-pin, straight	M12, 4-pin, straight	2 m	YF8U14-020UA3M2A14	2096136
4-pin	eed				3/BU 1/BN → 4/BK 4 2/WH	<sup>1/BN</sup> ≥2/WH 3/BU	5 m	YF8U14-050UA3M2A14	2096137
					Female connector,	Male connector,	0.6 m	YG8U14-C60UA3M2A14	2096681
	à 🗞	IP65/ IP66K/	4 A	60 V	M8, 4-pin, angled	M12, 4-pin, straight	2 m	YG8U14-020UA3M2A14	2096682
	000 000	IP67			2/WH 4/BK	<sup>1/BN</sup> ≥/WH → 3/BU	5 m	YG8U14-050UA3M2A14	2096683

### Connection cables with M12 female and male connector, PUR

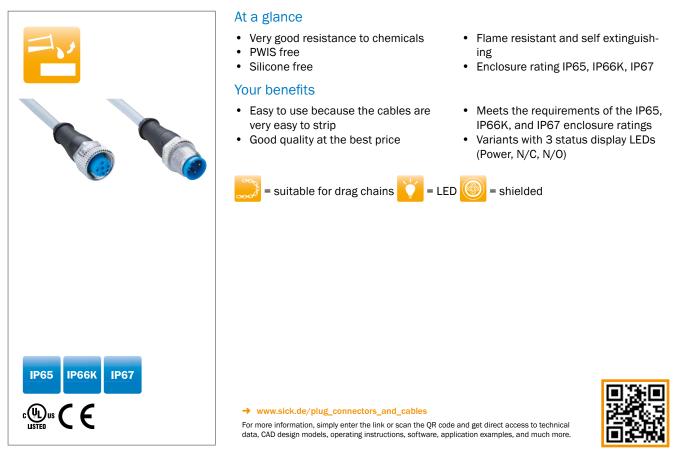
Cable material	Temperature resistance	Certifications	Tightening torque	Type head A	Type head B
				Female connector, M12, 3-pin	Male connector, M8, 3-pin
			0.4 Nm (M8) 0.6 Nm (M12)	Female connector, M12, 3-pin	Male connector, M12, 3-pin
PUR, halogen free	-25 °C 85 °C, head -40 °C +80 °C, for fixed installation -25 °C +80 °C, for flexible use	UL		Female connector, M12, 4-pin	Male connector, M8, 4-pin
				Female connector, M12, 5-pin	Male connector, M12, 5-pin
				Female connector, M12, 8-pin	Male connector, M12, 8-pin

### CONNECTIVITY Zones with oils, coolants, or lubricants

Туре	Figure	Enclo- sure rating	Current carrying capacity	Rated voltage	Head A connection type	Head B connection type	Length of cable	Туре	Part no.
		IP65/			Female connector, M12, 3-pin,	Male connector, M8, 3-pin,	0.6 m	YF2A13-C60UA1M8U13	2095731
	No 🗞	IP66K/ IP67	4 A	60 V	straight	straight	2 m	YF2A13-020UA1M8U13	2095732
	000 0000				4/BK 5/n.c. ↓ 1/BN 5/BU ↓ 2/n.c.	3/BU ▶ 1/BN → 4/BK	5 m	YF2A13-050UA1M8U13	2095735
Female					Female connector,	Male connector,	0.6 m	YF2A13-C60UB1M2A13	2095991
con- nector,		IP65/ IP66K/	4 A	60 V	M12, 3-pin, straight	M12, 3-pin, straight	1 m	YF2A13-010UB1M2A13	2095992
M12,	_	IP67			Ū.	0	3 m	YF2A13-030UB1M2A13	2095994
3-pin					4/BK 5/n.c. ↓ 1/BN ⊲ 3/BU ↓ 2/n.c.	1/BN ► 0 4/BK ► 3/BU	5 m	YF2A13-050UB1M2A13	2095995
					Female connector,	Male connector,	0.6 m	YG2A13-C60UB1M2A13	2095737
		IP65/		001/	M12, 3-pin,	M12, 3-pin,	1 m	YG2A13-010UB1M2A13	2095877
		IP66K/ IP67	4 A	60 V	angled	straight	2 m	YG2A13-020UB1M2A13	2095993
	0000				3/BU 2/n.c. 1/BN 5/n.c.	1/BN ► 0 4/BK ► 3/BU	5 m	YG2A13-050UB1M2A13	2095996
					Female connector,	Male connector,	0.6 m	YF2A14-C60UA3M8U14	2096111
	<b>N N</b>	IP65/ IP66K/ IP67	4 A	60 V	M12, 4-pin, straight	M8, 4-pin, straight	2 m	YF2A14-020UA3M8U14	2096112
		2			4/BK 5/n.c. ↓ 1/BN 3/BU ↓ 2/WH	4/BK ≥/WH → 3/BU 1/BN	5 m	YF2A14-050UA3M8U14	2096113
					Female connector, M12, 4-pin, straight	Male	0.2 m	YF2A14-C20UB3M2A14	2096013
		IP65/		250 V		connector, M12, 4-pin, straight	0.6 m	YF2A14-C60UB3M2A14	2095999
	v 🗸	IP65/ IP66K/	4 A				1 m	YF2A14-010UB3M2A14	2095997
Female		IP67					2 m 5 m	YF2A14-020UB3M2A14 YF2A14-050UB3M2A14	2096000 2096001
con-							10 m	YF2A14-100UB3M2A14	2096001
nector, M12, 4-pin					Female con-	Male connector,	0.6 m	YG2A14-C60UB3M2A14	2095740
	<b>&gt;</b>	IP65/ IP66K/	4 A	250 V	nector, M12, 4-pin, angled	M12, 4-pin, straight	2 m	YG2A14-020UB3M2A14	2095741
	000 000	IP67			3/BU 2/WH 1/BN 5/n.c.	1/BN ▶ 2/WH 3/BU	5 m	YG2A14-050UB3M2A14	2095857
					Female	Male con-	0.6 m	YF2A14-C60UB3N2A14	2095728
		IP65/		<b>05</b> 0 V	connector, M12, 4-pin,	nector, M12, 4-pin, angled	5 m	YF2A14-050UB3N2A14	2095787
	Vo 🥔	IP66K/ IP67	4 A	250 V	straight	4/BK 3/BU 2/WH	10 m	YF2A14-100UB3N2A14	2096114
	990 9900				4/BK 5/n.c. 3/BU → 1/BN ⊲ 2/WH	4/ BK 2/WH 1/BN	15 m	YF2A14-150UB3N2A14	2096115
Female con- nector,		IP65/ IP66K/	4 A	24 V	Female con- nector, M12, 4-pin, angled with LED	Male con- nector, 4-pin, angled	0.6 m	YI2A14-C60UB3N2A14	2095788
M12, 4-pin		IP67	4 A	24 V	3/BU 2/WH 1/BN 5/n.c.	4/ВК 3/ВU 2/WH 1/BN	2 m	YI2A14-020UB3N2A14	2095790

### Zones with oils, coolants, or lubricants CONNECTIVITY

Туре	Figure	Enclo- sure rating	Current carrying capacity	Rated voltage	Head A connection type	Head B connection type	Length of cable	Туре	Part no.
							0,15 m	YF2A15-C15UB5M2A15	2096004
							0.6 m	YF2A15-C60UB5M2A15	2096006
					Female connector,	Male	1 m	YF2A15-010UB5M2A15	2096007
						connector,	1.5 m	YF2A15-015UB5M2A15	2096008
	100 Ma	IP65/ IP66K/	4 A	125 V	M12, 5-pin, straight	M12, 5-pin, straight	2 m	YF2A15-020UB5M2A15	2096009
		IP667	4 A	125 V	Ū	U U	5 m	YF2A15-050UB5M2A15	2096010
					4/BK 5/GY 3/BU 2/WH	1/BN - 4/BK ≥ 5/GY 3/BU	10 m	YF2A15-100UB5M2A15	2096011
					3/ BU 2/ WH	2/ 113/ 50	15 m	YF2A15-150UB5M2A15	2096171
Female	- CO						20 m	YF2A15-200UB5M2A15	2095844
con- nector,	-						30 m	YF2A15-300UB5M2A15	2095845
M12, 5-pin					Female con- nector, M12,	Male connector,	0.6 m	YG2A15-C60UB5M2A15	2095600
	IP65/ IP66K/ 4 A 125 V IP67 ■	IP66K/	4 A	125 V	5-pin, angled	M12, 5-pin, straight	2 m	YG2A15-020UB5M2A15	2095601
		3/BU 2/WH 1/BN 5/GY	1/BN ▶ 2/WH → 5/GY 3/BU	5 m	YG2A15-050UB5M2A15	2095602			
	3	IP65/ IP66K/ IP67	4 A	24 V	Female con- nector, M12, 5-pin, angled with LED	Male con- nector, M12, 5-pin, straight	2 m	YI2A15-020UB5M2A15	2096138
					3/BU 2/WH 1/BN 5/GY	1/BN ▶ 5/GY 2/WH 3/BU			
			2 A	30 V	Female	Male	0.6 m	YF2A18-C60UA5M2A18	2096031
		ID65/			connector, M12, 8-pin,	connector, M12, 8-pin,	1 m	YF2A18-010UA5M2A18	2096032
		IP65/ IP66K/			straight	straight	1.5 m	YF2A18-015UA5M2A18	2096012
	🚺 🚺	IP67			7/BU ~ 8/RD	8/RD - 7/BU 1/WH - 6/PK 2/BN - 5/GY	2 m	YF2A18-020UA5M2A18	2096033
Female					5/GY - 2/BN 4/YE - 3/GN		5 m	YF2A18-050UA5M2A18	2096034
con- nector,	000						10 m	YF2A18-100UA5M2A18	2096035
M12, 8-pin					Female connector,	Male connector,	1 m	YF2A28-010UA6M2A28	2096108
	$\sim$	IP65/ IP66K/	2 A	30 V	M12, 8-pin, straight, shielded	M12, 8-pin, straight, shielded	2 m	YF2A28-020UA6M2A28	2096105
	<b>*</b>	IP67			7/BU - c 8/RD	8/RD 7/BU	5 m	YF2A28-050UA6M2A28	2096106
					6/PK - 1/WH 5/GY - 2/BN 4/YE - 3/GN	1/WH - 6/PK 2/BN - 5/GY 3/GN - 4/YE	10 m	YF2A28-100UA6M2A28	2096109
					Female connector,	Male connector,	0.25 m	DSL-127SGM25E25KM0	2076626
Female con-			2 A	≤ 30 V	M12, 8-pin, straight	M12, 8-pin, straight	0.5 m	DSL-127SG0M5E- 25KM0	2076627
nector, M12,	1000	IP65/ IP67			4/YE 5/GY	6/PK 5/GY	1 m	DSL-127SG01ME25KM0	2076628
8-pin					- Cir	7/BU 3/GN	1.5 m	DSL-127SG1M5E25KM0	2076629
					2/BN/	1/WH/2/BN 8/Shield	20 m	DSL-127SG20ME25KM0	2078579



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#### Suitable torque wrenches

For more information → see page 40

Figure	Description	Туре	Part no.
	M08 torque wrench (AF9, 0.4 Nm)	TOOL-TW06M08AF09	5337207
	M12 torque wrench (AF13, 0.6 Nm)	TOOL-TW06M12AF13	5337208

### Connecting cables with M8 female connector, PVC

Cable material	Temperature resistance	Certifications	Tightening torque	Туре
PVC	-25 °C 85 °C, head	UL	0.4 Nm	Female connector, M8, 3-pin
	-30 °C +80 °C, for fixed installation -5 °C +80 °C, for flexible use		0.4 Nm	Female connector, M8, 4-pin

### Uncontaminated fields of application CONNECTIVITY

Туре	Figure	Enclo- sure rating	Current carrying capacity	Rated voltage	Head A connection type	Head B connection type	Length of cable	Туре	Part no.
					Female		2 m	YF8U13-020VA1XLEAX	2095860
		IP65/			connector, M8, 3-pin, straight	Open cable	5 m	YF8U13-050VA1XLEAX	2095884
		IP66K/ IP67	4 A	60 V	4/BK-€ <sup>-3/BU</sup> 4/BK-€ <sup>-3/BU</sup> 1/BN	end	10 m	YF8U13-100VA1XLEAX	2095885
Female connec-					1/BN		15 m	YF8U13-150VA1XLEAX	2095886
tor, M8, 3-pin					Female		2 m	YG8U13-020VA1XLEAX	2096165
					connector, M8, 3-pin,		5 m	YG8U13-050VA1XLEAX	2096166
	<b>(</b>	IP65/ IP66K/ IP67	4 A	60 V	angled	Open cable end	10 m	YG8U13-100VA1XLEAX	2096209
					4́/ВК – З/ВU –		15 m	YG8U13-150VA1XLEAX	2096210
			4 A	60 V	Female connector, M8, 4-pin, straight	Open cable end	1.5 m	YF8U14-015VA3XLEAX	2095894
		IP65/ IP66K/					2 m	YF8U14-020VA3XLEAX	2095888
							2.5 m	YF8U14-025VA3XLEAX	2095876
							3 m	YF8U14-030VA3XLEAX	2095896
							5 m	YF8U14-050VA3XLEAX	2095889
Female	10	IP67			3/BU 1/BN 2/WH		10 m	YF8U14-100VA3XLEAX	2095890
connec- tor, M8,					1/ DIV- 2/ WIT		15 m	YF8U14-150VA3XLEAX	2095899
4-pin							20 m	YF8U14-200VA3XLEAX	2095891
							30 m	YF8U14-300VA3XLEAX	2095900
					Female		2 m	YG8U14-020VA3XLEAX	2095962
		IP65/ IP66K/ IP67	4 A	60 V	connector, M8, 4-pin, angled 2/WH 2 1/BN 4/BK 3/BU	Open cable end	5 m	YG8U14-050VA3XLEAX	2095963
							10 m	YG8U14-100VA3XLEAX	2095964
							30 m	YG8U14-300VA3XLEAX	2095968

### Connecting cables with M12 female connector, PVC

Cable material	Temperature resistance	Certifications	Tightening torque	Туре
	-25 °C 85 °C. head	UL, CE <sup>1)</sup>		Female connector, M12, 4-pin
PVC	-30 °C +80 °C, for fixed installation		0.6 Nm	Female connector, M12, 5-pin
	-5 °C +80 °C, for flexible use			Female connector, M12, 8-pin

 $^{\mbox{\tiny 1)}}$  Applies to cables with a rated voltage > 75 V DC.

Туре	Figure	Enclo-	Current	Rated	Head A	Head B	Length of	Туре	Part no.
		sure rating	carrying capacity	voltage	connection type	connection type	cable		
					Female		2 m	YF2A14-020VB3XLEAX	2096234
		IP65/			connector, M12, 4-pin,	Outra a shire	5 m	YF2A14-050VB3XLEAX	2096235
		IP66K/ IP67	4 A	250 V	straight	Open cable end	10 m	YF2A14-100VB3XLEAX	2096236
	<b>V</b>	IF 07			4/BK 5/n.c. 3/BU 2/WH		15 m	YF2A14-150VB3XLEAX	2096237
					3/BU 2~~ 2/WH		20 m	YF2A14-200VB3XLEAX	2096238
	<b>N</b>	ір65/ ір66к/ ір67	4 A	60 V	connector, M12, 4-pin, straight, shielded 4/BK ↓ 1/BN 5/n.c. ↓ 1/BN 3/BU ↓ 2/WH	Open cable end	5 m	YF2A24-050VB4XLEAX	2096247
					Female		2 m	YG2A14-020VB3XLEAX	2095895
Female		IP65/			connector, M12, 4-pin,		5 m	YG2A14-050VB3XLEAX	2095897
con- nector,		IP66K/	4 A	250 V	angled	Open cable end	10 m	YG2A14-100VB3XLEAX	2095898
M12,		IP67			3/BU 2/WH 1/BN		15 m	YG2A14-150VB3XLEAX	2096213
4-pin					1/BN - 902 5/11.C.		20 m	YG2A14-200VB3XLEAX	2096214
	<b>&gt;&gt;</b>	IP65/ IP66K/ IP67	4 A	6 V	Female connector, M12, 4-pin, angled, shielded	Open cable end	5 m	YG2A24-050VB4XLEAX	2096221
		IP65/ IP66K/ IP67	4 A	24 V	Female connector, M12, 4-pin, angled, with LED	Open cable end	2 m	YI2A14-020VB3XLEAX	2096222
	(F)						5 m	YI2A14-050VB3XLEAX	2096223
					3/BU 2/WH 1/BN 5/n.c.		10 m	YI2A14-100VB3XLEAX	2096231
					Female connector,		2 m	YF2A15-020VB5XLEAX	2096239
		IP65/	4.4	405.14	M12, 5-pin, straight	Open cable	5 m	YF2A15-050VB5XLEAX	2096240
	<b>1</b>	IP66K/ IP67	4 A	125 V	Ū	end	10 m	YF2A15-100VB5XLEAX	2096241
Female con- nector,	·				3/BU 2/WH 1/BN 5/n.c.		15 m	YF2A15-150VB5XLEAX	2096242
M12, 5-pin					Female connector, M12 5-pin		2 m	YG2A15-020VB5XLEAX	2096215
		IP65/ IP66K/ IP67	4 A	125 V	M12, 5-pin, angled	Open cable end	5 m	YG2A15-050VB5XLEAX	2096216
					3/BU 2/WH 1/BN 5/GY		10 m	YG2A15-100VB5XLEAX	2096217

### Uncontaminated fields of application CONNECTIVITY

Туре	Figure	Enclo- sure rating	Current carrying capacity	Rated voltage	Head A connection type	Head B connection type	Length of cable	Туре	Part no.
					Female connector,		2 m	YF2A28-020VA6XLEAX	2096243
		IP65/			M12, 8-pin, straight,		5 m	YF2A28-050VA6XLEAX	2096244
		IP66K/ IP67	2 A	30 V	shielded	shielded Upen cable end //BU	10 m	YF2A28-100VA6XLEAX	2096245
Female		IF07			7/BU - 8/RD 6/PK - 9/WH		15 m	YF2A28-150VA6XLEAX	2096356
con- nector,					4/YE - 3/GN		30 m	YF2A28-300VA6XLEAX	2096357
M12, 8-pin	6	IP65/ IP66K/ : IP67		20.1/	Female connector, M12, 8-pin, angled, shieldod	Open cable end	2 m	YG2A28-020VA6XLEAX	2096218
			2 A	30 V	shielded 4/YE 3/GN 2/BN 2/BN 4/YE 5/GY 8/RD 6/PK 1/WH 7/BU		5 m	YG2A28-050VA6XLEAX	2096219

### Connecting cables with M8 male connector, PVC

Cable materia	I Temperature resistance	Certifications	Tightening torque	Туре
PVC	-25 °C 85 °C, head -30 °C +80 °C, for fixed installation -5 °C +80 °C, for flexible use	UL	0.4 Nm	Male connector, M8, 3-pin

Туре	Figure	Enclo- sure rating	Current carrying capacity	Rated voltage	Head A connection type	Head B connection type	Length of cable	Туре	Part no.
Male				Male connector,		2 m	YM8U13-020VA1XLEAX	2096225	
connec- tor, M8,	connec-	IP65/ IP66K/ IP67	4 A	60 V	M8, 3-pin, straight	Open cable end	5 m	YM8U13-050VA1XLEAX	2096226
3-pin					4/BK		10 m	YM8U13-100VA1XLEAX	2096227

### Connecting cables with M12 male connector, PVC

Cable material	Temperature resistance	Certifications	Tightening torque	Туре
PVC	-25 °C 85 °C, head	UL, CE <sup>1)</sup>	0.0.1	Male connector, M12, 4-pin
	-30 °C +80 °C, for fixed installation -5 °C +80 °C, for flexible use		0.6 Nm	Male connector, M12, 8-pin

 $^{\scriptscriptstyle 1)}$  Applies to cables with a rated voltage > 75 V DC.

Туре	Figure	Enclo- sure rating	Current carrying capacity	Rated voltage	Head A connection type	Head B connection type	Length of cable	Туре	Part no.
Male con- nector, M12, 4-pin		IP65/ IP66K/ IP67	4 A	250 V	Male connector, M12, 4-pin, straight <sup>3/BU</sup> 4/BK	Open cable end	5 m	YM2A14-050VB3XLEAX	2095616
Male		IP65/ IP66K/ IP67	2 A	30 V	Male con- nector, M12, 8-pin, straight, shielded 4/YE 5/GY 5/GY 6/PK 7/BU 8/RD	Open cable end	2 m	YM2A28-020VA6XLEAX	2096232
con- nector, M12,							5 m	YM2A28-050VA6XLEAX	2096233
8-pin							10 m	YM2A28-100VA6XLEAX	2096246

### Connection cables with M8 female and male connector, PVC

Cable material	Temperature resistance	Certifications	Tightening torque	Type head A	Type head B
				Female connector, M8, 3-pin	Male connector, M12, 3-pin
PVC	-25 °C 85 °C, head -30 °C +80 °C, for fixed installation -5 °C +80 °C, for flexible use	UL	0.4 Nm (M8) 0.6 Nm (M12)	Female connector, M8, 4-pin	Male connector, M8, 4-pin
				Female connector, M8, 4-pin	Male connector, M12, 4-pin

Туре	Figure	Enclo- sure rating	Current carrying capacity	Rated voltage	Head A connection type	Head B connection type	Length of cable	Туре	Part no.
Female			4 A	60 V	Female connector, M8, 3-pin, straight ₄/BK - ♀ <sup>3/BU</sup> ₄ 1/BN	Male connector,	0.6 m	YF8U13-C60VA1M2A13	2096604
connec- tor, M8,	N. N.	IP65/ IP66K/ IP67				M12, 3-pin, straight	2 m	YF8U13-020VA1M2A13	2096605
3-pin						<sup>1/BN</sup> ℃ 4/BK	5 m	YF8U13-050VA1M2A13	2096606

### Uncontaminated fields of application CONNECTIVITY

Туре	Figure	Enclo- sure rating	Current carrying capacity	Rated voltage	Head A connection type	Head B connection type	Length of cable	Туре	Part no.
					Female connector,	Male connector,	0.6 m	YF8U14-C60VA3M8U14	2096612
	No 100	IP65/ IP66K/	4 A	60 V	M8, 4-pin, straight	M8, 4-pin,	1.5 m	YF8U14-015VA3M8U14	2096613
		IP67	4 A		3/BU 1/BN → 4/BK 2/WH	straight	2 m	YF8U14-020VA3M8U14	2096614
Female connec-						2/WH	3 m	YF8U14-030VA3M8U14	2096615
tor, M8,		IP65/			Female connector, M8, 4-pin,	Male	0.6 m	YF8U14-C60VA3M2A14	2096607
4-pin						connector, M12, 4-pin,	2 m	YF8U14-020VA3M2A14	2096608
		IP66K/	4 A	60 V	straight	straight	5 m	YF8U14-050VA3M2A14	2096609
	<b>1</b> 0 <b>1</b> 0	IP67			3/BU 1/BN4/BK 2/WH	1/BN ~ 4/BK	10 m	YF8U14-100VA3M2A14	2096610
					1/BN _ 2/WH	2/WH - 2/BU	20 m	YF8U14-200VA3M2A14	2096611

### Connection cables with M12 female and male connector, PVC

Cable material	Temperature resistance	Certifications	Tightening torque	Type head A	Type head B
PVC	-25 °C 85 °C, head	UL. CE <sup>1)</sup>	0.6 Nm	Female connector, M12, 3-pin, straight	Male connector, M12, 3-pin, straight
PVC	-30 °C +80 °C, for fixed installation -5 °C +80 °C, for flexible use	UL, CE →	0.6 MIII	Female connector, M12, 4-pin, straight	Male connector, M12, 4-pin, straight

 $^{\scriptscriptstyle 1)}$  Applies to cables with a rated voltage > 75 V DC.

Туре	Figure	Enclo- sure rating	Current carrying capacity	Rated voltage	Head A connection type	Head B connection type	Length of cable	Туре	Part no.
Female					Female connector,	Male connector,	0.6 m	YF2A13-C60VB1M2A13	2096358
con- nector, M12,	1. A CO	IP65/ IP66K/ IP67	4 A	250 V	M12, 3-pin, straight	M12, 3-pin, straight	2 m	YF2A13-020VB1M2A13	2096359
3-pin					4/BK 5/n.c. 3/BU → 1/BN 4 2/n.c.	<sup>1/BN</sup> ℃ 4/BK > ℃ 3/BU	5 m	YF2A13-050VB1M2A13	2096360
				250 V	Female connector,	Male	0.6 m	YF2A14-C60VB3M2A14	2096248
Female						connector, M12, 4-pin, straight	1.5 m	YF2A14-015VB3M2A14	2096598
con- nector,		IP65/ IP66K/	4 A		M12, 4-pin, straight		2 m	YF2A14-020VB3M2A14	2096599
M12,	Vo Vo	IP67	4 A		U	U	5 m	YF2A14-050VB3M2A14	2096600
4-pin					4/BK 5/n.c. 3/BU → 1/BN ⊲ 2/WH	1/BN → 2/BK	10 m	YF2A14-100VB3M2A14	2096601
					3/BU -/-~~ 2/WH	2/ WH 3/ BU	20 m	YF2A14-200VB3M2A14	2096602



### At a glance

 Great variety of M8 and M12 plug connectors

#### Your benefits

- A good deal of latitude in planning and flexibility for installation
- Many plug connectors have connectors which enable fast assembly
- Field wireable connectors also save time which brings the costs down
- Some of the plug connectors are pre-assembled
- Different connectors (differentiated by the type code ending):
  - PC = quick connection
     (→ Pierce connection)
  - QU = quick connection (> Insulation displacement connection)
  - FE = quick connection (spring connection)
  - N = stainless steel knurled nut
  - X = enlarged cable feed-through

→ www.sick.de/plug\_connectors\_and\_cables

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.



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### Female connectors (field wireable), M8

Figure	Head A connection type	Enclo- sure rating	Current car- rying capac- ity	Rated voltage	Tight- ening torque	Temperature resistance	Screw-type terminals	Pierce connection	Solder connection	Spring-cage connection	Cutting technology	Туре	Part no.
•	Female connector, M8, 3-pin, straight <u>3/BU</u> <u>1/BN</u>	IP67	4 A	≤ 60 V	0.4 Nm	-40 °C +85 °C	•	-	_	-	-	DOS-0803-G	7902077
<b>%</b>	Female connector, M8, 3-pin, straight <u>4/BK</u> <u>3/BU</u> S	IP68	4 A	≤ 60 V	0.2 Nm	-25 °C +90 °C	-	•	-	-	-	DOS-0803-GPC	6042092

### Field wireable connectors CONNECTIVITY

Figure	Head A connection type	Enclo- sure rating	Current car- rying capac- ity	Rated voltage	Tight- ening torque	Temperature resistance	Screw-type terminals	Pierce connection	Solder connection	Spring-cage connection	Cutting technology	Туре	Part no.
×.	Female connector, M8, 3-pin, angled <u>3/BU</u>	IP67	4 A	≤ 60 V	0.4 Nm	-40 °C +85 °C	-	Pie	e	-	-	D0S-0803-W	7902078
all a	Female connector, M8, 3-pin, angled <u>3/BU</u> 3/BU	IP67	4 A	≤ 60 V	0.6 Nm	-40 °C +85 °C	•	-	-	-	-	DOS-0803-WSK	6053168
<b>N</b> 0	Female connector, M8, 4-pin, straight <u>4/BK 2/WH</u> <u>3/BU 5 1/BN</u>	IP67	4 A	≤ 30 V	0.4 Nm	-40 °C +85 °C	•	_	_	_	-	DOS-0804-G	6009974
<b>%</b>	Female connector, M8, 4-pin, straight <u>4/BK 2/WH</u> <u>3/BU 5 1/BN</u>	IP68	4 A	≤ 30 V	0.2 Nm	-25 °C +90 °C	-	•	_	_	-	DOS-0804-GPC	6042090
e contra	Female connector, M8, 4-pin, angled <u>4/BK</u> 2/WH <u>3/BU</u> 6 9 1/BN	IP67	4 A	≤ 30 V	0.4 Nm	-40 °C +85 °C	-	-	•	-	-	DOS-0804-W	6009975
al C	Female connector, M8, 4-pin, angled <u>4/BK</u> <u>2/WH</u> <u>3/BU</u> <u>1/BN</u>	IP67	4 A	≤ 30 V	0.6 Nm	-40 °C +85 °C	•	-	-	-	-	DOS-0804-WSK	6053169

Figure	Head A connection type	Enclo- sure rating	Current car- rying capac- ity	Rated voltage	Tight- ening torque	Temperature resistance	Screw-type terminals	Pierce connection	Solder connection	Spring-cage connection	Cutting technology	Туре	Part no.
<b>N</b>	Female connector, M12, 4-pin, straight <u>3/BU</u> 4/BK <u>5/n.c.</u> 2/WH	IP67	4 A	≤ 250 V	0.6 Nm	-40 °C +85 °C	•	-	-	-	-	D0S-1204-G	6007302
	Female connector, M12, 4-pin, straight	1067/				40.80						DOS-1204-GN <sup>1)</sup>	6028357
	3/BU 4/BK	IP67/ IP69K	4 A	≤ 250 V	0.6 Nm	-40 °C +85 °C	•	-	-	-	-	DOS-1204-GX <sup>2)</sup>	6026528
	Female connector, M12, 4-pin, straight	IP65/ IP67		≤ 250 V	0.6 Nm	-40 °C +85 °C						DOS-1204-GQU6	6042088
×6	<u>3/BU</u> <u>4/BK</u> <u>0 0 5/n.c.</u> <u>2/WH</u> <u>1/BN</u>		4 A				-	-	-	-	•	DOS-1204-GQU8 <sup>2)</sup>	6053328
<b>C</b>	Female connector, M12, 4-pin, angled <u>3/BU</u> 4/BK 5/n.c. 2/WH) 1/BN	IP67	4 A	≤ 250 V	0.6 Nm	-40 °C +85 °C	•	-	-	_	-	D0S-1204-W	6007303
	Female connector, M12, 4-pin, angled <u>3/BU</u> 4/BK 5/n.c. 2/WH	IP67/ IP69K	4 A	≤ 250 V	0.6 Nm	-40 °C +85 °C	•	-	-	-	-	D0S-1204-WN <sup>1)</sup>	6028358
	Female connector, M12, 5-pin, straight					-40 °C +85 °C	•	-	-	_	_	D0S-1205-G	6009719
Ó	Straight IP67 <u>3/BU</u> <u>2/WH</u> <u>1/BN</u>	4 A	≤ 125 V	0.6 Nm	-25 °C +90 °C	•	_	_	_	-	D0S-1205-GX <sup>2)</sup>	6047950	

### Female connectors (field wireable), M12

<sup>2)</sup> Extended/enlarged cable feed-through.

### Field wireable connectors CONNECTIVITY

Figure	Head A connection type	Enclo- sure rating	Current car- rying capac- ity	Rated voltage	Tight- ening torque	Temperature resistance	Screw-type terminals	Pierce connection	Solder connection	Spring-cage connection	Cutting technology	Туре	Part no.
	Female connector, M12, 5-pin, angled 3/BU 3/BU 4/BK 2/WH	IP67	4 A	≤ 63 V	0.6 Nm	-40 °C +85 °C	•	-	-	-	-	D0S-1205-W	6009720
6	Female connector, M12, 5-pin, angled 3/BU 3/BU 4/BK 2/WH	IP67	4 A	≤ 63 V	0.6 Nm	-25 °C +90 °C	•	_	_	_	_	DOS-1205-WX <sup>2)</sup>	6047951
•	Female connector, M12, 8-pin, straight 4/YE 5/GY 6/PK 3/GN 000 7/BU 2/BN 1/WH 8/RD	IP67	2 A	≤ 60 V	0.6 Nm	-40 °C +85 °C	•	_	_	_	_	D0S-1208-G	6028422
	Female connector, M12, 8-pin, straight, A-coded 5/GN, WH 6/OG, 3/BN 60 7/BU 2/BN, 60 7/BU 2/BN, 60 7/BU 1/BU, 8/GN	IP67	1.75 A	≤ 30 V	0.4 Nm	-40 °C +85 °C	-	_	_	_	•	DOS-1208-GA01	6045001

<sup>1)</sup> Stainless steel knurled nut.

<sup>2)</sup> Extended/enlarged cable feed-through.

Figure	Head A connection type	Enclo- sure rating	Current car- rying capac- ity	Rated voltage	Tight- ening torque	Temperature resistance	Screw-type terminals	Pierce connection	Solder connection	Spring-cage connection	Cutting technology	Туре	Part no.
<b>N</b>	Male connector, M8, 3-pin, straight <u>1/BN</u> <u>3/BU</u>	IP67	4 A	≤ 60 V	0.6 Nm	-40 °C +85 °C	•	-	-	-	-	STE-0803-G	6037322
•	Male connector, M8, 3-pin, straight <u>4/BK</u> <u>3/BU</u>	IP68	4 A	≤ 60 V	0.2 Nm	-25 °C +90 °C	-	•	-	-	-	STE-0803-GPC	6042093
all a	Male con- nector, M8, 3-pin, angled	IP67	4 A	≤ 60 V	0.6 Nm	-40 °C +85 °C	•	-	-	-	-	STE-0803-WSK	6053170
	Male connector, M8, 4-pin, straight <u>2/WH</u> <u>4/BK</u> <u>1/BN</u> <u>3/BU</u>	IP67	4 A	≤ 60 V	0.4 Nm	-40 °C +85 °C	•	-	-	-	-	STE-0804-G	6037323
<b>V</b> e	Male connector, M8, 4-pin, straight 2/WH 4/BK 1/BN 3/BU	IP68	4 A	≤ 60 V	0.2 Nm	-25 °C +90 °C	-	•	-	-	-	STE-0804-GPC	6042091
all a	Male con- nector, M8, 4-pin, angled	IP67	4 A	≤ 60 V	0.6 Nm	-40 °C +85 °C	•	-	-	_	-	STE-0804-WSK	6053171

### Male connectors (field wireable), M8

Figure	Head A	Enclo-	Current	Rated	Tight-	Temperature				_		Туре	Part no.
. iguro	connection type	sure rating	car- rying capac- ity	voltage	ening torque	resistance	Screw-type terminals	Pierce connection	Solder connection	Spring-cage connection	Cutting technology	.,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	
<b>N</b>	Male connector, M12, 4-pin, straight <u>4/BK 3/BU</u> <u>1/BN 2/WH</u>	IP67	4 A	≤ 250 V	0.6 Nm	-40 °C +85 °C	•	-	-	_	-	STE-1204-G	6009932
<b>N</b>	Male connector, M12, 4-pin, straight <u>4/BK</u> <u>3/BU</u> <u>1/BN</u> 2/WH	IP67/ IP69K	4 A	≤ 250 V	0.6 Nm	-40 ℃ +85 ℃	•	-	-	_	_	STE-1204-GN 1)	6028359
<b>M</b>	Male connector, M12, 4-pin, straight <u>4/BK</u> <u>3/BU</u> <u>1/BN</u> 2/WH	IP67	4 A	≤ 250 V	0.4 Nm	-25 °C +90 °C	-	-	-	-	•	STE-1204-GQU6	6042089
	Male connector, M12, 4-pin, straight <u>4/BK</u> <u>3/BU</u> <u>1/BN</u> 2/WH	IP65/ IP67	4 A	≤ 250 V	0.4 Nm	-25 °C +80 °C	-	-	-	_	•	STE-1204-GQU8 <sup>2)</sup>	6044998
	Male con- nector, M12, 4-pin, angled	IP67	4 A	≤ 250 V	0.6 Nm	-40 °C +85 °C	•	-	-	-	-	STE-1204-W	6022084
	Male connector, M12, 5-pin, straight <u>4/BK</u> <u>3/BU</u> <u>1/BN</u> 2/WH	IP67	4 A	≤ 125 V	0.6 Nm	-40 °C +85 °C	•	-	-	_	_	STE-1205-G	6022083
<sup>1)</sup> Stainless ste	Male connector, M12, 5-pin, straight <u>4/BK</u> <u>3/BU</u> <u>1/BN</u> 2/WH	IP67	4 A	≤ 60 V	0.4 Nm	-40 °C +85 °C	_	_	-	•	_	STE-1205-GFE	6044999

### Male connectors (field wireable), M12

 $^{\mbox{\tiny 1)}}$  Stainless steel knurled nut.

<sup>2)</sup> Extended/enlarged cable feed-through.

### CONNECTIVITY Field wireable connectors

Figure	Head A connection type	Enclo- sure rating	Current car- rying capac- ity	Rated voltage	Tight- ening torque	Temperature resistance	Screw-type terminals	Pierce connection	Solder connection	Spring-cage connection	Cutting technology	Туре	Part no.
	Male con- nector, M12, 5-pin, angled	IP67	4 A	≤ 125 V	0.6 Nm	-40 °C +85 °C	•	_	_	_	_	STE-1205-W	6022082
	Male connector, M12, 8-pin, straight <u>6/PK</u> 7/BU <u>1/WH</u> <u>2/BN</u> 8/RD	IP67	2 A	≤ 63 V	0.4 Nm	-25 °C +90 °C	•	_	_	_	-	STE-1208-G	6033269
<sup>1</sup> Stainless ste	Male connector, M12, 8-pin, straight, A-coded 6/OG, WH 4/OG 7/BU 7/BU 1/BU VH 2/BN, 8/GN	IP67	1.75 A	≤ 30 V	0.4 Nm	-40 °C +85 °C	_	_	-	_	•	STE-1208-GA01	6044892

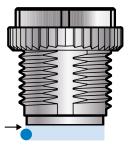
 $^{\mbox{\tiny 1)}}$  Stainless steel knurled nut.

 $^{\mbox{\tiny 2)}}$  Extended/enlarged cable feed-through.

### Accessories

SICK offers suitable torque wrenches as accessories for its M8 and M12 connector technologies. These guarantee that the connector is tightened securely, and ensures a perfect connection between the sensor and cable.

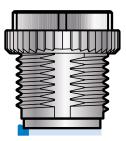
#### For comparison:





1. The connector is not screwed tight, thereby allowing medium to penetrate between the connector and O-ring.

2. The connector is screwed too tight. The connection is watertight, however the O-ring will be destroyed.



3. The connector has been tightened with the optimal tightening torque and is water-tight.

Your benefits:

- Secure connection: machine downtimes due to loose screws or water ingress will be a thing of the past.
- Simple and safe: an audible "click" indicates that the defined torque has been reached.
- No more injured fingers.

### Selecting a suitable torque wrench:

You will find a suitable torque wrench for your product at the start of every product overview table in this brochure.

Figure	Description	Туре	Part no.
	M12 torque wrench (AF13, 0.6 Nm)	TOOL-TW06M12AF13	5337208
	M12 torque wrench (AF14, 0.6 Nm)	TOOL-TW06M12AF14	5329575
	M08 torque wrench (AF9, 0.4 Nm)	TOOL-TW06M08AF09	5337207
	M08 torque wrench (AF10, 0.4 Nm)	TOOL-TW04M08AF10	5337210

# GLOSSARY

### В

### **Bend radius**

Bend radius refers to the smallest possible radius of any bends which may be made in the cable when it is installed without altering the cable properties. The bend radius is given in relation to the cable diameter.

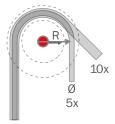


Fig.: Bend radius

### Bending cycle

Bending cycles refers to the number of repetitions of bending in a cable. This property is particularly relevant when using a cable in a drag chain.

## С

### Color code and wire colors

### M8 cables, 3-pin

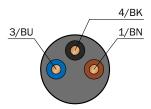


Fig.: Color code for M8 cables, 3-pin

### M8 cables, 4-pin, PUR

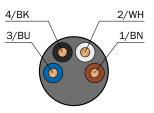


Fig.: Color code for M8 cables, 4-pin, PUR

### M12 cables, 4-pin, PUR

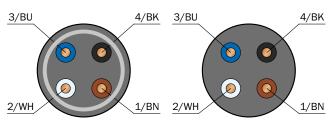


Fig.: Color code for M12 cables, 4-pin, PUR Left: shielded; right: unshielded

#### M12 cables, 5-pin

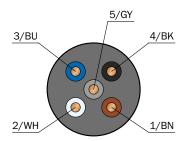


Fig.: Color code for M12 cables, 5-pin

### Current carrying capacity

This is the value specified by the manufacturer for the current which a plug connector can conduct continuously and which flows through all of its contacts. In relation to this an upper limit of +40 °C is often specified for the ambient temperature for the plug connector, and this must not be exceeded.

### F

### Flame resistance

Materials which prevent fire from spreading or are adequately resistant to it are described as flame resistant.

## Η

### Halogen free

Cables are said to be halogen free if the materials used do not contain halogens, e.g., salt forming chlorine, fluorine, bromine, or iodine. The insulation and jacket materials of these cables consist of polymers based on pure hydrocarbons. When such materials are burned, no corrosive or toxic gases are produced, but only water vapor and carbon dioxide.

### Insulation displacement connection

An insulation displacement contact establishes a connection by cutting through the conductor insulation. It makes a flexible, shockproof, vibration proof, gas tight contact with the litz wire. In type code STE-1204-GQU6 the insulation displacement connection is identified by the suffix "QU".

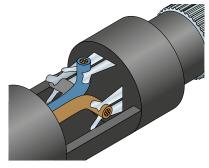


Fig.: Insulation displacement connection

### **IP** enclosure ratings

The IP enclosure ratings define the degree of protection (ingress protection) afforded by the housing against contact, foreign bodies, and water. The first number indicates protection against contact and foreign bodies; the second number is for protection against water.

### IP65

Protected against access by wire; dustproof; protection against water jets from any angle.

### IP66K

Protected against access by wire; dustproof; protection against strong high-velocity water with increased pressure.

### IP67

Protected against access by wire; dustproof; protection against temporary immersion in water (depth of 1 m, 30 minutes).

### IP68

Protected against access by wire; dustproof; protection against lengthy immersion in water (the requirements must be higher than IP67).

### IP69K

Protected against access by wire; dustproof; protection against water during high pressure cleaning and steam cleaning (100 bar at 80 °C) from a variety of angles.

### Important note

Up to enclosure rating IPX6, the lower enclosure ratings are also fulfilled. With the higher enclosure ratings this does not automatically apply to the water protection grades 7, 8, and 9K. If a lower enclosure rating needs to be included this is stated using a double code.

## Μ

### Material compatibility

If different materials are used in a product, e.g., PVC cables overmolded with PUR, it is important to consider material compatibility. We recommend testing cables before laying them to check material compatibility.

	PVC	PUR	PP
Acetic acid, 10%	+++	++	+++
Acetone	_	-	+
Aluminum chloride, 10%	+++	++	*)
Ammonia	+	+++	+
Ammonium chloride	+++	++	+++
Aniline	_	-	++
ASTM fuel no. 1	+++	+++	*)
ASTM fuel no. 2	++	+	*)
ASTM oil no. 1	+++	+++	+++
ASTM oil no. 2	+++	+++	+++
ASTM oil no. 3	+++	+++	++
ATE brake fluid	++	-	+++
Benzene	-	-	-
Butanol	-	-	*)
Butyl acetate	-	-	+++
Calcium chloride, 40%	+++	++	+++
Carbon disulfide	_	-	-
Carbon tetrachloride	-	-	-
Chlorobenzene	-	-	-
Chloroform	-	-	-
Chromic acid	-	-	*)
Cyclohexanone	-	+	-
Diesel oil	-	-	*)
Dimethylformamide	-	++	+
Ethanol	++	++	+++
Ethyl acetate	-	+	*)
Ethyl ether	-	+	*)
Ethylene chloride	-	-	-
Ferric chloride, 40%	-	-	*)
Formic acid	-	-	+
Freon 12	++	+	*)
Freon 22	++	+	*)
Gear oil SAE 90	++	-	*)
Glycerol	+++	+++	+++
Glycol	+	+++	+++
Hydrochloric acid, 10%	+++	+++	++
Hydrogen peroxide, 3%	+++	-	+++
Isopropanol	-	+	*)
Kerosene (US), paraffin	_	++	*)
(GB)			

	PVC	PUR	PP
	PVC		
Lactic acid, 10%	-	+	+++
Magnesium chloride, 30%	+++	++	*)
Methanol	-	+	+++
Methyl acetate	-	-	*)
Methyl ethyl ketone	-	+	+++
Methyl glycol	-	-	*)
Methyl glycol acetate	-	-	*)
Methylene chloride	-	-	-
Nitric acid, 10%	-	-	+
Ozone	+++	+++	+
Perchlorethylene	+++	-	*)
Petroleum ether	-	+++	*)
Phosphoric acid, 10%	+++	-	+++
Potassium dichromate	+++	+++	++
Potassium hydroxide solu- tion, 10%	+++	+++	++
Potassium nitrate	+++	+++	++
Potassium permanganate	+	-	+
Sodium chloride, 10%	+++	++	+++
Sodium hydroxide solution, 10%	+++	+++	+++
Sodium hypochlorite solution	+	+++	*)
Sulfuric acid, 30%	+++	+++	+++
Tetrachloroethylene	-	-	-
Tetrahydrofuran	-	-	-
Toluene	-	-	-
Trichloroethylene	-	-	-
Xylon	-	-	-
<b>_</b>			

Resistant: +++, largely resistant: ++, slightly resistant: +, not resistant : -

 $^{\ast)}$  There are no test results or evidence concerning the behavior of polypropylene with this material.

Table: Material compatibility

The user should always run tests to check the suitability for specific applications. The chemical resistance given applies only to unpressurized storage and, unless otherwise stated, at room temperature.

### Mounting instructions

For fixed installation of cable, minimum radius: 5 x cable diameter



For fixed installation of cable, minimum radius: 10 x cable diameter

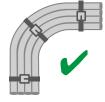


### Cable bend radius





**Bundling several cables** 





Fixed installation of cables





### Ν

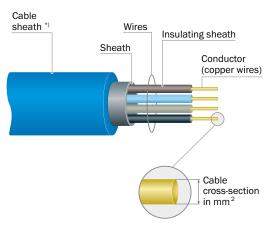
### Notch sensitivity

Notch sensitivity describes the tendency of a plastic to crack at points with notches, sharp edges and abrupt changes in wall thickness, i.e., at places of stress concentration.

## 0

### Outer jacket

The outer jacket indicates what the outer layer of the cable is made of.



\*) Vital for cable material}.

Fig.: Outer jacket

### Overvoltage category

In various standards the possible overvoltages are divided into four categories. Three categories are relevant for plug connectors:

### Overvoltage category I

Pieces of equipment, e.g., plug connectors, which are intended for use in devices or parts of systems where no overvoltage can occur. This covers mainly devices operated at low voltages.

### Overvoltage category II

Pieces of equipment, e.g., plug connectors, which are intended for use in systems or parts of systems where only switching surges need to be considered, and not lightning surges. This category covers e.g., household appliances.

### Overvoltage category III

Pieces of equipment, e.g., plug connectors, which are intended for use in systems or parts of systems where only switching surges need to be considered, and not lightning surges. In this category there are also special requirements for safety and availability of the equipment and the networks depending on it. It covers equipment for fixed installations, e.g., protective devices, contactors, switches and sockets.

### Ρ

### **Pierce connection**

The contact pin pierces the individual core creating an electrical connection. The contact makes the individual cores into a contact zone.

In type code DOS-0803-GPC the Pierce connection is identified by the suffix "PC".

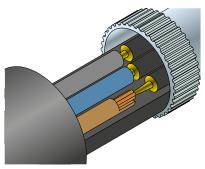


Fig.: Pierce connection

### **Pollution degree**

The contamination to be expected in the immediate environment of a piece of equipment, e.g., a plug connector, is divided into four degrees in the IEC 60664-1 standard:

### Pollution degree 1

There is no contamination or only dry, non-conductive contamination. The contamination has no effect. Examples of equipment with pollution degree 1: The inside of electrical measuring devices or electronic measuring devices.

### Pollution degree 2

Normally only non-conductive contamination occurs. However, occasional, temporary conductivity caused by condensation is to be expected. Examples of equipment with pollution degree 2: Household appliances, installation material, lights, and power supply units for office equipment.

### Pollution degree 3

Conductive contamination occurs or dry, non-conductive contamination that becomes conductive because condensation is to be expected. Examples of equipment with pollution degree 3: Electrical attachments for milling machines and production machines and low-voltage switchgear for machine tools.

### Pollution degree 4

The contamination generates persistent conductivity caused by conductive dust, rain, or snow.

Examples of equipment with pollution degree 4: Devices on the roofs and floors of electric locomotives and buses. Devices in electric underground locomotives.

### **PP:** Polypropylene

PP is a very high quality jacket material. It is very stable. SICK's flexible PVC free polypropylene cables feature good resistance to the highly effective cleaning agents used in the food and beverage industry. In addition, these cables are highly resistant to microbes and chemicals and are suitable for drag chains. This makes them suitable for the food and beverage industry, and since they are also resistant to lactic acid, they are also ideal for dairies etc. Cables like these are also used in packaging and bottling plants and in industrial mechanical engineering and construction.

### **PUR: Polyurethane**

PUR cables are characterized by particularly high tensile strength, crack resistance, notch resistance, and wear resistance. They are also are suitable for drag chains and have high flexural fatigue strength. SICK's PUR cables are silicone and halogen free and suitable for drag chains. Their outer jacket is made of PUR and their conductor insulation out of polypropylene, which makes them very resistant to wear. They meet the requirements of VDE0472 for oil resistance and flame resistance. Other features of these cables: PVC free, PWIS free, and resistant to hydrolysis and microbes. These characteristics make PUR cables very good for flexible use in robotics, machine tools, and machining.

### PVC: Polyvinyl chloride

While other thermoplastic plastics are mainly applied in the form of ready-to-use molding compound using a spray process, PVC is processed in powder form in an extruder. PVC is self extinguishing even without flame protection; it has good mechanical stability; however, it is notch sensitive. Cables made of pure PVC are suitable for moderate mechanical stress in packaging machines and assembly and production lines. They boast good resistance to acids and lyes, making them ideal for use in the food and beverage industry. SICK's PVC cables are also self extinguishing, PWIS free, and silicone free; however, they have little wear resistance and they are notch sensitive.

→ Silicone free

### Product travel path

A machine's product travel path is the route a moving machine part travels along from one end position to the other.

### **PWIS** free

The term "PWIS free" means that something is free of paint wetting impairment substances. These substances can be present in silicones, materials containing fluorine, and certain oils and fats. Components such as cables that are used in the automotive industry, especially in paint shops, must be PWIS free.

## R

### Rated voltage

The rated voltage is greater than or equal to the nominal voltage and it specifies the maximum value of voltage in normal operation.

### Resistance to microbes and hydrolysis

Under very warm, humid climatic conditions, cables can be damaged by microbes or hydrolysis. Especially microorganisms that produce enzymes can cause severe damage to cables. The first visible sign of attack by microbes is discoloration. Then surface cracks appear, which give the microbes the opportunity to penetrate more deeply and cause complete destruction of the material.

Hydrolysis involves irreversibly breaking down polyester chains, which reduces the mechanical stability of materials. To prevent such defects, SICK provides polyurethane and polypropylene cables, which are more resistant to hydrolysis. These materials are also resistant to microbes, which can be measured by the saponification value.

Materials with a saponification value of up to 200 KOH/g are considered resistant to microbes.

### **Robot cables**

By contrast with cables for drag chains, robot cables can withstand torsion stresses as well as bending stresses. In machines and plants sensor cables are increasingly being used in energy chains, revolving and tilting tables, and industrial robots. SICK does not currently have these cables in its portfolio; however it can supply them on request.

### S

### Screw connection

The screw connection is the standard for SICK M8 and M12 plug connectors. They can be used to assemble different cables and cable qualities quickly and correctly.

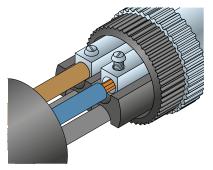
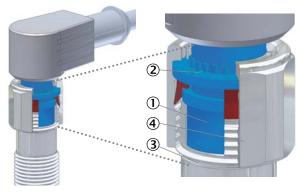


Fig.: Screw connection

### Sealing concept

For PVC M12 connecting cables for hygienic and washdown zones



- 0 Dual-action profile seal provides absolute impermeability.
- ② Reaching a torque of 0.6 Nm activates the mechanical vibration protection. This dual-acting interlock offers high shock and vibration resistance up to 50 G.
- ③ Integrated fixed stop prevents the plug connector from being screwed too tight.
- ④ High-quality material: Long service life and corrosion resistance verified by Ecolab certification.
- → See "Connectivity for hygienic and washdown zones" on page 4

### Shielding

The devices must be made such that:

- The generation of electromagnetic interference is limited to a level where it is possible to operate the devices as intended;
- 2. The devices have adequate resistance to electromagnetic interference so that it is possible to operate them as intended. With round connectors it is important to ensure that the braided shield of the cable is attached carefully to the shield connection of the plug connector. A wraparound attachment (360°) is best in this regard. However, good shielding values, often adequate in practice, can also be achieved by connecting the braided shield firmly to the conductive housing. Plug connectors made only of plastic with no metal sleeves cannot be used for this as the braided shield cannot be attached to them.

It is also important that when the connector is being plugged in that perfect contact is made with the mating connector, and that the mating connector also has a good contact with the device chassis.

### Silicone free

In some areas, such as paint shops, silicones must be avoided. This is because silicones have low surface energy which can cause surface defects in paint films and adhesive layers, which are known as craters. It can even cause areas of glue to peel off. To avoid these paint wetting impairments SICK provides silicone free cables.

### Standards and test parameters

Test parameters	Standards
Enclosure rating, housing	IEC 60529
Mechanical service life	IEC 60512-5
Upper limit temperature	IEC 60512-6
Lower limit temperature	IEC 60512-6
Rated voltage	IEC 60664-1
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### Suitability for drag chains

A drag chain (also known as an energy chain) is a device used in mechanical engineering and construction which guides and protects flexible cables and pneumatic or hydraulic hoses. Drag chain cables are connected to machine parts exposed to repetitive movements, e.g., in machine tools, lathes, and high-bay warehouses, and they supply the connected machine parts with power and information. Drag chain cables must meet widely differing mechanical requirements depending on the application in different industry sectors, e.g., in terms of flexibility, bending and torsional properties, number of bend cycles, bend cycle frequency, travel speed, service life, wear resistance, and bend radius. If cables meet these requirements they are said to be suitable for drag chains.

#### Typical ranges for cables suitable for drag chains

Maximum speed	0 300 m/min
•	,
Maximum acceleration	0 30 m/s²
Maximum travel length	0 50 m
Minimum bend radius	> 7 x D *)
Maximum possible number of	
alternating bending movements	0 20 million

\*) D = outer diameter of drag chain.

- → Bend radius
- Travel speed

### Т

### TPU: thermoplastic polyurethane

TPU has good electrical properties, feels good, is very flexible over a wide temperature range, and is highly resistant to wear. Thermoplastic polyurethanes are also elastic and cold crack resistant. SICK often uses this material for overmolding plug connectors.

### **Travel speed**

The speed at which the product travel path is covered.

→ Product travel path

### W

### Welding spark resistant

Radiation cross-linked PVC and PUR cables are generally resistant to welding sparks. In comparison to conventional cables they can withstand higher temperatures and they have better wear resistance so they can be used in areas where welding is being done.

### Wire cross-section

Conductors or wires are made of copper. The wire cross-section is specified in mm<sup>2</sup>. The cross-sectional thickness is determined partly by the maximum current to be carried (amperes), and partly by the number of pins and the wires in the cable. With M8 and M12 plug connectors 0.25 mm<sup>2</sup> or 0.34 mm<sup>2</sup> wires are usually used.

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