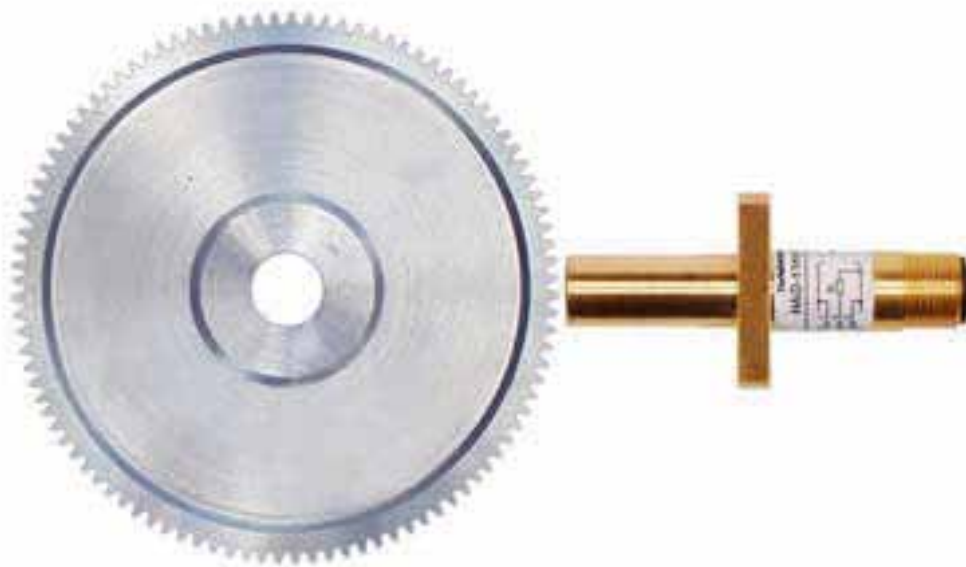


Sensors for Automation

Catalog Section Pulse Sensors and Accessories

ALSEN TK 2 + 12.1
Edition 9.12_20



Klaschka
Industrieelektronik GmbH
Am Zeller Pfad 1
75242 Neuhausen / Enzkreis
Germany
Fon +49 7234 79-0
Fax +49 7234 79-112
vertrieb@klaschka.de
www.klaschka.de

Pulse Sensors

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You will find evaluation devices for pulse rate, frequency and direction of rotation in the ALDIF catalog.

You will find a further selection from our extensive product range of sensors in the following catalogs:

Catalog Section Inductive Proximity Switches and Accessories **TK 1 + 12.1**

Catalog Section Ultrasonic Sensors **TK 8**

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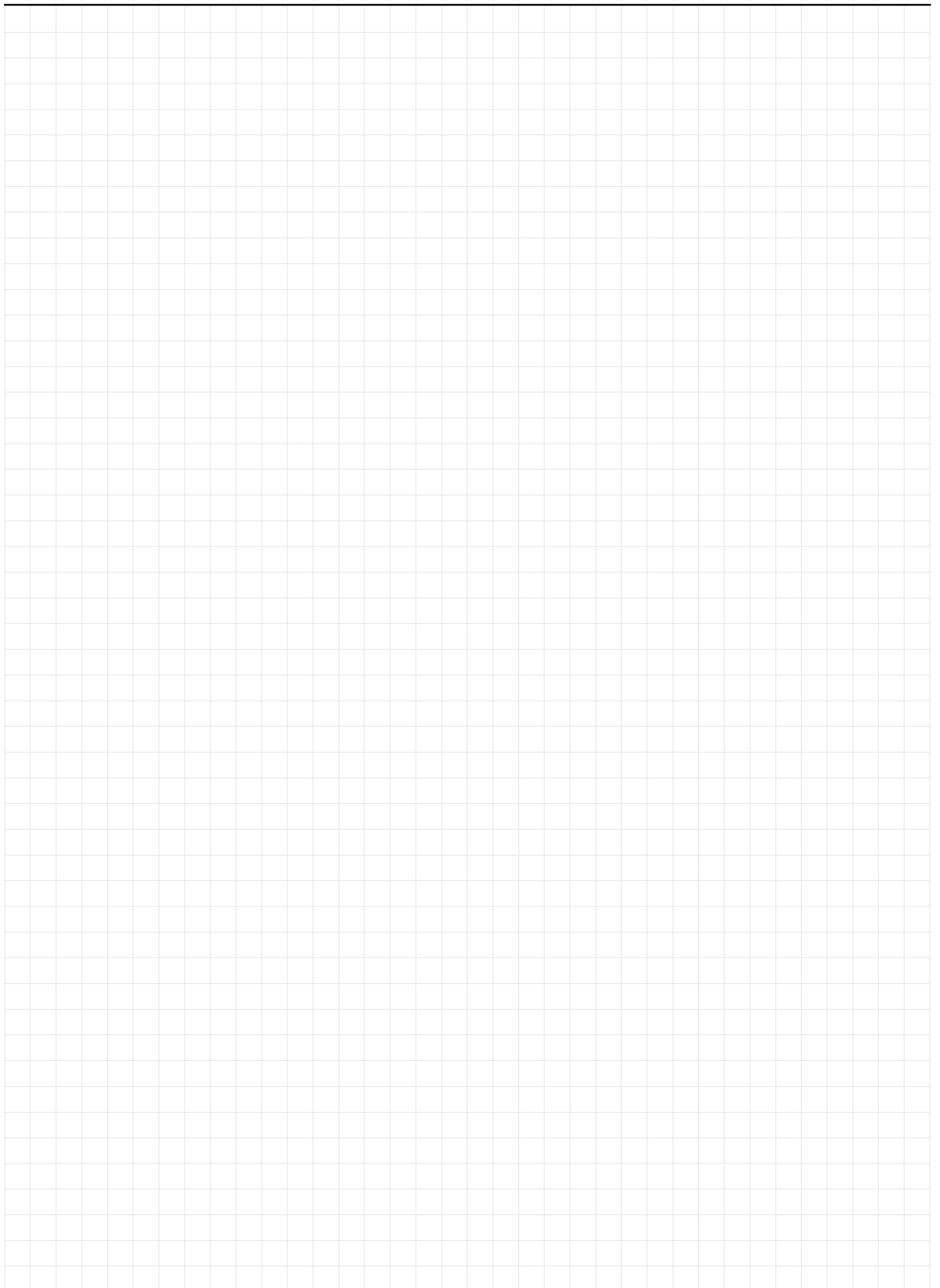
Accessories

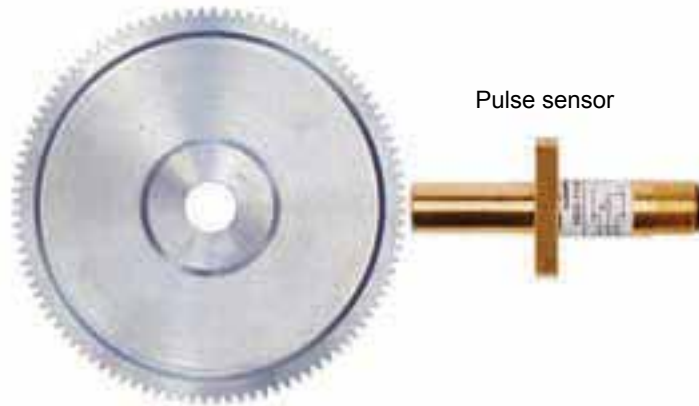
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Notes





The detection and evaluation of pulse rate, rotation speed and direction of rotation for the automation of plant and machinery are our core competences. Since 1964 Klaschka has developed and manufactured

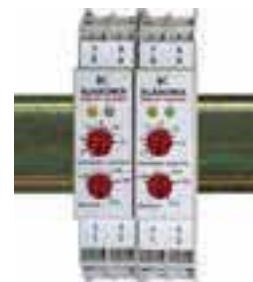
- non-contact, high resolution and fast pulse sensors,
- pulse rate measuring relays and transducers with and without determination of the direction of rotation,

For decades, our sensors and devices have demonstrated our competence in detecting, modifying, monitoring and converting pulse rates, rotation speeds, frequencies, positions, linear and rotary velocities.

Klaschka also has many years of experience in combining these sensors and devices with programmable logic controls.

Measuring relays, transducers, and direction of rotation detectors for pulse rate or frequency evaluate the signals from pulse sensors to generate digital or analogue switching commands or signals.

You will find a large selection of evaluation devices in the ALDIF catalog



Pulse Sensors

Type Magnetic Field

Characteristics



Pulse sensors of the type **magnetic field** are suitable for the generation of rotation speed-proportional pulse numbers and are equipped with either a Hall- or a magneto-resistant sensor element.

For the pulse generation either a **gear wheel** or a **rack rail made of steel**, e.g. St37 are used, for whose width B applies:

$$4 \text{ mm} < B < \varnothing \text{ sensor.}$$

With the **mounting** the right **mounting position** has to be considered. The axis of the pulse sensor has to be in line with the center of the gear wheel / of the rack rail. A lateral position marking allows an alignment parallel to the tooth flank and/or vertical to the actuating direction.

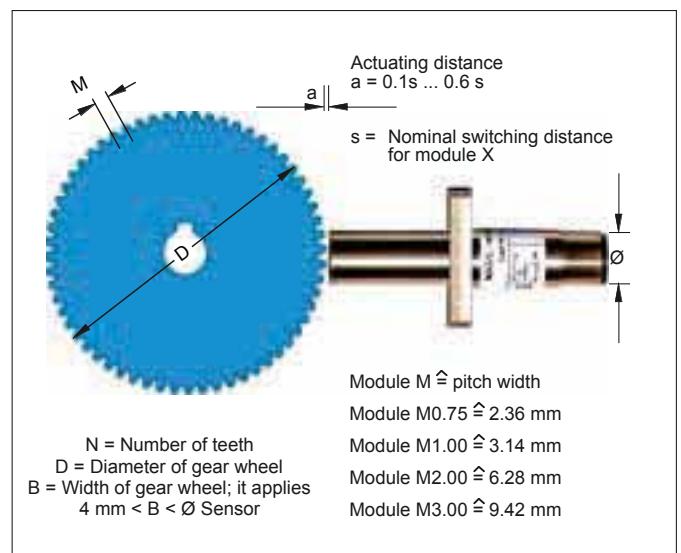
The **lateral displacement** of the gear wheel / of the rack rail may not exceed 0.2 mm at the smallest width. The run-out should be < 0.2 mm.

The **fixing** has to avoid reliably a vibration of the pulse sensor against the gear wheel / the rack rail.

The pulse sensors produce a **rectangular output signal**. There are two different types:

- **dynamic pulse sensors** for an actuating frequency range of some Hertz up to approx. 25 kHz
- **static pulse sensors** for an actuating frequency range from 0 to approx. 20 kHz.

Please take precise values from the Technical Data.



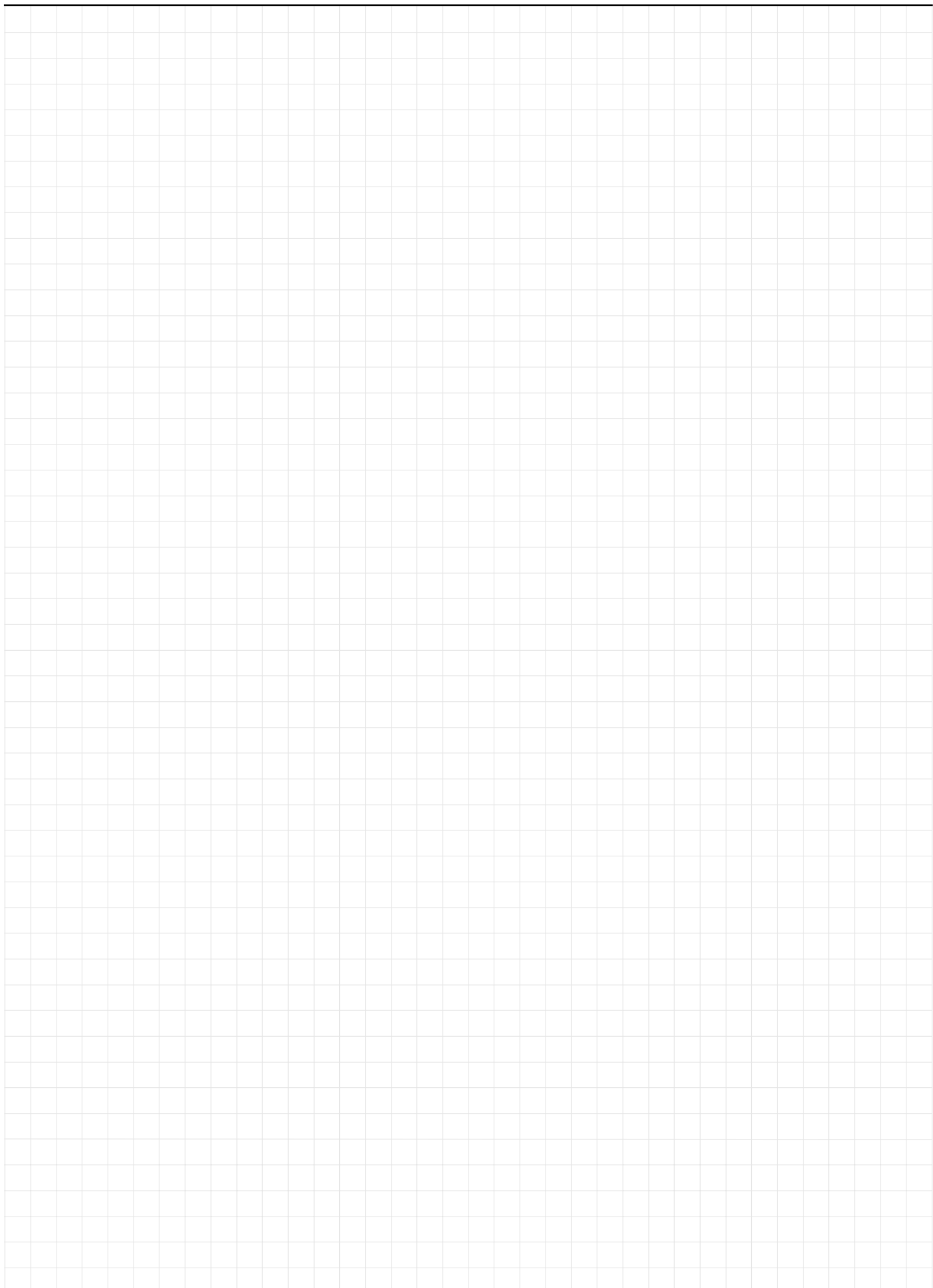
Pulse Sensors, Type Magnetic Field

Type	Ref. No.	Switching distance
		in mm Mounting *)
HALL cylindrical 10.8 Ø x L		
HAD-11ms45b2,5-5S1	13.26-01	2.5 b
HAD-11ms60b1-5Sd1	13.26-66	1.0 b
HAD-11ms60b2,5-50NK1	13.26-03-020	2.5 b
HAD-11ms60b2,5-50Z1	13.26-02	2.5 b
HAD-11ms60b2,5-5S1	13.26-13	2.5 b
HAD-11ms60b2,5-5S4	13.26-56	2.5 b
HAD-11ms60b1-5Sd7	13.32-05	2.5 b
HALL cylindrical 12 Ø x L		
HAD-12aq50b1-5NK1	13.26-63-020	1.0 b
HAD-12er55b1-5PK1	13.26-70-020	1.0 b
HAD-12er55b2,4-5NK2	13.26-72-020	2.4 b
HAD-12er55b2,5-5NK1	13.26-38-020	2.5 b
HAD-12mg50b2,5-5ND1	13.26-06-020	2.5 b
HAD-12mg70b2,5-5S2	13.26-55	2.5 b
HAD-12mg70b2,5-5S3	13.26-74	2.5 b
HALL cylindrical 14 Ø x L		
HAD-14eg50b1-5ND1	13.26-77-025	1.0 b
HAD-14er120b1-5TT3	13.26-79-030	1.0 b

Type	Ref. No.	Switching distance
		in mm Mounting *)
HALL cylindrical 16 Ø x L		
HAD-16ss96b1-5Yd1	13.26-73	1.0 b
HALL cylindrical 18 Ø x L		
HAD-18eg82b1-5NT1	13.26-71-020	1.0 b
HAD-18mg82b1-5NT1	13.26-69-020	1.0 b
HAD-18mg93b1-5Sd1	13.26-68	1.0 b
HAD-18mg98b1-5Vd1	13.26-67	1.0 b
HAD-18sg80b2,5-5TK1	13.26-50-020	2.5 b
HAD-18ss100b1,6-5NT1	13.26-65-005	1.6 b
HAD-18ss85b1-5NT1	13.26-64-060	1.0 b
Magneto- resistive rectangular 25 x 12 x L		
MDD-12aq50b0,4-55NK2	132151-020	0,4 b
MDD-12aq50b0,4-55NK3	132158-020	0,4 b

*) b = flush mounting, n = non-flush mounting

Notes

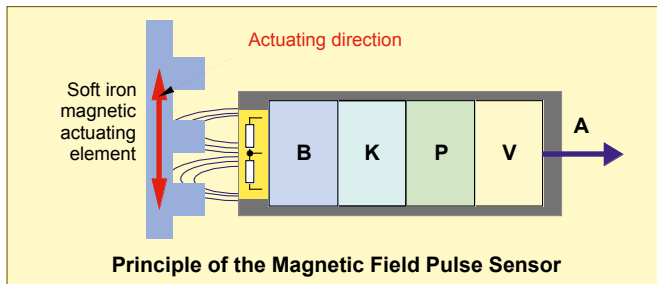


Task

Hall Element (HAD) and Magnetic Field Plate Switches (MAD) are especially suitable for detecting the **rotation speed** and **direction** of shafts using gear wheels from module 0.3 or larger. Thus these sensors can be used as increment generators, for counting tasks, and position control. For example, rack rails can be scanned in order to detect the **speed and direction** of linear motions.

Method of operation

The active element in the HAD and MAD switches is a differential sensor, made of two magnetic field dependent elements (Hall element or field plate) mounted on axially poled permanent magnets. The two sensors are connected in series with a lead connected to the center. Thus the differential sensor is half of the measuring bridge B.



If the switch is not externally influenced, the field lines of the permanent magnet extend symmetrically outwards. Both sensors, permeated by magnetic flux of equal strength, produce equal Hall voltages or resistances respectively.

If a soft iron actuating element approaches the sensing face laterally, the magnetic field is distorted; the field lines become asymmetrical. The resulting unequal Hall voltages or field plate resistances unbalance the bridge B, causing the comparator K to generate a switching signal, which is fed to the push-pull output amplifier V via the level converter P.

Characteristics

Compared to inductive proximity switches, HAD and MAD have an entirely different behaviour, which makes them suitable for special applications. The most important characteristics are the following:

- High switching frequency (up to 25 kHz)
- High geometrical resolution (starting from about module 1)
- For the detection of edges of soft iron (ferrous) metal approaching or passing radially. Not suitable for axial approach or for non-ferrous targets.
- Push-pull output

The magnetic field pulse sensors have generally a preferential actuating direction. During the lateral actuation with a steel lug the status at the sensor output changes depending on the direction from "High" to "Low" and/or from "Low" to "High". After the removal of the flag the status at the output remains the same (self-holding sensor).

In general, the load resistance must be connected in the same way as with an open collector output: To the negative (or positive) terminal. When so connected, the push-pull output quickly discharges the lead capacities, ensuring output pulses with precise edges even with long output lines and high switching frequency. Connecting the load resistances to both positive and negative terminals results in a simple arrangement for monitoring lead breaks.

Notes

For trouble-free operation of magnetic field plate and Hall element switches, the strict observation of the following points is imperative:

- Instructions and sketches concerning material, distances, and mounting
- Mount so that groove on housing is exactly perpendicular to tooth edges
- Keep metal filings away from the sensing surface
- Avoid the use near to strong magnetic fields
- The distance from the connecting leads to inductive loads has to be ≥ 30 cm
- Whenever lead lengths are > 10 m, a shielded lead must be used. The shield must be connected to L - (0 V) at the device end only
- The tooth length should be > 3 mm; magnetic field plate switches are thus unsuitable for the detection of flat grooves.

Versions

Static magnetic field plate proximity switches for the arbitrarily slow motions from 0 Hz, for counting functions, and for positioning.

Dynamic magnetic field plate proximity switches with self-regulating circuit for higher sensitivity (greater switching distance) and stability of the output signals, switching frequency from 1 Hz up.

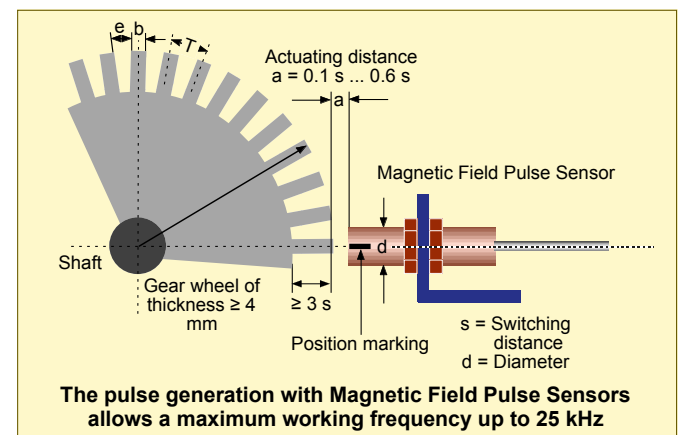
Special versions, e.g. for extended temperature range (e.g. - 40 ... + 100 °C), with LED etc. as well as special designs on request.

Principle of the Magnetic Field Pulse Sensor	Typical switching distance	Actuating frequency
static	1 mm	0 ... 25 kHz
dynamic	2.5 mm	1 Hz ... 25 kHz

Mounting

When mounting the pulse sensor the right mounting position has to be considered. The pulse sensor has a position marking which allows an alignment parallel to the tooth flank and vertical to the actuating direction.

The air gap a (=actuating distance) is calculated from the indicated rated operating distance s minus the sum of all tolerances t (radial play of the gear wheel, bearings, adjustment tolerance): $a = s - \sum t = 0.1 s \dots 0.6 s$.



Accessories and evaluation devices

- Connectors, Chapter 12
- You will find ISN rotation speed measuring relays and IWA frequency-current converters in the ALDIF catalog.

Ø 10.8 mm; 60 mm
PBT / CuZn
- / 1.3 / 1.8 / 2.4 / 2.5 mm; flush

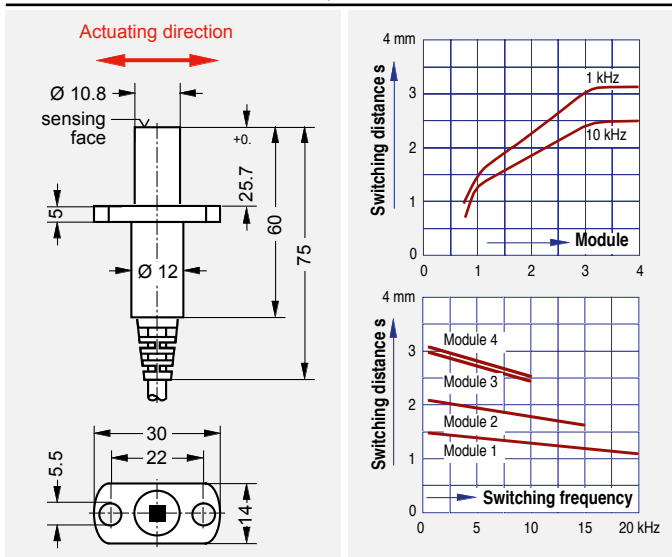
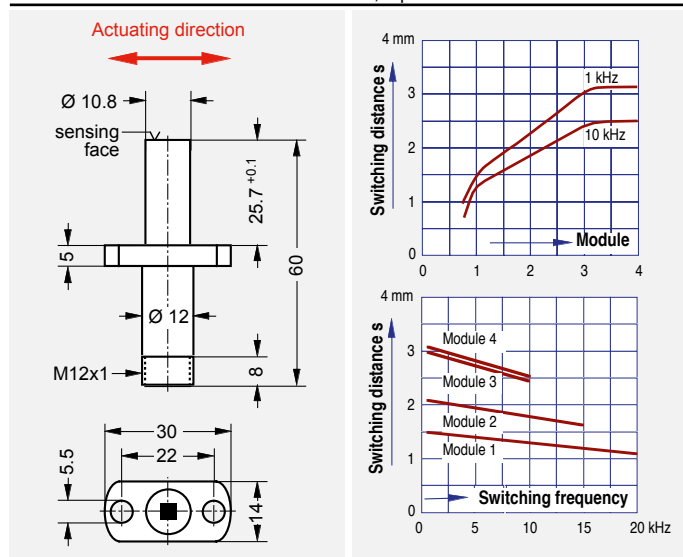
Ø 10.8 mm; 60 mm
PBT / CuZn
- / 1.3 / 1.8 / 2.4 / 2.5 mm; flush

HAD-11ms60b1-5Sd1, 13.26-66 (1)

HAD-11ms60b2.5-50NK1, 13.26-03-020 (2)

5 Hz ... 20 kHz
connector M12; 4 poles

5 Hz ... 20 kHz
lead; 3 wires



10 ... 24 ... 30 V DC
≤ 10 mA
≤ 25 mA

10 ... 24 ... 30 V DC
≤ 10 mA
≤ 50 mA

Voltage drop over the switched output:
load current 0: ≤ 1.5 V
load current 25 mA: ≤ 10 V

Voltage drop over the switched output:
load current 0: ≤ 5 V between the outputs
load current 50 mA: ≤ 2 V between the outputs

75 V DC
- 25 ... + 80 °C

75 V DC
- 25 ... + 80 °C

≤ 150 m

≤ 150 m
NK / 2.0 m / 4 x 0.25 mm²

DC 12
IP 65
II, □

DC 12
IP 67

30 g

30 g + weight of the lead

chapter 12.1

Ø 10.8 mm; 60 mm
PBT / CuZn
0.7 / 1.3 / 1.8 / 2.4 / 2.4 mm; flush

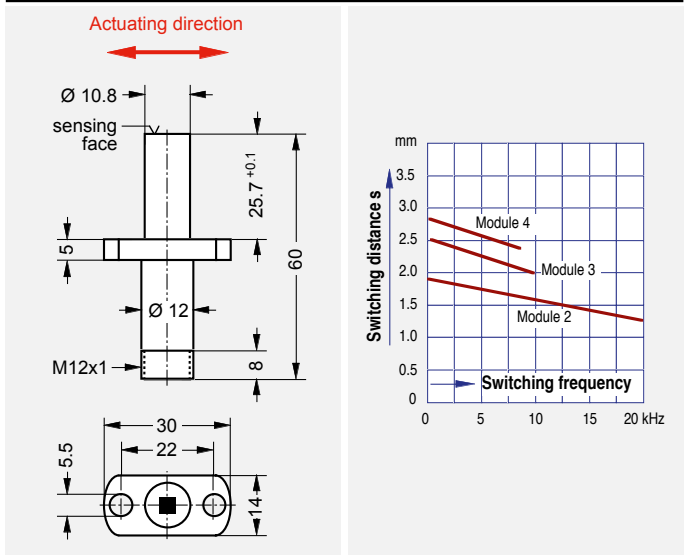
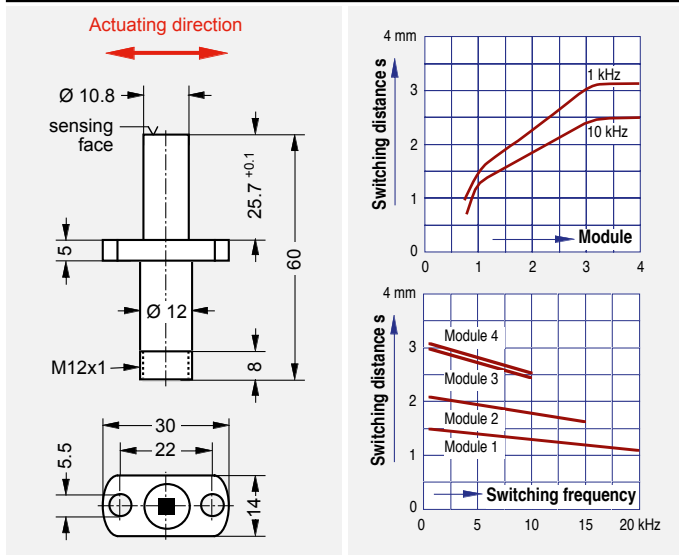
Ø 10.8 mm; 60 mm
PBT / CuZn
- / - / 1.3 / 2.0 / 2.4 mm; flush

HAD-11ms60b2,5-5S1, 13.26-13 (2)

HAD-11ms60b2,5-5S4, 13.26-56 (3)

5 Hz ... 20 kHz
connector M12; 4 poles

1 Hz ... 20 kHz
connector with lead M12; 4 poles

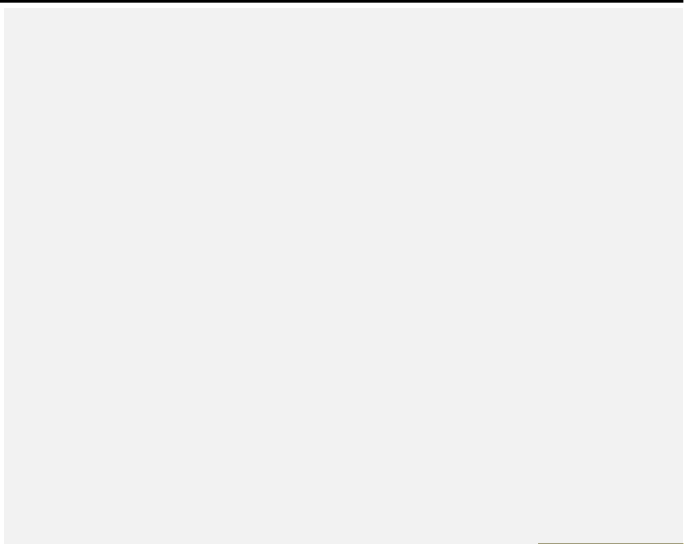
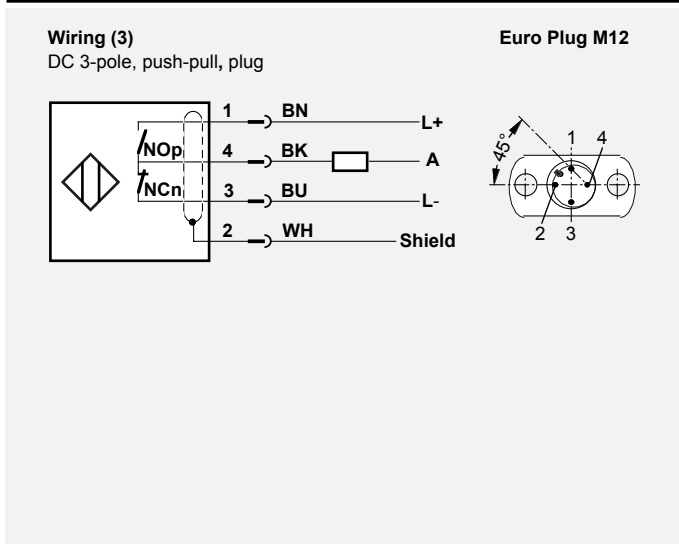


6 ... 24 ... 30 V DC
≤ 10 mA
≤ 25 mA
≤ 1,5 V
≤ 10 V
75 V DC
- 25 ... + 100 °C
≤ 150 m
DC 12
IP 65
II, □
30 g

8 ... 24 ... 30 V DC
≤ 10 mA
≤ 25 mA
≤ 1,5 V
≤ 10 V
75 V DC
- 25 ... + 100 °C
≤ 150 m
DC 12
IP 67
II, □
30 g

chapter 12.1

chapter 12.1



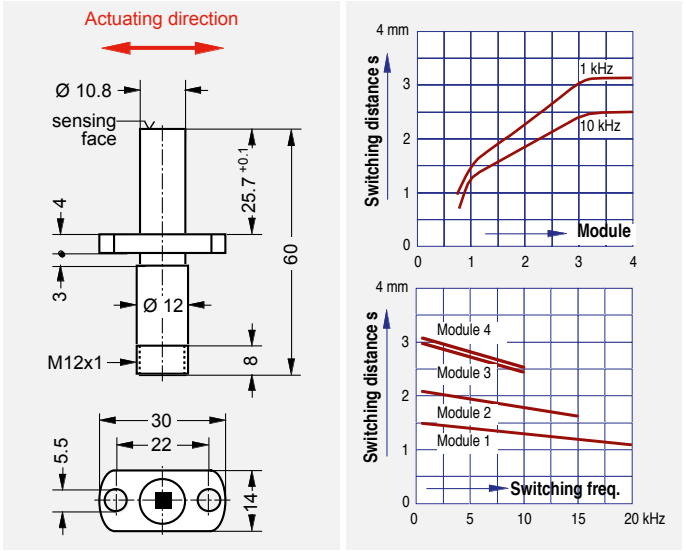
Pulse Sensors, Magnetic Field

Series HAD-11ms, -12aq, -12er

Design; length	Ø 10.8 mm; 60 mm		
Material of the sensing face / of the housing	PBT / CuZn		
Rated operat. distance for gear wheel - modules 0.75 / 1 / 2 / 3 / 4; mounting	- / 1.3 / 1.8 / 2.4 / 2.5 mm; flush		
Type designation, Ref.no. (Wiring)	Switch latching, plus-switching Sp Switch latching, minus-switching Sn Switch latching, plus- and minus-switching Sp + Sn		
	HAD-11ms60b1-5Sd7,	13.32-05	(1)
Switching frequency range	5 Hz ... 20 kHz		
Wiring (connector or lead); number of wires	connector M12; 4 poles		

Common Technical Data	
Reduction factors Fe / Non-ferrous metals	1.0 / 0
Permissible ripple voltage	≤ 10 %
Short-circuit-proof ? (13.32-05)	yes, for ≤ 15 s
Short-circuit-proof ? (13.26-63-020, 13.26-70-020)	yes, for ≤ 20 s
Reverse polarity protection ?	yes

Specific Technical Data	
Permissible operating voltage range	11 ... 24 ... 30 V DC
Current consumption without load	≤ 14 mA
Load current	≤ 25 mA
Residual current (output locked)	Plus-switching ≤ 0.5 mA Minus-switching ≤ 2.5 mA
Voltage drop (output conductive; I _L = 25 mA)	Plus-switching ≤ 12 V Minus-switching ≤ 10 V
Nominal insulation voltage	75 V DC
Ambient temperature range	- 25 ... + 80 °C
Max. lead length	≤ 150 m
Lead type / standard lead length / number of wires x lead cross section	
Utilization category according to IEC 60947-5-2	DC 12
Protection rating according to IEC 60529	IP 65
Protection class	
Permissible torque without / with toothed disc	
Weight	30 g
Recommended accessories	chapter 12.1



For pulse sensors with connector: Please choose the connector and lead you require in Chapter 12, "Accessories". The connector with its lead must be ordered separately.

For pulse sensors with connection lead: The standard lead length is 2 m. Lead lengths are indicated by the digits at the end of the ref. no. (-020 = 2m). On some types other standard lead lengths are indicated.

Certifications

Proximity switches according to standard:
DIN EN 60 947-5-2 (VDE 0660 Part 208).
We are certified according to DIN EN ISO 9001.

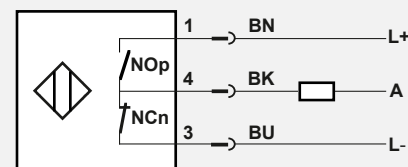


Safety Regulations

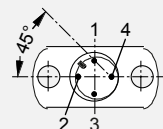
Connection, commissioning and maintenance may only be accomplished by specialists or instructed staff.
Subject to technical changes!

Wiring (1)

DC 3-pole, push-pull, plug

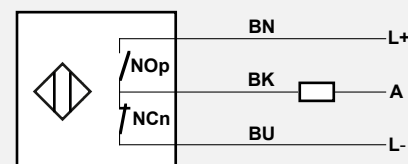


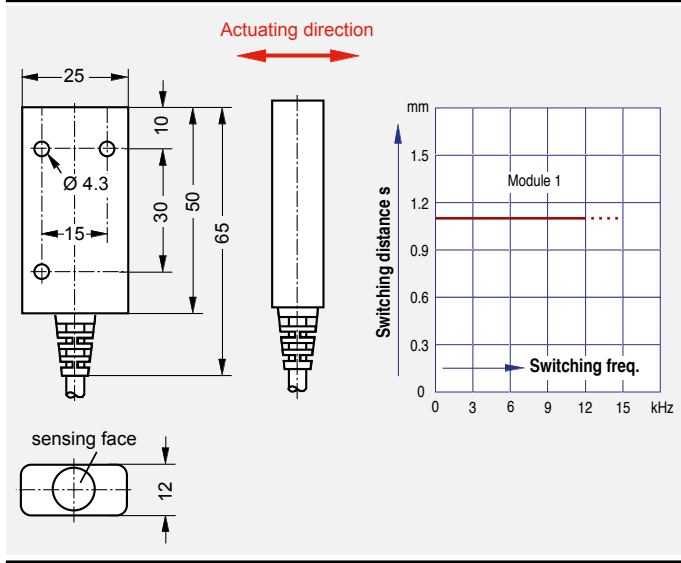
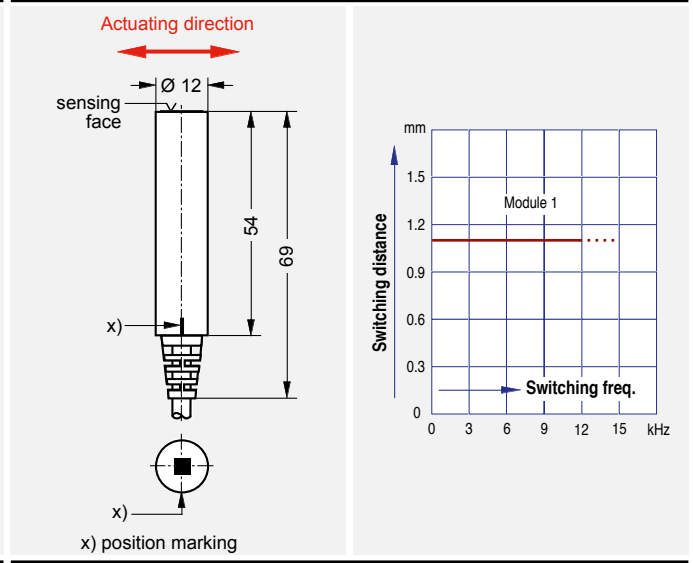
Euro plug M12



Wiring (2)

DC 3-pole, push-pull, outgoing lead



<p>□ 25 mm x 12 mm; 50 mm PBT / aluminium - / 1.0 / - / - mm; flush</p>	<p>○ 12 mm; 55 mm PBT / stainless steel - / 1.0 / - / - mm; flush</p>
<p>HAD-12aq50b1-5NK1, 13.26-63-020 (2)</p>	<p>HAD-12er55b1-5PK1, 13.26-70-020 (2)</p>
<p>0 ... 12 kHz lead; 3 wires</p>	<p>0 ... 12 kHz lead; 3 wires</p>
	
<p>10 ... 24 ... 30 V DC ≤ 25 mA ≤ 25 mA</p>	<p>10 ... 24 ... 30 V DC ≤ 25 mA ≤ 25 mA</p>
<p>Voltage drop over the switched output: load current 0: ≤ 1.5 V load current 25 mA: ≤ 10 V</p>	<p>Voltage drop over the switched output: load current 0: ≤ 1.5 V load current 25 mA: ≤ 10 V</p>
<p>75 V DC - 25 ... + 80 °C</p>	<p>75 V DC - 25 ... + 80 °C</p>
<p>≤ 150 m NK / 2.0 m / 3 x 0.34 mm²</p>	<p>≤ 150 m PK / 2.0 m / 3 x 0.34 mm²</p>
<p>DC 12 IP 67 II, □</p>	<p>DC 12 IP 67 II, □</p>
<p>40 g + weight of the lead</p>	<p>25 g + weight of the lead</p>

Ø 12 mm; 55 mm	Ø M12 x 1; 70 mm
PBT / stainless steel	PBT / CuZn nickel-plated
- / 1.3 / 1.8 / 2.4 / 2.5 mm; flush	0.7 / 1.3 / 1.8 / 2.4 / - mm; flush
HAD-12er55b2,5-5NK1, 13.26-38-020 (1)	HAD-12mg50b2,5-5ND1, 13.26-06-020 (2)
1 Hz ... 20 kHz	5 Hz ... 20 kHz
lead; 3 wires	lead; 3 wires
10 ... 24 ... 30 V DC	6 ... 24 ... 30 V DC
≤ 10 mA	≤ 10 mA
≤ 50 mA	≤ 25 mA
≤ 1.5 V	≤ 1.5 V
≤ 10 V	≤ 10 V
75 V DC	75 V DC
- 25 ... + 80 °C	- 25 ... + 80 °C
≤ 150 m	≤ 150 m
NK / 2.0 m / 3 x 0.34 mm ²	ND / 2.0 m / 3 x 0.34 mm ²
DC 12	DC 12
IP 67	IP 67
II, ☐	II, ☐
9 Nm / 30 Nm	9 Nm / 30 Nm
25 g + weight of the lead	25 g + weight of the lead

Note: This sensor is also suitable for the detection of metal profiles coated e.g. with synthetic material or rubber

O M12 x 1; 70 mm

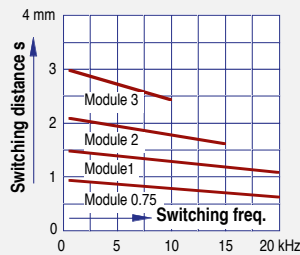
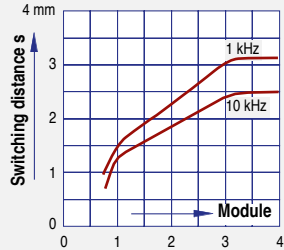
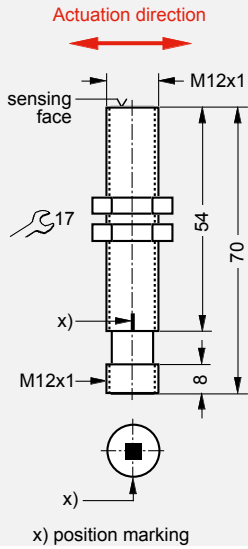
PBT / CuZn nickel plated

0.7 / 1.3 / 1.8 / 2.4 / - mm; flush

HAD-12mg70b2,5-5S3, 13.26-74 (2)

1 Hz ... 20 kHz

connector M12; 4 poles



6 ... 24 ... 30 V DC

≤ 10 mA

≤ 25 mA

≤ 1.5 V

≤ 10 V

75 V DC

- 25 ... + 100 °C

≤ 150 m

DC 12

IP 65

9 Nm / 30 Nm

30 g

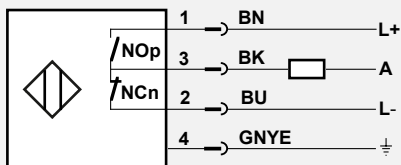
chapter 12.1

O 14 mm; 120 mm	O 16 mm; 96 mm
PBT / stainless steel	PBT / steel
- / 1.0 / - / - / - mm; flush	- / 0.8 / 1.3 / 1.6 / 1.6 mm; flush
HAD-14er120b1-5TT3, 13.26-79-030 (2)	HAD-16ss96b1-5Yd1, 13.26-73 (3)
0 ... 12 kHz	0 ... 12 kHz
lead; 3 wires	connector Euchner SD-4; 4 poles
10 ... 24 ... 30 V DC	10 ... 24 ... 30 V DC
≤ 25 mA	≤ 25 mA
≤ 25 mA	≤ 25 mA
≤ 1.5 V	≤ 1.5 V
≤ 10 V	≤ 10 V
75 V DC	75 V DC
- 25 ... + 100 °C	- 25 ... + 100 °C
≤ 150 m	≤ 150 m
TT / 3.0 m / 2 x 0.34 mm ²	
shielded Teflon lead	
DC 12	DC 12
IP 67	IP 65
II, ⊕	II, ⊕
160 g + weight of the lead	210 g

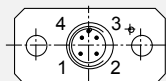
chapter 12.1

Wiring (3)

DC 4-pole, push-pull, plug



Euchner plug SD4



O M18 x 1; 82 mm
PBT / CuZn nickel-plated
- / 1 / - / - mm; flush

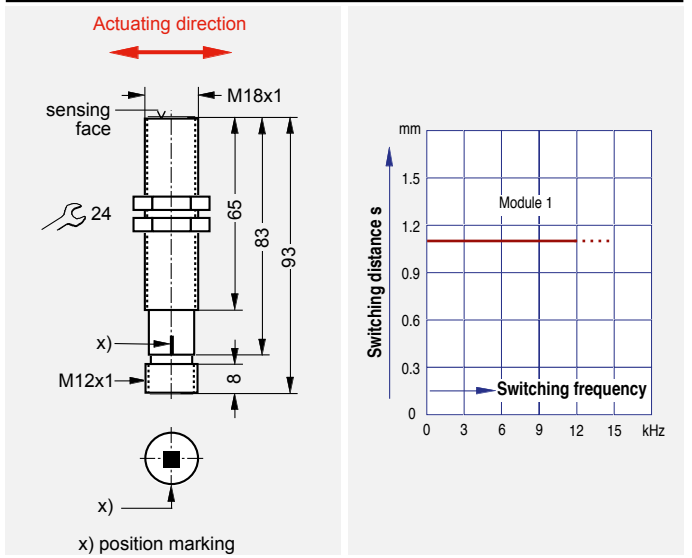
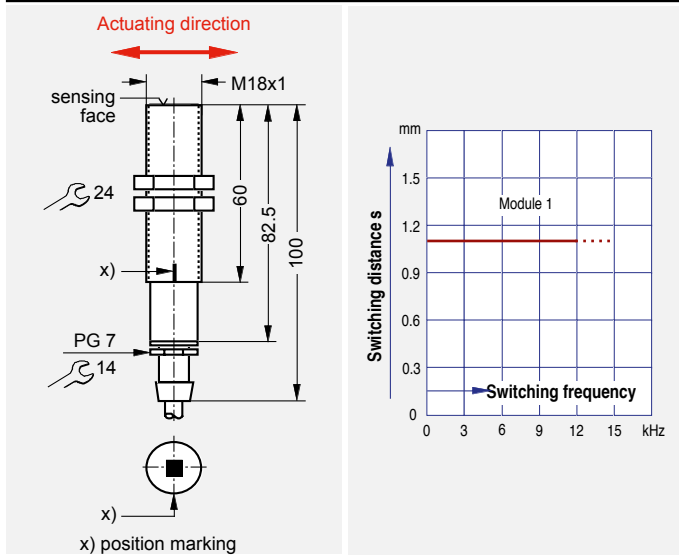
O M18 x 1; 93 mm
PBT / CuZn nickel-plated
- / 1 / - / - mm; flush

HAD-18mg82b1-5NT1, 13.26-69-020 (2)

HAD-18mg93b1-5Sd1, 13.26-68 (3)

0 Hz ... 12 kHz
lead; 3 wires

0 ... 12 kHz
connector M12; 4 poles



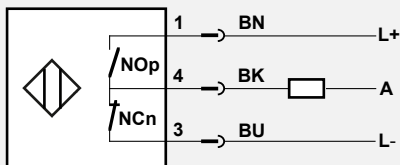
10 ... 24 ... 30 V DC
≤ 25 mA
≤ 25 mA
≤ 1.5 V
≤ 10 V
75 V DC
- 25 ... + 100 °C
≤ 150 m
NT / 2.0 m / 3 x 0.75 mm²
DC 12
IP 67
II, □
34 Nm / 70 Nm
150 g + weight of the lead

10 ... 24 ... 30 V DC
≤ 25 mA
≤ 25 mA
≤ 1.5 V
≤ 10 V
75 V DC
- 25 ... + 80 °C
≤ 150 m
DC 12
IP 65
II, □
34 Nm / 70 Nm
160 g

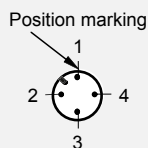
chapter 12.1

Wiring (3)

DC 3-pole, push-pull, plug



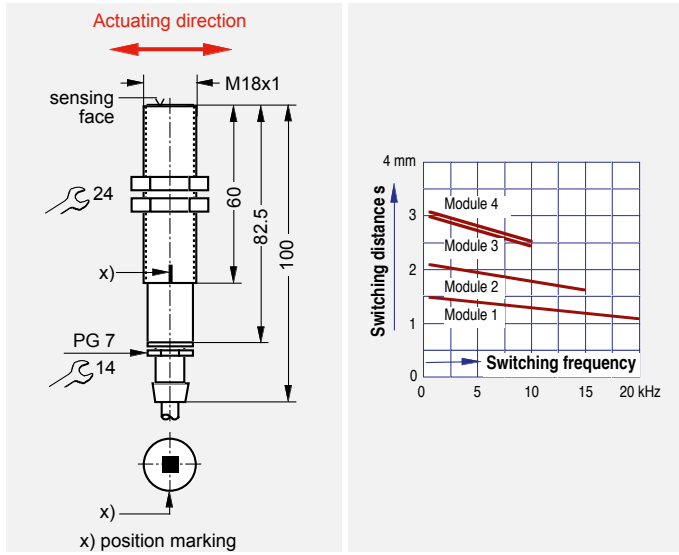
Euro Plug M12



O M18 x 1; 80 mm
PBT / steel
- / 1.3 / 1.8 / 2.4 / 2.5 mm; flush

HAD-18sg80b2,5-5TK1, 13.26-50-020 (3)

1 Hz ... 20 kHz
lead; 3 wires



8 ... 24 ... 30 V DC
≤ 10 mA
≤ 25 mA

≤ 1.5 V
≤ 10 V

75 V DC
- 40 ... + 100 °C

≤ 150 m
TK / 2.0 m / 3 x 0.75 mm²

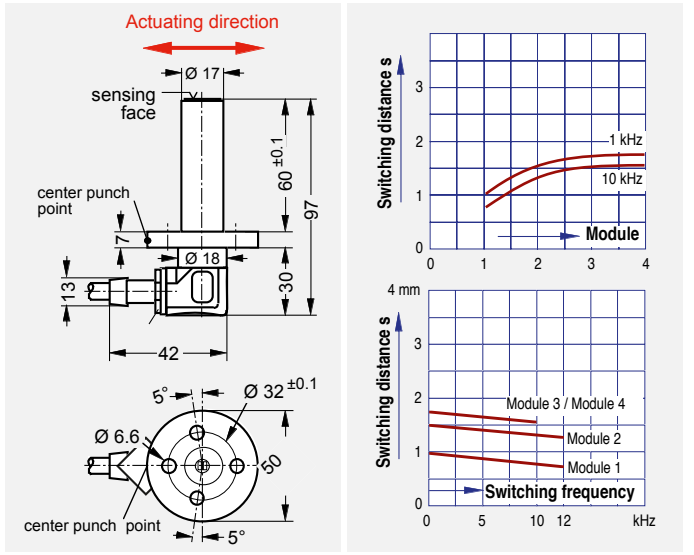
DC 12
IP 67
II, II

40 Nm / 80 Nm
110 g + weight of the lead

O 17 mm; 100 mm
PBT / steel
- / 0.8 / 1.3 / 1.6 / 1.6 mm; flush

HAD-18ss100b1,6-5NT1, 13.26-65-005 (3)

0 ... 12 kHz
lead; 3 wires



10 ... 24 ... 30 V DC
≤ 25 mA
≤ 25 mA

≤ 1.5 V
≤ 10 V

75 V DC
- 25 ... + 100 °C

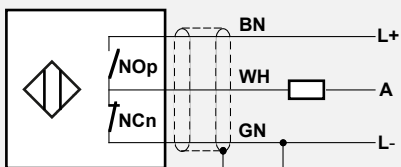
≤ 150 m
NT / 0.5 m / 3 x 0.5 mm²

DC 12
IP 67

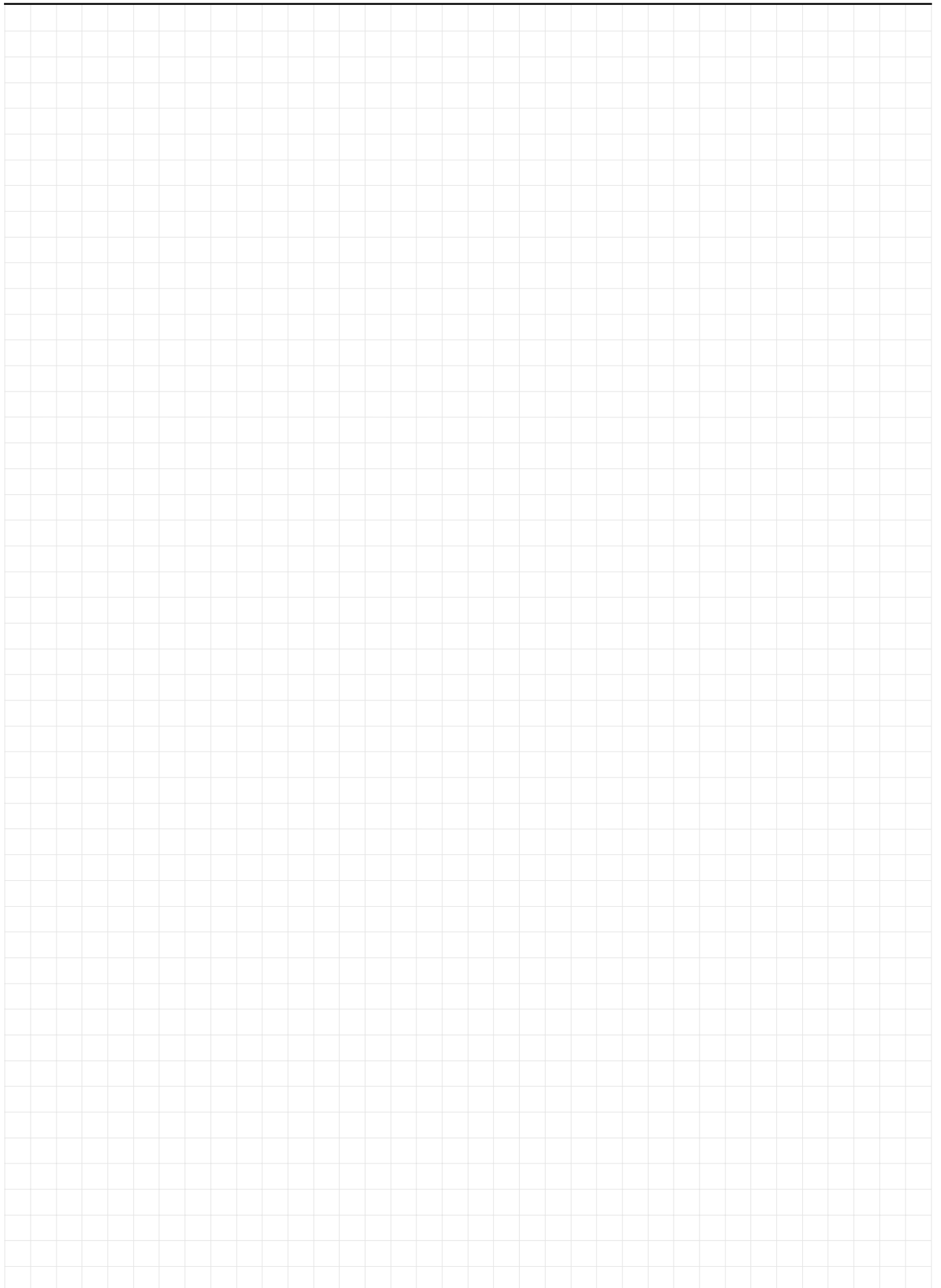
170 g + weight of the lead

Wiring (3)

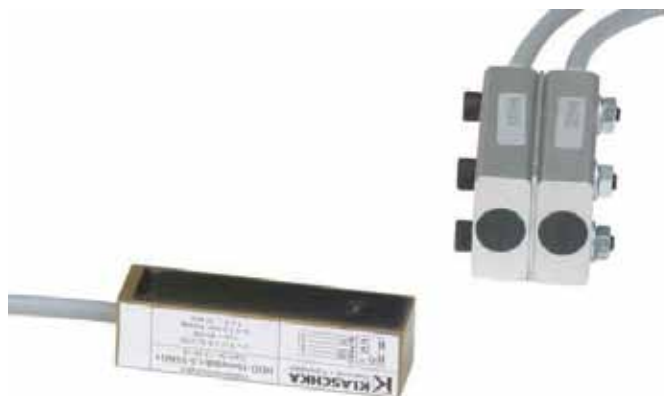
DC 3-pole, push-pull, outgoing lead



Notes



Characteristics



Double pulse sensors of the type **magnetic field** are suitable for the generation of rotation- or speed-proportional, phase-shifted pulse sequences. From the order in which the pulses appear the user can detect the direction of rotation and/or direction of motion. For these sensors, static Hall or magneto-resistive elements can be used as sensing elements.

The double pulse sensors described here have been optimized for the scanning of specific racks and magnet wheels. We also manufacture and develop an individual system solution for your specific requirements.

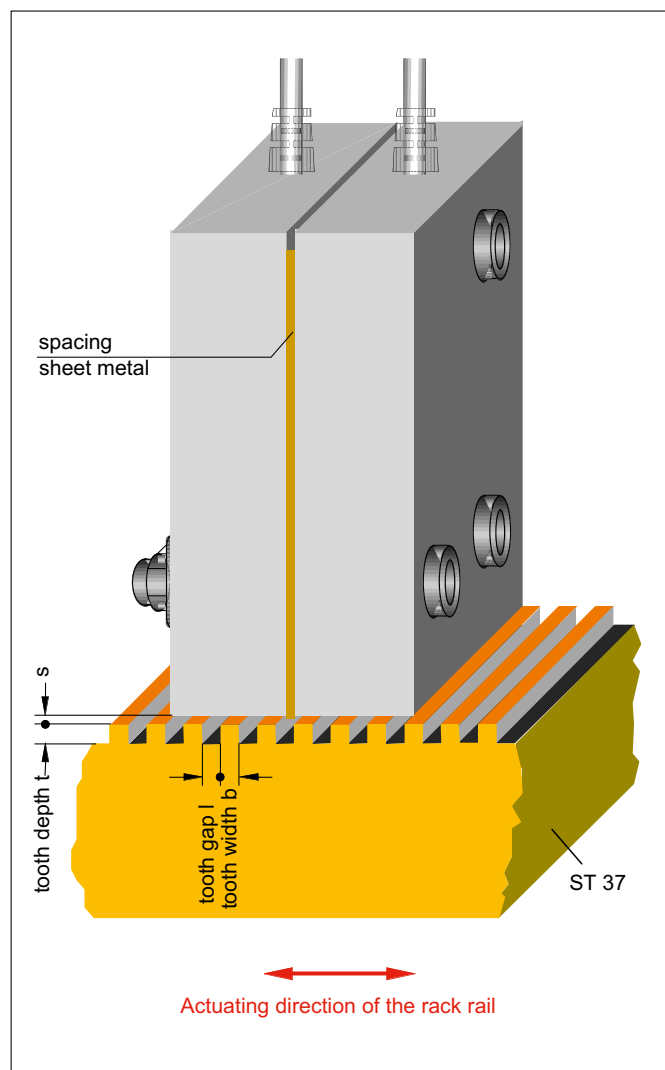
Gearwheels or racks made of ferromagnetic steel (e.g. St 37) or magnetised **pole belts, bars** and **wheels** are used as actuating elements.

When **mounting** the double pulse sensors the **mounting position** has to be considered. Please take the minimum width of the actuating element and information regarding the assembly of the sensor from the respective data sheets.

Mounting has to be accomplished in such a way that a vibration of the double pulse sensor and/or the actuating element is reliably prevented.

Double Pulse Sensors, Type Magnetic Field

Type	Ref. No.	Switching distance in mm Mounting *)
HALL		
rectangular 25 x 12 x L		
HDD-12aq50b0,4-55NK1	13.26-58-020	1.0 b
magneto-resistive		
rectangular		
MDD-12aq50b0,4-55NK2	13.21-51-020	1.0 b
MDD-12aq50b0,4-55NK3	13.21-58-020	1.0 b

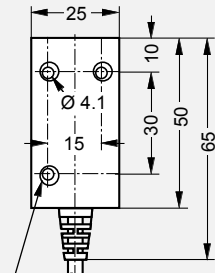


*) b = flush mounting, n = non-flush mounting

□ 25 mm x 12 mm; 50 mm
PBT / Al
s = 0.4 mm; flush

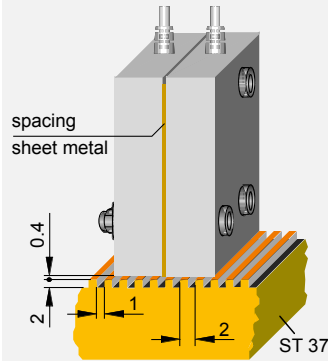
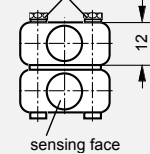
HDD-12aq50b0,4-55NK1, 13.26-58-020 (2)

0 ... 12 kHz
lead; 3 wires



hex socket head screws
M4 x 30 DIN 912

hex nuts DIN 934



Actuating direction of the rack rail

Rack rail
tooth width $b = 1$ mm
tooth gap $l = 1$ mm
tooth depth $t = 2$ mm

10 ... 24 ... 30 V DC
 ≤ 25 mA per sensor part
 ≤ 25 mA per sensor part

≤ 1.5 V

≤ 10 V

75 V DC

- 25 ... + 75 °C

≤ 150 m

NK / 2.0 m / 3 x 0.34 mm²

DC 12

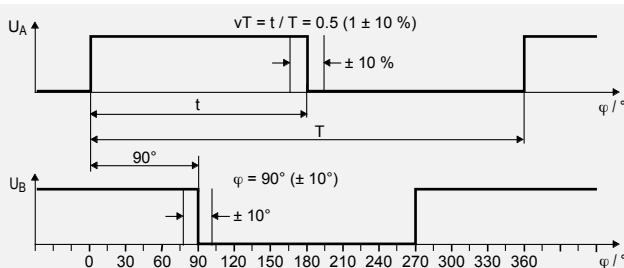
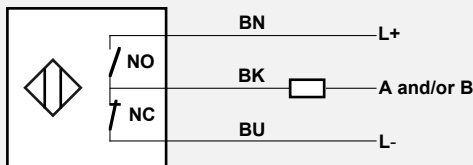
IP 67

II, □

90 g + weight of the lead

Wiring (2)

For each sensor: DC 3-pole, push-pull, outgoing lead



Double Pulse Sensors, Magnetic Field

Series MDD-12aq

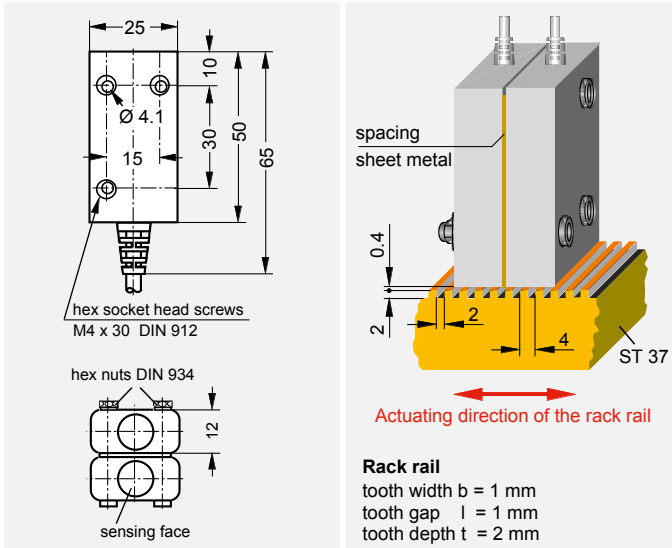
Design; length	□ 25 mm x 12 mm; 50 mm
Material of the sensing face / of the housing	CuZn / aluminium
Rated operat. distance s; mounting	s = 0.4 mm (s = 0.2 mm for minor tooth depths); flush

Type designation, Ref. no. (Wiring)	Switch latching, plus-switching Sp	Sp
	Switch latching, minus-switching Sn	Sn
	Switch latching, plus- and minus-switching Sp + Sn	Sp + Sn
Maximum Switching frequency	0 ... 10 kHz	
Connection (connector or lead); number of wires	lead; 3 wires	

MDD-12aq50b0,4-55NK2,	13.21-51-020	(1)
-----------------------	--------------	-----

Common Technical Data	
Reduction factors Fe / Non-ferrous metals	1.0 / 0
Permissible ripple voltage	≤ 10 %
Short-circuit-proof ?	yes, for ≤ 20 s
Reverse polarity protection ?	yes

Spezifische Technische Daten	
Permissible operating voltage range	10 ... 24 ... 30 V DC
Current consumption without load	≤ 25 mA per sensor part
Load current	≤ 25 mA per sensor part
Voltage drop over the switched output	
- at load current 0	≤ 1.5 V
- at load current 25mA	≤ 10 V
Nominal insulation voltage	75 V DC
Ambient temperature range	- 25 ... + 75 °C
Max. lead length at 10 kHz	15 m
Lead type / standard lead length / number of wires x lead cross section	NK / 2.0 m / 3 x 0.34 mm ²
Utilization category according to IEC 60947-5-2	DC 12
Protection rating according to 60529	IP 67
Protection class	II, □
Permissible torque without / with toothed disc	
Weight	90 g + weight of the lead
Recommended accessories	



For pulse sensors with connector: Please choose the connector and lead you require in Chapter 12, "Accessories". The connector with its lead must be ordered separately.

For pulse sensors with connection lead: The standard lead length is 2 m.

Lead lengths are indicated by the digits at the end of the ref. no. (-020 = 2m). On some types other standard lead lengths are indicated.

Certifications

Proximity switches according to standard:
DIN EN 60947-5-2 (VDE 0660 Part 208).

We are certified according to DIN EN ISO 9001.



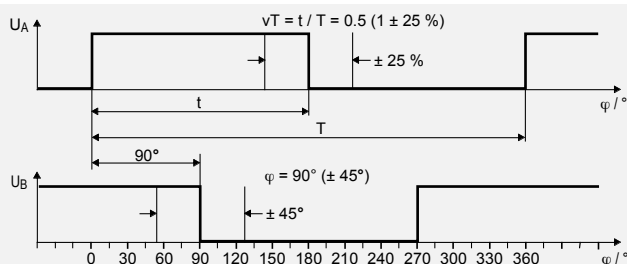
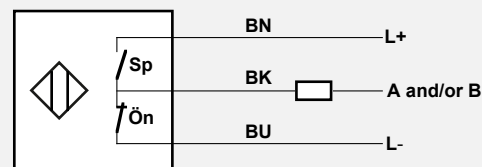
Safety Regulations

Connection, commissioning and maintenance may only be accomplished by specialists or instructed staff.

Subject to technical changes!

Wiring (1)

For each sensor: DC 3-pole, push-pull, outgoing lead



□ 25 mm x 12 mm; 50 mm

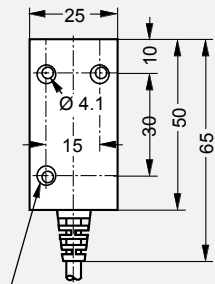
CuZn / aluminium

s = 0.4 mm (s = 0.2 mm for minor tooth depths); flush

MDD-12aq50b0,4-55NK3, 13.21-58-020 (1)

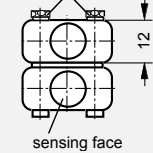
0 ... 10 kHz

lead; 3 wires

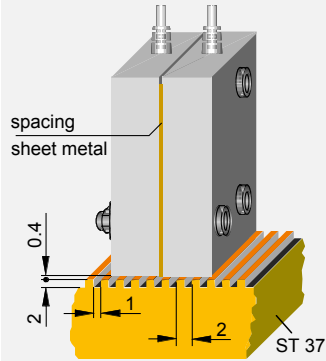


hex socket head screws
M4 x 30 DIN 912

hex nuts DIN 934



sensing face



Actuating direction of the rack rail

Rack rail
tooth width b = 1 mm
tooth gap l = 1 mm
tooth depth t = 2 mm

10 ... 24 ... 30 V DC

≤ 25 mA per sensor part

≤ 25 mA per sensor part

≤ 1.5 V

≤ 10 V

75 V DC

- 25 ... + 75 °C

15 m

NK / 2.0 m / 3 x 0.34 mm²

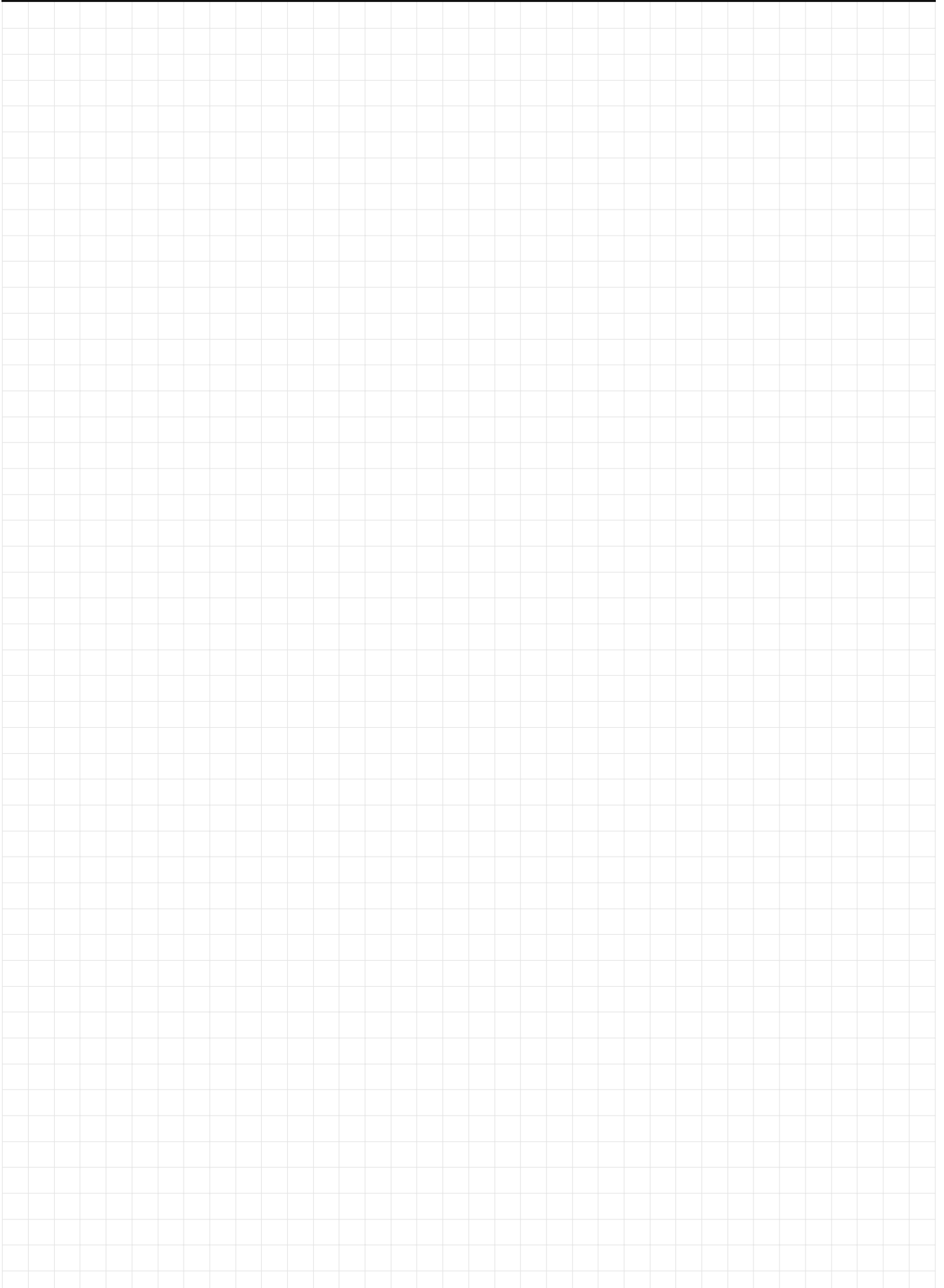
DC 12

IP 67

II, □

90 g + weight of the lead

Notes



Cordsets with sockets



Field attachable connectors



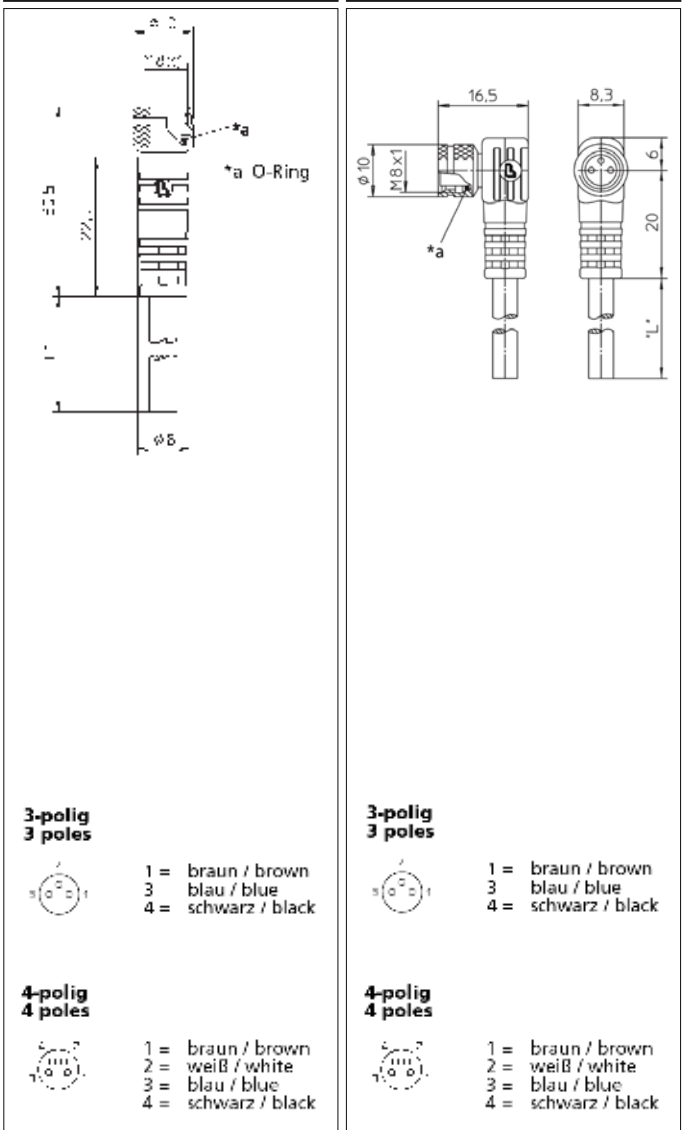
Cordset with socket and plug



Accessories for Sensors

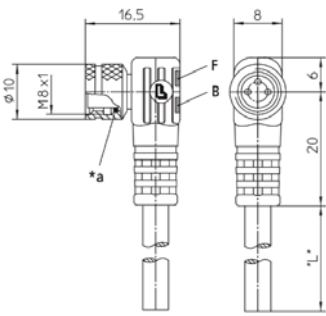
Cordsets with M8 and M12 connectors, ready-for-use

Connector	lead M8	lead socket M8
Version; pole number;	straight; 3- and 4-pole	angled; 3- and 4-pole
Material: Housing / insulating body / contact carrier	TPU; self-extinguishing	TPU; self-extinguishing
Flange	CuZn nickel-plated	CuZn nickel-plated
Contact material and surface	CuZn gold-plated	CuZn gold-plated
Connection type	lead firmly assembled, moulded	lead firmly assembled, moulded
Manufacture	Lumberg RKMV	Lumberg RKMWW



Type designation *)	JSM8U3 / LN3x0,34u5,0OG	JSM8V3 / LN3x0,34u5,0OG
Ref. no. for lead length 2 m; 5 m; 10 m; on request *)	13.97-01-020; -050; -100; -xxx *)	13.97-05-020; -050; -100; -xxx *)
Nominal voltage at 40 °C; contact resistance	60 V; 4 A; ≤ 5 mΩ	60 V; 4 A; ≤ 5 mΩ
Material of lead jacket; lead colour	PVC; OG	PVC; OG
Lead diameter; number of single cores x cross section	5.0 mm; 3 x 0.34 mm ²	5.0 mm; 3 x 0.34 mm ²
Number of LEDs and colour	0	0
Protection rating acc. to IEC 60529 (screw locked); shield	IP 67; unshielded	IP 67; unshielded
Ambient temperature range	- 25 ... + 80 °C	- 25 ... + 80 °C
Type designation *)	JSM8U4 / LN4x0,25u5,0OG	JSM8V4 / LN4x0,25u5,0OG
Ref. no. for lead length 2 m; 5 m; 10 m; on request *)	13.97-03-020; -050; -100; -xxx *)	13.97-07-020; -050; -100; -xxx *)
Nominal voltage at 40 °C; contact resistance	30 V; 4 A; ≤ 5 mΩ	30 V; 4 A; ≤ 5 mΩ
Material of lead jacket; lead colour	PVC; OG	PVC; OG
Lead diameter; number of single cores x cross section	5.0 mm; 4 x 0.25 mm ²	5.0 mm; 4 x 0.25 mm ²
Number of LEDs and colour	0	0
Protection rating acc. to IEC 60529 (screw locked); shield	IP 67; unshielded	IP 67; unshielded
Ambient temperature range	- 25 ... + 80 °C	- 25 ... + 80 °C

lead socket M8 with indicator angled; 3-pole	lead socket M12 straight; 3- and 4-pole	lead socket M12 angled; 3- and 4-pole	lead socket M12 with indicator angled; 3- and 4-pole
TPU; self-extinguishing	TPU; self-extinguishing	TPU; self-extinguishing	TPU; self-extinguishing
CuZn nickel-plated	CuZn nickel-plated	CuZn nickel-plated	CuZn nickel-plated
CuZn gold-plated	CuSn gold-plated	CuSn nickel sublayer a. 0,3 µm gold-plat.	CuSn gold-plated
lead firmly assembled, moulded	lead firmly assembled, moulded	lead firmly assembled, moulded	lead firmly assembled, moulded
Lumberg RKMVV/LED	Binder, Lumberg RKT	Lumberg RKWT	Binder, Lumberg RKWT/LED




*a O-Ring
O-ring

B Betriebsanzeige grün
operation indicator green

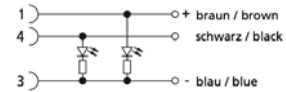
F Funktionsanzeige gelb
function indicator yellow

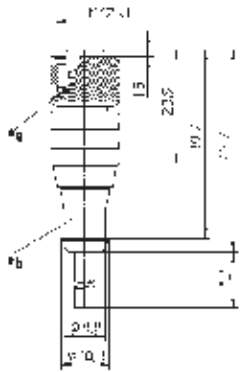
3-polig
3 poles




1 = braun / brown
3 = blau / blue
4 = schwarz / black

A pnp-Schließer /
pnp Normally open =
gelb-grün / yellow-green






3-polig
3 poles

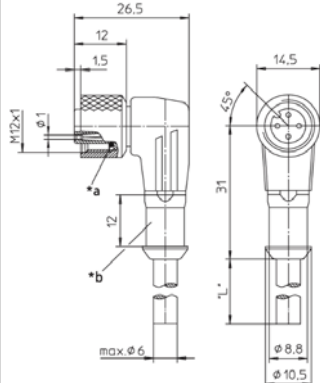


1 = braun / brown
2 = n.c.
3 = blau / blue
4 = schwarz / black

4-polig
4 poles




1 = braun / brown
2 = weiß / white
3 = blau / blue
4 = schwarz / black




*a O-Ring
*b Schutzschlauchmontage
protective hose mounting

3-polig
3 poles

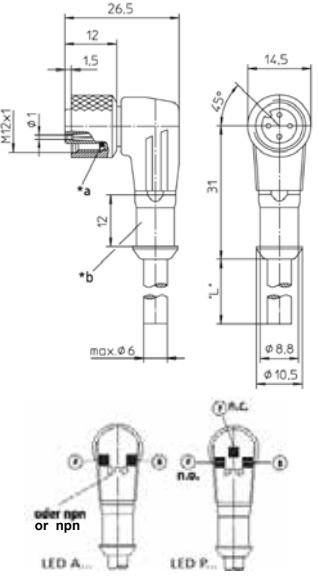


1 = braun / brown
2 = n.c.
3 = blau / blue
4 = schwarz / black

4-polig
4 poles

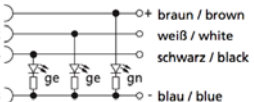


1 = braun / brown
2 = weiß / white
3 = blau / blue
4 = schwarz / black



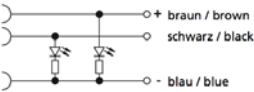
*a O-Ring
*b Schutzschlauchmontage
B Betriebsanzeige grün
F Funktionsanzeige gelb

P pnp-Öffner/-Schließer /
pnp-Normally closed/open =
gelb-gelb-grün (Antivalent) /
yellow-yellow-green



1) 2) 3) 4) + braun / brown
- weiß / white
- schwarz / black
- blau / blue

A pnp-Schließer /
pnp Normally open =
gelb-grün / yellow-green

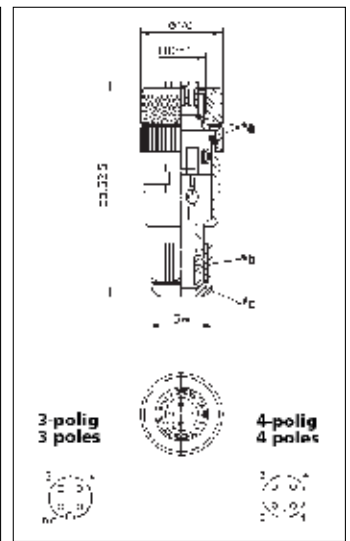
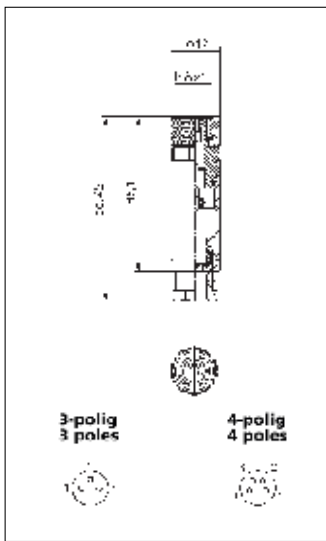


JSM8V3gy / LN3x0,34u5,00G 13.97-09-020; -050; -100; -xxx *) 10 ... 30 V DC; 4 A; ≤ 5 mΩ PVC; OG 5.0 mm; 3 x 0.34 mm ² 1 LED GN + 1 LED YE IP 67; unshielded - 25 ... + 80 °C	JSM12U3 / LN3x0,34u5,00G 13.97-11-020; -050; -100; -xxx *) 240 V; 4 A; ≤ 5 mΩ PVC; OG 5.0 mm; 3 x 0.34 mm ² 0 IP 67; unshielded - 25 ... + 80 °C	JSM12V3 / LN3x0,34u5,00G 13.97-24-020; -050; -100; -xxx *) 240 V; 4 A; ≤ 5 mΩ PVC; OG 5.0 mm; 3 x 0.34 mm ² 0 IP 67; unshielded - 25 ... + 80 °C	JSM12V3gy / LN3x0,34u5,00G 13.97-17-020; -050; -100; -xxx *) 10 ... 30 V DC; 4 A; ≤ 5 mΩ PVC; OG 5.0 mm; 3 x 0.34 mm ² 1 LED GN + 1 LED YE IP 67; unshielded - 25 ... + 80 °C
JSM12U4 / LN4x0,25u5,00G 13.97-13-020; -050; -100; -xxx *) 240 V; 4 A; ≤ 5 mΩ PVC; OG 5.0 mm; 4 x 0.25 mm ² 0 IP 67; unshielded - 25 ... + 80 °C	JSM12V4 / LN4x0,25u5,00G 13.97-21-020; -050; -100; -xxx *) 240 V; 4 A; ≤ 5 mΩ PVC; OG 5.0 mm; 4 x 0.25 mm ² 0 IP 67; unshielded - 25 ... + 80 °C	JSM12V4gy / LN4x0,25u5,00G 13.97-19-020; -050; -100; -xxx *) 10 ... 30 V DC; 4 A; ≤ 5 mΩ PVC; OG 5.0 mm; 4 x 0.25 mm ² 1 LED GN + 2 LED YE IP 67; unshielded - 25 ... + 80 °C	

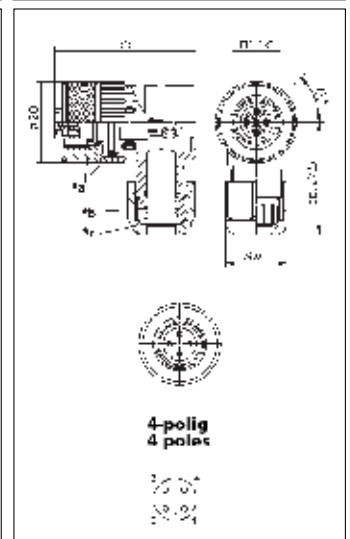
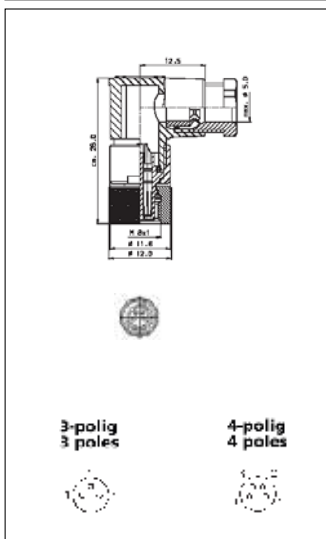
Accessories for Sensors

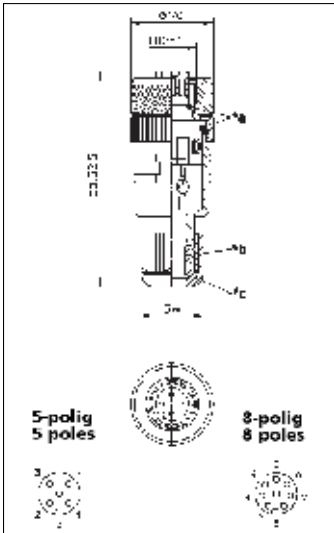
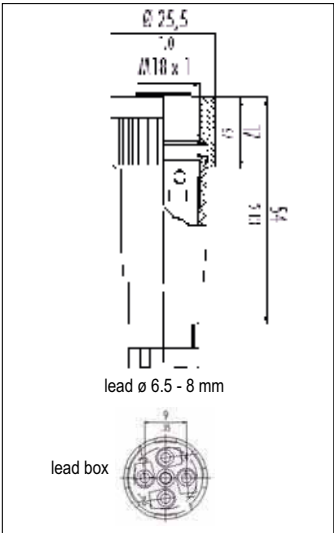
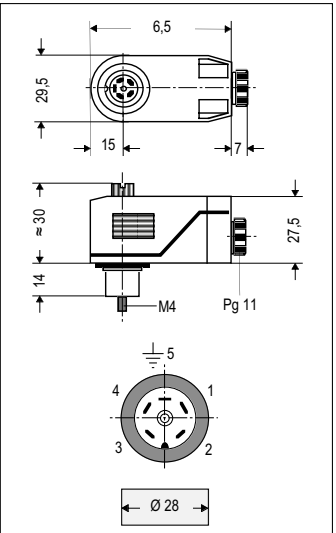
Field attachable sockets

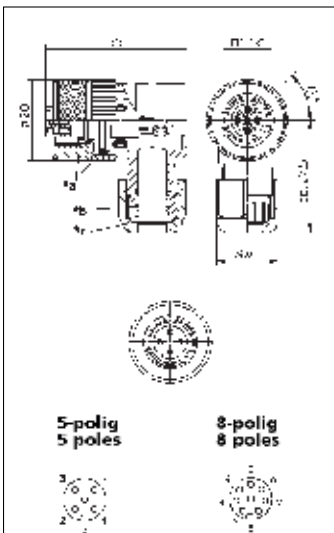
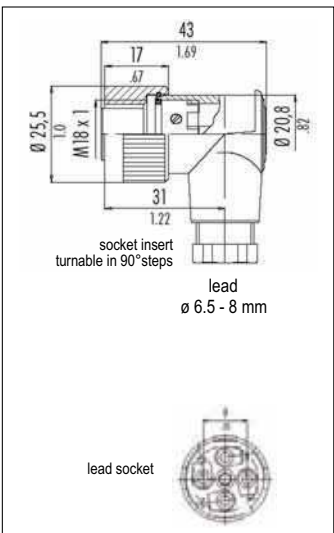
Connector; type of lead connection	lead socket M8; screwable	lead socket M12; screwable
Version	straight	straight
Pole number: Type designation; ref. no.	3-pole: JSM8U3; 13.98-01	4-pole: JSM12U4; 13.98-06
Pole number: Type designation; ref. no.	4-pole: JSM8U4; 13.98-02	
Material: Housing / insulating body / contact carrier	PA / PA / TPU; self-extinguishing	PA / PA / PA
Flange	CuZn nickel-plated	CuZn nickel-plated
Contact material and surface	CuZn gold-plated	CuZn gold-plated
Nominal voltage; nominal current at 40 °C; contact resistance	60 V (4-pol. 30 V); 4 A; ≤ 5 mΩ	240 V; 4 A; ≤ 5 mΩ
Number of LED's and colour	0	0
Lead diameter	3.5 ... 5.0 mm	3.0 ... 6.5 mm
Recommended: Number of single cores x cross section	3 / 4 x 0.34 mm ²	3 / 4 x 0.34 mm ²
Protection rating acc. to IEC 60529 (screw locked)	IP 67	IP 67
Ambient temperature range	- 40 ... + 85 °C	- 25 ... + 90 °C
Manufacture	Lumberg RKMCK	Lumberg RKC



Connector; type of lead connection	socket M8; screwable	socket M12; screwable
Version	angled	angled
Pole number: Type designation; ref. no.	3-pole: JSM8V3; 13.98-03	4-pole: JSM12V4; 13.98-08
Pole number: Type designation; ref. no.	4-pole: JSM8V4; 13.98-04	
Material: Housing / insulating body / contact carrier	PBT / PBT / PA	PA / PA / PA
Flange	CuZn	CuZn nickel-plated
Contact material and surface	CuSn gold-plated	CuZn gold-plated
Nominal voltage; nominal current at 40 °C; contact resistance	60 V (4-pol. 30 V); 4 A; ≤ 5 mΩ	240 V; 4 A; ≤ 5 mΩ
Number of LED's and colour	0	0
Lead diameter / PG-thread	3.5 ... 5.0 mm	3.0 ... 6.5 mm
Recommended: Number of single cores x cross section	3 / 4 x 0.34 mm ²	3 / 4 x 0.34 mm ²
Protection rating acc. to IEC 60529 (screw locked)	IP 67	IP 67
Ambient temperature range	- 40 ... + 85 °C	- 25 ... + 90 °C
Manufacture	Lumberg RKMCKW	Lumberg RKCW



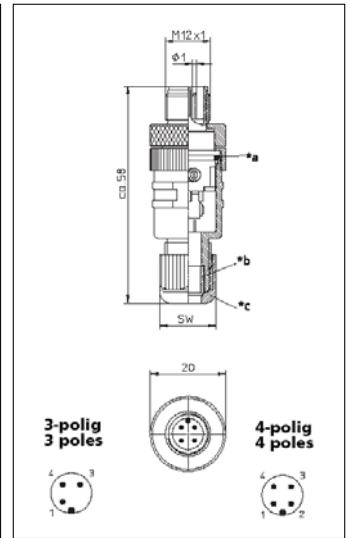
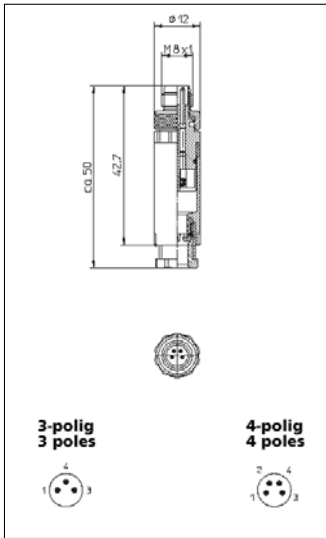
lead socket M12; screwable straight	lead socket M18; screwable straight	socket V28; screwable angled	
5-pole: JSM12U5; 13.98-09	4-pole: JSM18U4; 13.98-13	5-pole: JSV28V5; 13.98-19	
8-pole: JSM12U8; 13.98-10			
PA / PA / PA	PA / PA / PA		
CuZn nickel-plated	CuZn		
CuZn gold-plated	CuZn		
60 V (8-pol. 30 V); 4 A (8-pol. 2 A); ≤ 5 mΩ	250 V; 5 A; ≤ 8 mΩ		
0	0		
3.0 ... 6.5 mm	3.0 ... 6.5 mm		
5 / 8 x 0.34 mm ²	4 x 0.34 mm ²		
IP 67	IP 65		
- 25 ... + 90 °C	- 40 ... + 85 °C		
Lumberg RKC	Binder series 714	Binder	
			

socket M12; screwable angled	socket M18; screwable angled		
5-pole: JSM12V5; 13.98-11	4-pole: JSM18V4; 13.98-14		
8-pole: JSM12V8; 13.98-12			
PA	PBT / PA / PA		
CuZn nickel-plated	CuZn		
CuSn gold-plated	CuZn		
60 V (8-pol. 30 V); 4 A (8-pol. 2 A); ≤ 5 mΩ	250 V; 5 A; ≤ 8 mΩ		
0	0		
3.0 ... 6.5 mm (8-pol. 4.0 ... 8.0 mm)	3.0 ... 6.5 mm		
5 / 8 x 0.34 mm ²	4 x 0.34 mm ²		
IP 67	IP 65		
- 25 ... + 90 °C	- 40 ... + 85 °C		
Lumberg RKCW	Binder series 714		
			

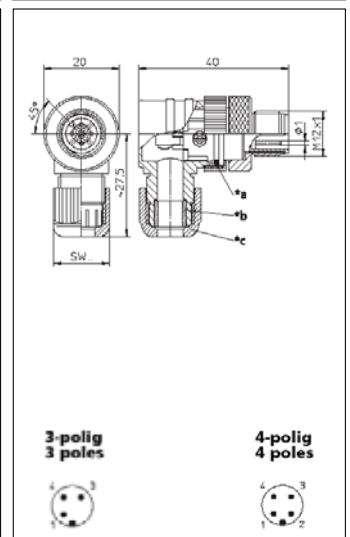
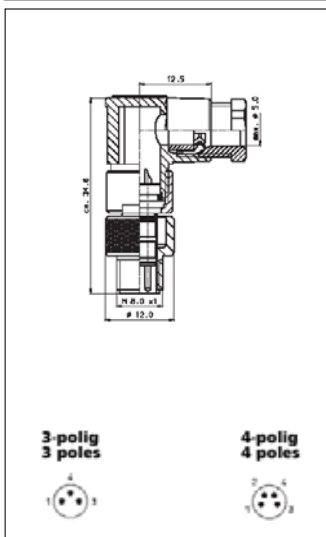
Accessories for Sensors

Field attachable plugs

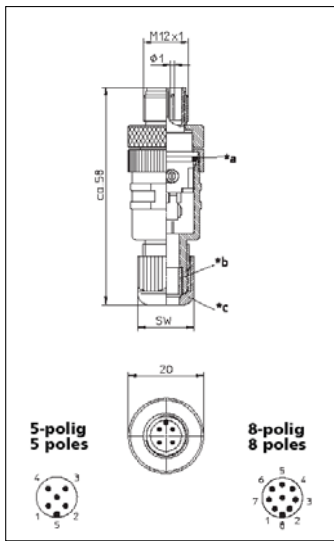
Connector; type of lead connection	plug M8, screwable straight	plug M12, screwable straight
Version		
Pole number: Type designation; ref. no.	3-pole: JSM8S3; 13.98-30	3-pole: JSM12S3; 13.98-34
Pole number: Type designation; ref. no.	4-pole: JSM8S4; 13.98-31	4-pole: JSM12S4; 13.98-35
Material: Housing / insulating body / contact carrier	PA / PA / TPU, self-quenching	PA / PA / PA
Flange	CuZn nickel-plated	CuZn nickel-plated
Contact material and surface	CuZn gold-plated	CuZn gold-plated
Nominal voltage; nominal current at 40 °C; contact resistance	60 V (4-pol. 30 V); 4 A; ≤ 5 mΩ	240 V; 4 A; ≤ 5 mΩ
Number of LED's and colour	0	0
Lead diameter	3.5 ... 5.0 mm	3.0 ... 6.5 mm
Recommended: Number of single cores x cross section	3 / 4 x 0.34 mm ²	3 / 4 x 0.34 mm ²
Protection rating according to IEC 60529 (screw locked)	IP 67	IP 67
Ambient temperature range	- 40 ... + 85 °C	- 25 ... + 90 °C
Manufacture	Lumberg RSMCK	Lumberg RSC



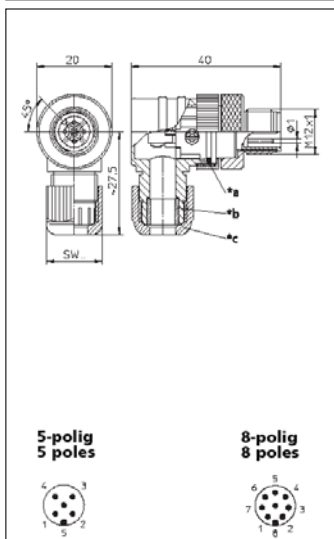
Connector; type of lead connection	plug M8; screwable angled	plug M12; screwable angled
Version		
Pole number: Type designation; ref. no.	3-pole: JSM8T3; 13.98-32	3-pole: JSM12T3; 13.98-36
Pole number: Type designation; ref. no.	4-pole: JSM8T4; 13.98-33	4-pole: JSM12T4; 13.98-37
Material: Housing / insulating body / contact carrier	PBT / PBT / PA	PA / PA / PA
Flange	CuZn	CuZn nickel-plated
Contact material and surface	CuZn gold-plated	CuSn gold-plated
Nominal voltage; nominal current at 40 °C; contact resistance	60 V (4 pol. 30 V); 4 A; ≤ 5 mΩ	240 V; 4 A; ≤ 5 mΩ
Number of LED's and colour	0	0
Lead diameter	3.5 ... 5.0 mm	3.0 ... 6.5 mm
Recommended: Number of single cores x cross section	3 / 4 x 0.34 mm ²	3 / 4 x 0.34 mm ²
Protection rating according to IEC 60529 (screw locked)	IP 67	IP 67
Ambient temperature range	- 40 ... + 85 °C	- 25 ... + 90 °C
Manufacture	Lumberg RSMCW	Lumberg RSCW



plug M12; screwable			
straight			
5-pole: JSM12S5; 13.98-38			
8-pole: JSM12S8; 13.98-39			
PA / PA / PA			
CuZn nickel-plated			
CuZn (8-pol. CuSnZn) gold-plated			
60 V (8-pol. 30 V); 4 A (8-pol. 2 A); ≤ 5 mΩ			
0			
3.0 ... 6.5 mm (8-pol. 4.0 ... 8.0 mm)			
5 / 8 x 0.34 mm ²			
IP 67			
- 25 ... + 90 °C			
Lumberg RSC			



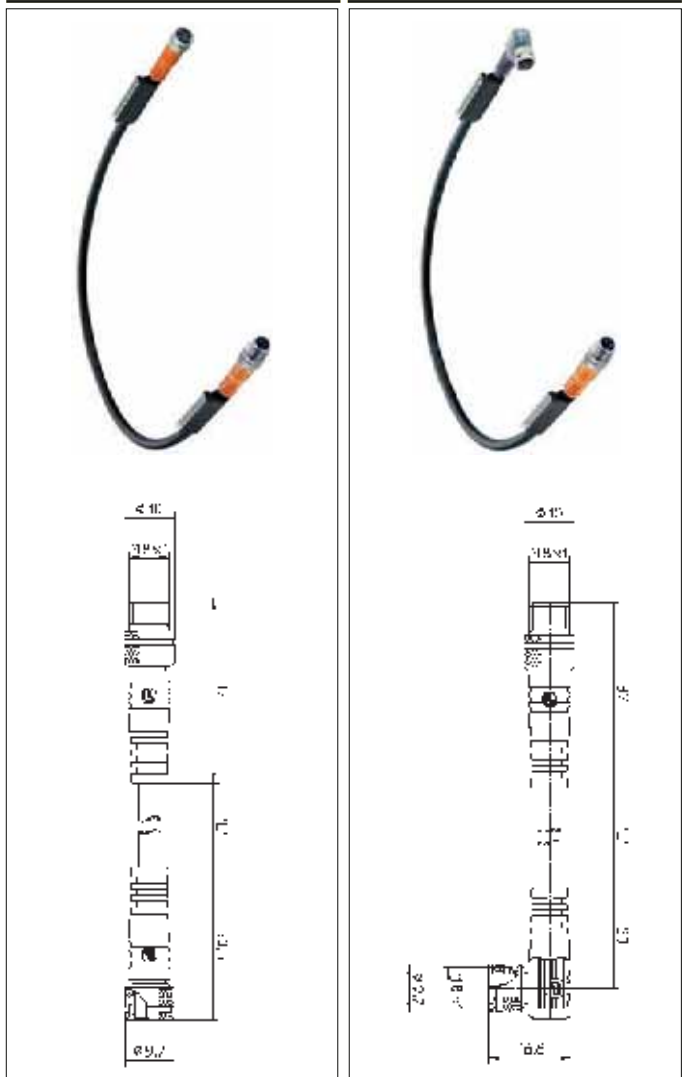
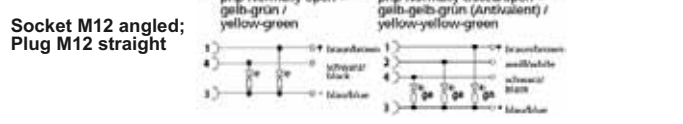
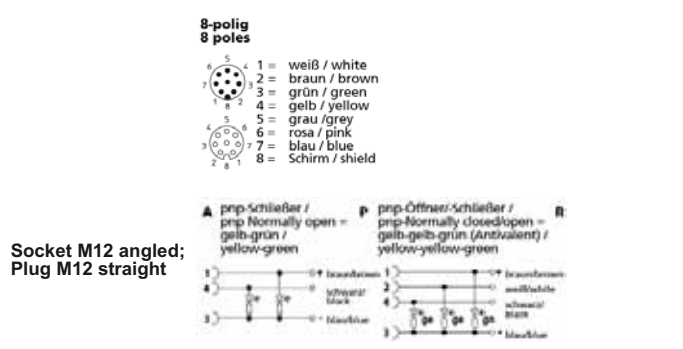
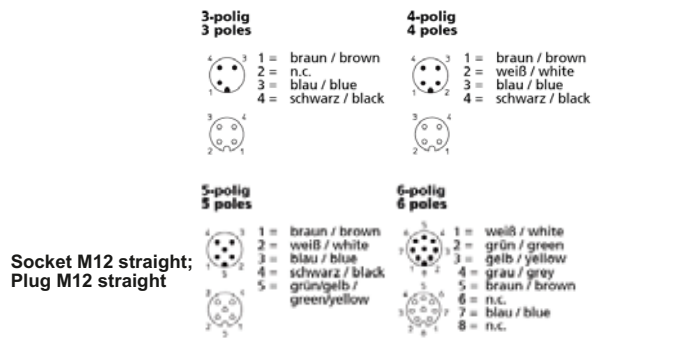
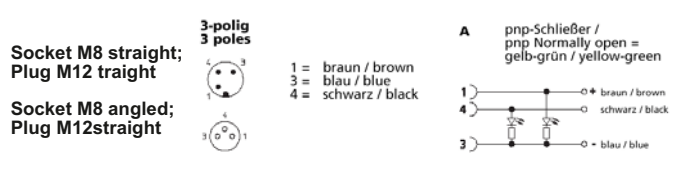
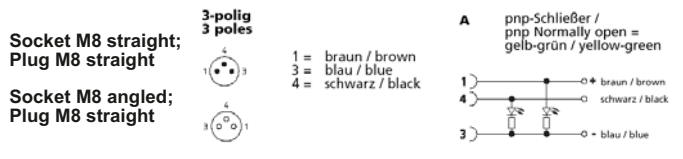
plug M12; screwable			
angled			
5-pole: JSM12T5; 13.98-40			
8-pole: JSM12T8; 13.98-41			
PA / PA / PA			
CuZn nickel-plated			
CuZn (8-pol. CuSnZn) gold-plated			
60 V (8 pol. 30 V); 4 A (8 pol. 2 A); ≤ 5 mΩ			
0			
3.0 ... 6.5 mm (8-pol. 4.0 ... 8.0 mm)			
5 / 8 x 0.34 mm ²			
IP 67			
- 25 ... + 90 °C			
Lumberg RSCW			



Accessories for Sensors

Cordsets with M8 or M12 connectors (adaptors)

Socket version; plug version	M8 straight; M8 straight	M8 angled; M8 straight
Connection type (screws or snap-ins)	both sockets and plugs: screws	both sockets and plugs: screws
Material: Housing / insulating body / contact carrier	TPU	TPU
Flange and surface / contact material and surface	CuZn nickel-plated / CuZn gold-plated	CuZn nickel-plated / CuZn gold-plated
Nominal voltage	60 V	10-30 V DC
Nominal current at 40 °C	4 A	4 A
LED indicator in the angled plug	0	1 x GN, 1 x YE
Lead jacket / colours	PUR / BK	PUR / BK
Protection rating according to IEC 60529 (screw locked)	IP 67	IP 67
Ambient temperature range	- 25 ... + 80 °C	- 25 ... + 80 °C
Manufacture	Lumberg RSMV-RKMV	Lumberg RSMV-RKMV/LED
Pole no. socket / no. of cores x cross section / pole no. plug	3 / 3 x 0.34 mm² / 3	3 / 3 x 0.34 mm² / 3
Type designation	JSM8U3 / LP3x0.34u4.3BK / SM8S3	JSM8V3gy / LP3x0.34u4.3BK / SM8S3
Ref. no.	13.97-50-xxx	13.97-51-xxx
Pole no. socket/ no. of cores x cross section / pole no. plug		
Type designation		
Ref. no.		
Pole no. socket / no. of cores x cross section / pole no. plug		
Type designation		
Ref. no.		
Pole no. socket / no. of cores x cross section / pole no. plug		
Type designation		
Ref. no.		
Pole no. socket / no. of cores x cross section / pole no. plug		
Type designation		
Ref. no.		



M8 straight; M12 straight both sockets and plugs: screws	M8 angled; M12 straight both sockets and plugs: screws	M12 straight; M12 straight both sockets and plugs: screws	M12 angled; M12 straight both sockets and plugs: screws
TPU	TPU	TPU	TPU
CuZn nickel-plated / CuZn gold-plated	CuZn nickel-plated / CuZn gold-plated	CuZn nickel-plated / CuSn gold-plated	CuZn nickel-plated / CuSn gold-plated
60 V	10-30 V DC	3-4 pol. 240 V, 5 pol. 60 V, 6-8 pol. 30 V	10-30 V DC
4 A	4 A	3-5 pol. 4 A, 6-8 pol. 2 A	4 A
0	1 x GN, 1 x YE	0	1 x GN, 1 x YE
PUR / BK	PUR / BK	PUR / BK	PUR / BK
IP 67	IP 67	IP 67	IP 67
- 25 ... + 80 °C	- 25 ... + 80 °C	- 25 ... + 80 °C	- 25 ... + 80 °C
Lumberg RST-RKMV	Lumberg RST-RKMWW/LED	Lumberg RST-RKT	Lumberg RST-RKWT/LED
3 / 3 x 0.34 mm² / 3	3 / 3 x 0.34 mm² / 3	3 / 3 x 0.34 mm² / 3	3 / 3 x 0.34 mm² / 3
JSM8U3 / LP3x0.34u4.3BK / SM12S3	JSM8V3gy / LP3x0.34u4.3BK / SM12S3	JSM12U3 / LP3x0.34u4.3BK / SM12S3	JSM12V3gy/LP3x0.34u4.3BK/SM12S3
13.97-52-xxx	13.97-53-xxx	13.97-54-xxx	13.97-55-xxx
		4 / 4 x 0.34 mm² / 4	4 / 4 x 0.34 mm² / 4
		JSM12U4 / LP4x0.34u4.7BK / SM12S4	JSM12V4gy/LP4x0.34u4.7BK/SM12S4
		13.97-56-xxx	13.97-57-xxx

