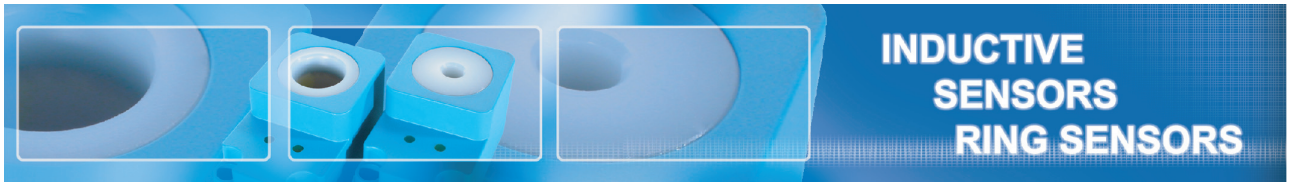
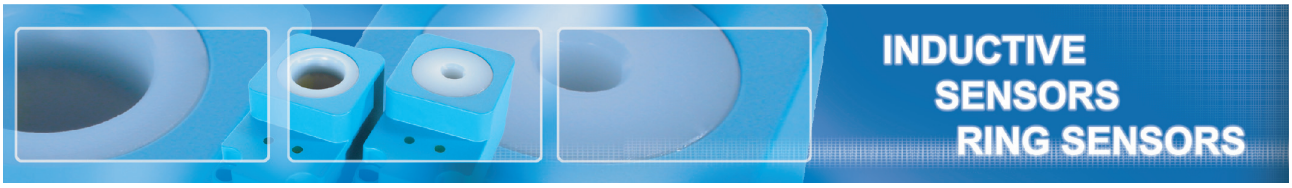



# TABLE OF CONTENT

# NOTES




# DESIGNATION CODE

Example: **K J 10 - M 30 M B 45 - D P S - V1 - X0000**

| 1 | 2 | | 3 | 4 | 5 | 6 | 7 | | 8 | 9 | 10 | | 11 | | 12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|

## 1 = Working principle

| | | | |
|---|---|---|---|
| **A** | Acoustic | | |
| **B** | Acceleration sensor | | |
| **C** | Capacitive | | |
| **D** | Strain gauge sensor | | |
| **H** | Hall-effect | | |
| **J** | Inductive | **JR** | Inductive ring |
| | | **JF** | Inductive surface |
| | | **JG** | Inductive slot |
| | | **JD** | Metalface |
| **M** | Magnetoresistive | | |
| **N** | Inclination sensor | | |
| **R** | Reed-contact | | |
| **W** | Angle sensor | | |

## 2 = Switching distance / range

## 3 = Design

| | |
|---|---|
| **D** | Ring housing |
| **G** | Cylindrical housing without thread |
| **M** | Cylindrical housing with metrical thread |
| **Q** | Square housing |

## 4 = Housing diameter / edge length

## 5 = Housing material

| | |
|---|---|
| **A** | Aluminium |
| **E** | Stainless steel |
| **K** | Plastic |
| **M** | Brass, nickel plated |
| **T** | PTFE |

## 6 = Installation

| | |
|---|---|
| **B** | Shielded |
| **N** | Non shielded |

## 7 = Tube length

## 8 = Operating voltage

| | |
|---|---|
| **AZ** | AC alternating current voltage |
| **D** | DC direct current voltage |
| **VZ** | AC/DC all voltages |

## 9 = Type of output signal

| | | | |
|---|---|---|---|
| **AN** | Analog | **ANI** | Current output |
| | | **ANU** | Voltage output |
| **CAN** | CAN-bus interface | | |
| **N** | NPN | | |
| **NA** | Namur | | |
| **P** | PNP | | |
| **Z** | Two wire | | |

## 10 = Function

| | |
|---|---|
| **A** | Changeover |
| **I** | Impulse output |
| **Ö** | N.C. |
| **S** | N.O. |
| **U** | Switchable |

## 11 = Connection

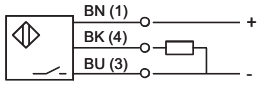
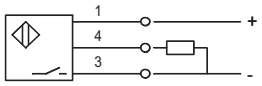
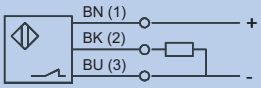
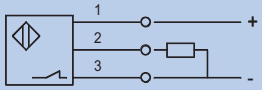
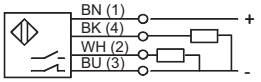
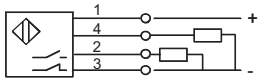
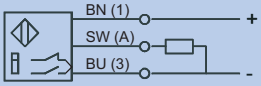
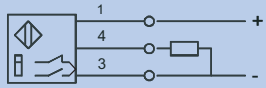
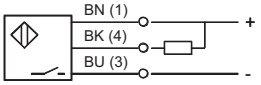
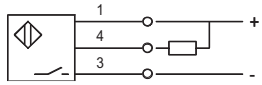
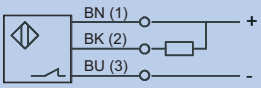
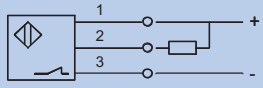
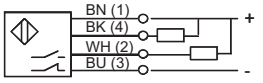
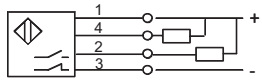
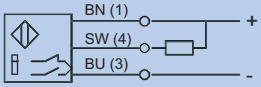
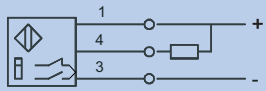
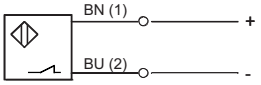
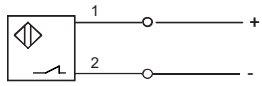
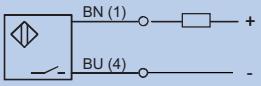
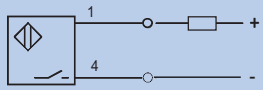
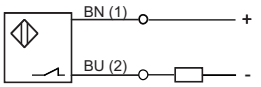
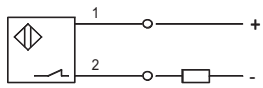
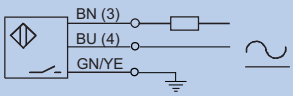
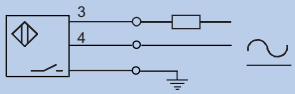
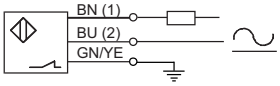
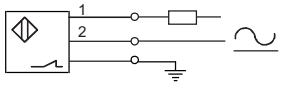
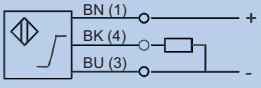
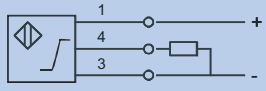
| | |
|---|---|
| **V1** | M8 screw-/snap-in |
| **V2** | M12 metal |
| **V2/1** | M12 plastic |
| **V3** | M5 metal |
| **V4** | Amphenol Tuchel |
| **V6** | Brad Harrison |
| **V7** | Valve connector type A |
| **V8** | M8 snap-in only |
| **V9** | Torson |
| **V10** | Valve connector type C |
| **V11** | AC connector 1/2" UNF |
| **V12** | M18 plastic |
| **VE** | Euchner connector |
| **RS232** | Data interface |
| **PG** | Thread joint PG |
| **Mxx** | Thread joint metrical |

others as requested

## 12 = Additional marks

| | |
|---|---|
| **AM** | Sensing face in centre |
| **FE** | Reduction 1 to steel / iron |
| **HT** | High temperature |
| **NF** | Reduction 1 to nonferrous metal |
| **SF** | Weld field immune |
| **T** | Enlarged temperature range |
| **W** | Angled sensing face / angled cable exit |
| **X** | Customized design with detailled description |

# CIRCUIT DIAGRAMS

| Circuit diagram for | Cable / clamp connection | Connector V1 ... V9 |
|---|---|---|
| DPS<br>DC PNP N.O. |  |  |
| DPÖ<br>DC PNP N.C. |  |  |
| DPA<br>DC PNP changeover |  |  |
| DPU<br>DC NO/NC switchable |  |  |
| DNS<br>DC NPN N.O. |  |  |
| DNÖ<br>DC NPN N.C. |  |  |
| DNA<br>DC NPN changeover |  |  |
| DNU<br>DC NO/NC switchable |  |  |
| NA<br>Namur EN 60947-5-6 |  |  |
| DZS<br>DC two-wire N.O. |  |  |
| DZÖ<br>DC two-wire N.C. |  |  |
| AZS/VZS<br>AC/DC two-wire N.O. |  |  |
| AZÖ/VZÖ<br>AC/DC two-wire N.C. |  |  |
| Analog |  |  |

# FUNCTIONAL DESCRIPTION

Ring sensors use the energy variations in a resonant circuit caused by eddy current losses in conductive materials. Thus they detect all types of conductive material. Ring sensors from Pulsotronic are used for object counting tasks, wire gauge measuring, wire break control or for presence check. The product range of Pulsotronic comprehends digital and analog ring sensors.

An oscillator in the sensor excites a high-frequency, electromagnetic alternating field. Due to the axially symmetric coil arrangement an almost homogeneous field is realised. The ferrite core and the sensor housing concentrate the field lines of the alternating field in the center of the ring. Metal entering in the sensor causes eddy currents that withdraw energy from the field. This leads to a damping and a voltage fluctuation in the sensor. The electronics in the sensor evaluates this variation.

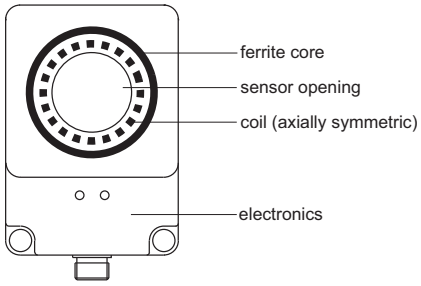



Illustration 1: front view ring sensor

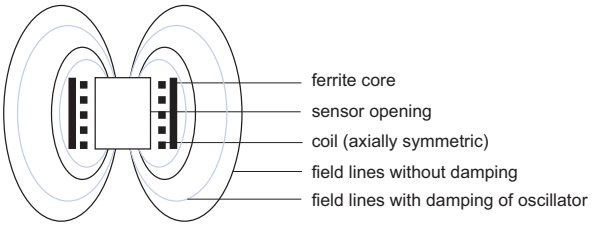



Illustration 2: course of field lines in the sensor (top view ring sensor)

**Digital ring sensors**

Digital ring sensors are classified into static sensors (normal sensitivity) and dynamic sensors (high sensitivity). As long as metal is situated in the sensor, the static sensor excites a permanent signal. Only when metal is removed from the sensor the signal deactivates. Static sensors detect moving and non moving objects. Dynamic sensors only excite a short pulse when metal is detected. They only detect moving objects.

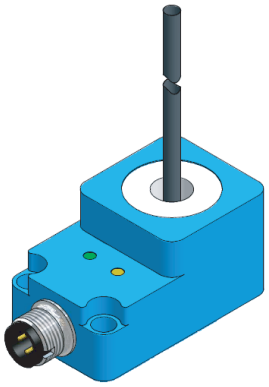
**Analog ring sensors**

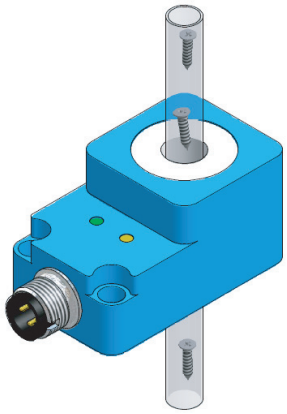
Like static sensors analog sensors excite a permanent signal which depends on the dimension and the position of the metallic object in the sensor. The bigger the metallic object, the bigger the output voltage of the sensor.

# APPLICATIONS

**Wire break control**

For this type of applications static sensors are used. The oscillator in the sensor excites a high-frequency alternating field. The wire passes through the sensor and withdraws energy from the resonant circuit. As long as the wire is moved through the sensor without interruption the sensor excites a constant signal because the damping of the oscillator is not alternating. A wire break leads to a damping of the oscillator. The sensor switches due to the voltage fluctuation.



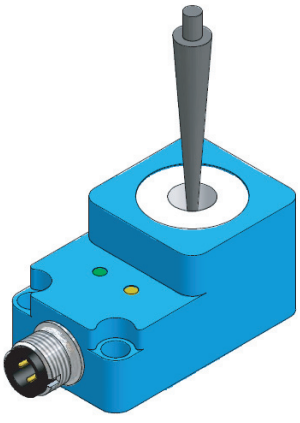


**Object counting, presence check**

In the sensor is a high-frequency alternating field. When a metallic object passes the sensor it withdraws energy from the field and leads to a voltage fluctuation in the oscillator. When the object quits the sensor, the oscillator takes its' normal value until the next object causes a new damping. Thus for example the ejection of stamping parts can be monitored. Ring sensors detect free-falling products as well as products being led in a tube through the sensor. The user can detect and count metallic objects. Ring sensors detect metallic contamination in non-metallic materials (e.g. synthetic granules). As moving parts are detected, dynamic and static sensors can be applied.

**Wire gauge measuring, object identification**

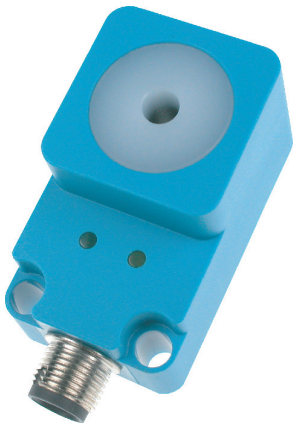
The wire passes through the sensor and withdraws energy from the resonant circuit. The degree of the energy loss depends on the dimension of the wire. The thicker the wire, the bigger the loss of energy and the bigger the voltage fluctuation in the sensor. The value of the voltage fluctuation provides information about the quantity of material in the field. By this it is possible to detect also other metallic objects. Depending on the size and the material of the object the sensor provides an according output voltage. Thus the user can make the distinction between different products. A possible application is a sorting device for small parts.



# NORMAL SENSITIVITY (STATIC PRINCIPLE)

## General data

| | |
|---|---|
| **Mounting** | non shielded |
| **Operating voltage $U_b$** | 10 ... 30V DC (KJR-D100FAN... 18 - 30V DC) |
| **Ripple voltage $U_b$** | ≤ 10% |
| **Voltage drop $U_d$** | ≤ 2,4V |
| **Max. load current** | ≤ 200mA (KJR-Q130... ≤ 50mA) |
| **Off-state current $I_0$** | KJR-D6... to KJR-D100...: ≤15mA<br>KJR-D130... to KJR-D300...: ≤10mA |
| **Residual current** | ≤ 10µA |
| **Hysteresis H** | ≤ 15% |
| **Operating temperature $T_a$** | -25°C ... +70°C |
| **Sensitivity over temp. range** | see sensitivity |
| **Protection class** | IP54 |
| **EMV-standard** | according to EN 60947-5-2 |
| **Switching state** | LED |
| **Housing material** | KJR-D6... to KJR-D30: Ultramid B3EG3<br>KJR-D50... to KJR-D300: Aluminium |
| **Connection** | connector M12 4-pole |



## Selection chart

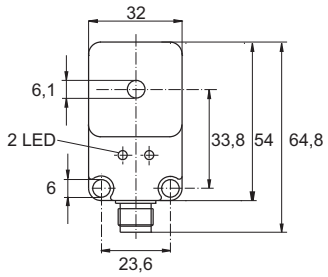
| Article number | Designation | Output signal | Sensitivity | Max. switching frequency f | Drawing (next page) |
|---|---|---|---|---|---|
| 08310000982 | **KJR-D6KN-DPA-V2** | PNP | FE-ball D=1,5mm | 600Hz | A + D |
| 08310000983 | **KJR-D6KN-DNA-V2** | NPN | FE-ball D=1,5mm | 600Hz | A + D |
| 08310000984 | **KJR-D10KN-DPA-V2** | PNP | FE-ball D=1,8mm | 600Hz | B + D |
| 08310000985 | **KJR-D10KN-DNA-V2** | NPN | FE-ball D=1,8mm | 600Hz | B + D |
| 08310000986 | **KJR-D15-KN-DPA-V2** | PNP | FE-ball D=2,4mm | 500Hz | C + D |
| 08310000987 | **KJR-D15-KN-DNA-V2** | NPN | FE-ball D=2,4mm | 500Hz | C + D |
| 08310000988 | **KJR-D20KN-DPA-V2** | PNP | FE-ball D=3,0mm | 400Hz | E + G |
| 08310000989 | **KJR-D20KN-DNA-V2** | NPN | FE-ball D=3,0mm | 400Hz | E + G |
| 08310000990 | **KJR-D30KN-DPA-V2** | PNP | FE-ball D=4,0mm | 300Hz | F + G |
| 08310000991 | **KJR-D30KN-DNA-V2** | NPN | FE-ball D=4,0mm | 300Hz | F + G |
| 08317050665 | **KJR-D50FAN-DPA-V2** | PNP | FE-ball D=3,0mm | 500Hz | H |
| 08317050265 | **KJR-D50FAN-DNA-V2** | NPN | FE-ball D=3,0mm | 500Hz | H |
| 08317080565 | **KJR-D100AN-DPA-V2** | PNP | FE-ball D=6,0mm | 500Hz | I |
| 08317080150 | **KJR-D100AN-DNA-V2** | NPN | FE-ball D=6,0mm | 500Hz | I |
| 08317080365 | **KJR-D100FAN-DPA-V2** | PNP | FE-ball D=8,0mm | 500Hz | J |
| 08317080465 | **KJR-D100FAN-DNA-V2** | NPN | FE-ball D=8,0mm | 500Hz | J |
| 08417090659 | **KJR-Q130AN-DPA-VE** | PNP | FE-ball D=12,0mm | 300Hz | K |
| 08317090159 | **KJR-Q130AN-DNA-VE** | NPN | FE-ball D=12,0mm | 300Hz | K |
| 08317160665 | **KJR-D200AN-DPA-V2** | PNP | FE-ball D=15,0mm | 300Hz | L |
| 08317160165 | **KJR-D200AN-DNA-V2** | NPN | FE-ball D=15,0mm | 300Hz | L |
| 08317070665 | **KJR-D300AN-DPA-V2** | PNP | FE-ball D=30,0mm | 300Hz | M |
| 08317071165 | **KJR-D300AN-DNA-V2** | NPN | FE-ball D=30,0mm | 300Hz | M |

Control unit and accessories on pages 15 and 16.

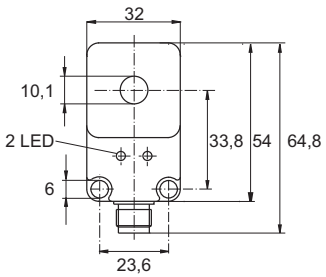
# NORMAL SENSITIVITY (STATIC PRINCIPLE)

## Dimensions

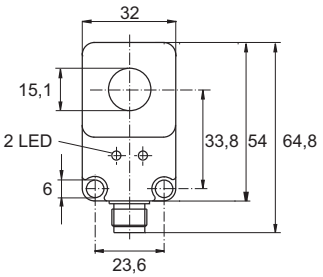
A)



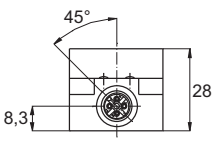

B)



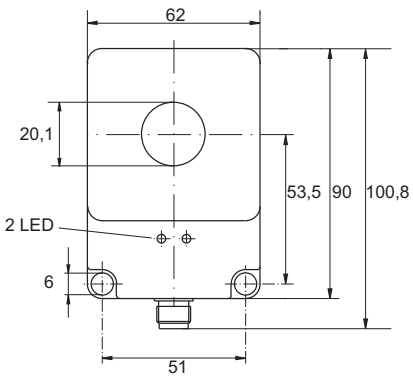

C)



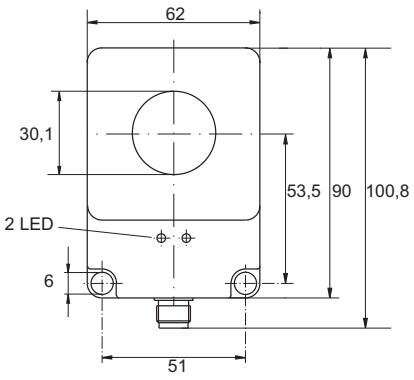

D)



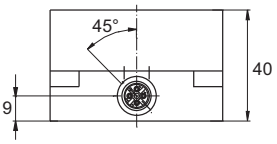

E)



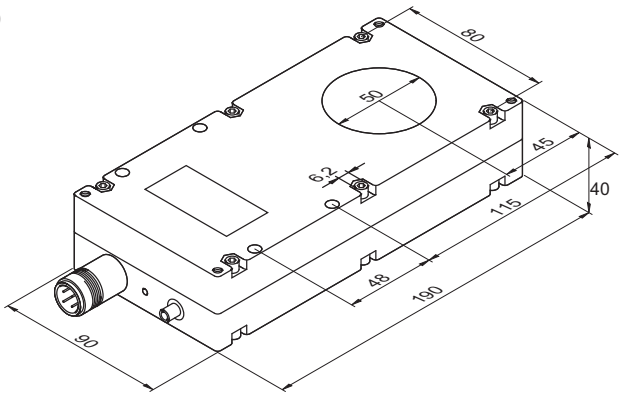

F)



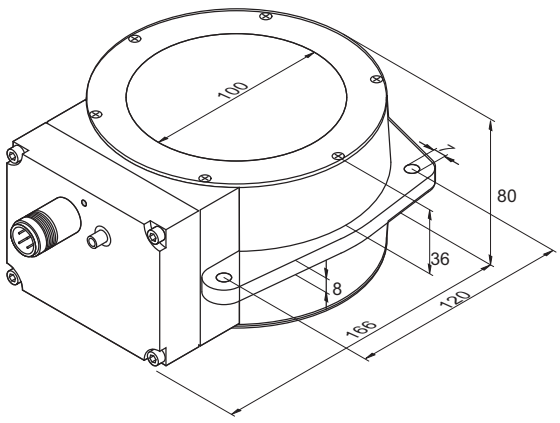

G)




H)




I)

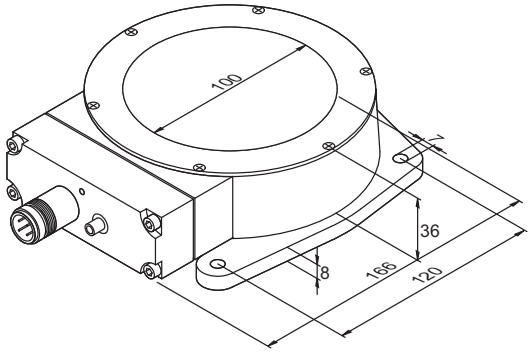



all data in mm

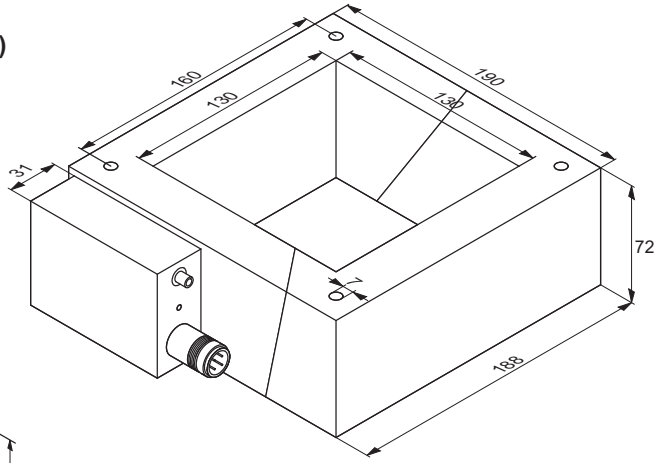
# NORMAL SENSITIVITY (STATIC PRINCIPLE)

## Dimensions

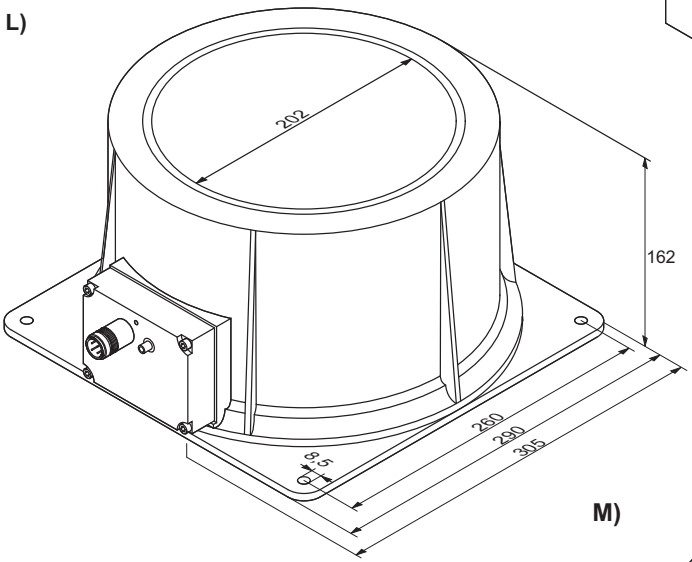
J)



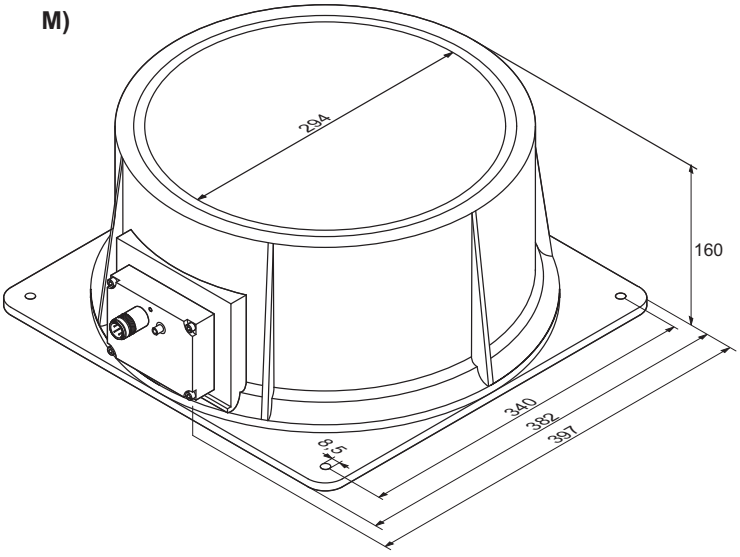

K)




L)




M)




all data in mm

# HIGH SENSITIVITY (DYNAMIC PRINCIPLE)

## General data

| | |
|---|---|
| **Mounting** | non shielded |
| **Operating voltage $U_b$** | 11 ... 30V DC |
| **Ripple voltage $U_b$** | ≤ 10% |
| **Voltage drop $U_d$** | ≤ 2,4V |
| **Max. load current** | KJR-D6... to KJR-D30: ≤200mA<br>KJR-D50... to KJR-D300: ≤50mA |
| **Off-state current $I_0$** | KJR-D6... to KJR-D30: ≤15mA<br>KJR-D50... to KJR-D300: ≤25mA |
| **Hysteresis H** | ≤ 15% |
| **Operating temperature $T_a$** | -25°C ... +70°C |
| **Sensitivity over temp. range** | see sensitivity |
| **Protection class** | IP54 |
| **EMV-standard** | according to EN 60947-5-2 |
| **Switching state** | LED |
| **Housing material** | KJR-D6... to KJR-D30: Ultramid B3EG3<br>KJR-D50... to KJR-D300: Aluminium |
| **Connection** | connector M12 4-pole |

## Selection chart

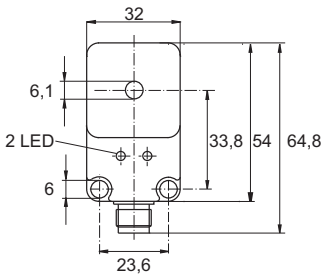
| Article number | Designation | Output signal | Sensitivity * = adjustable | Max. switching frequency | Residual current | Drawing (next page) |
|---|---|---|---|---|---|---|
| 08310001003 | **KJR-D6KN-DPIA-V2** | PNP | FE-ball D=0,4mm | 10Hz | 10µA | A + D |
| 08310001008 | **KJR-D6KN-DNIA-V2** | NPN | FE-ball D=0,4mm | 10Hz | 10µA | A + D |
| 08310001004 | **KJR-D10KN-DPIA-V2** | PNP | FE-ball D=0,5mm | 10Hz | 10µA | B + D |
| 08310001009 | **KJR-D10KN-DNIA-V2** | NPN | FE-ball D=0,5mm | 10Hz | 10µA | B + D |
| 08310001005 | **KJR-D15-KN-DPIA-V2** | PNP | FE-ball D=0,6mm | 10Hz | 10µA | C + D |
| 08310001010 | **KJR-D15-KN-DNIA-V2** | NPN | FE-ball D=0,6mm | 10Hz | 10µA | C + D |
| 08310001006 | **KJR-D20KN-DPIA-V2** | PNP | FE-ball D=0,7mm | 10Hz | 10µA | E + G |
| 08310001011 | **KJR-D20KN-DNIA-V2** | NPN | FE-ball D=0,7mm | 10Hz | 10µA | E + G |
| 08310001007 | **KJR-D30KN-DPIA-V2** | PNP | FE-ball D=1,0mm | 10Hz | 10µA | F + G |
| 08310001012 | **KJR-D30KN-DNIA-V2** | NPN | FE-ball D=1,0mm | 10Hz | 10µA | F + G |
| 08317010865 | **KJR-D50FAN-DPIA-V2** | PNP | FE-ball D=0,6mm* | 100Hz | 50µA | H |
| 08317010765 | **KJR-D50AN-DNIA-V2** | NPN | FE-ball D=0,6mm* | 100Hz | 50µA | H |
| 08317010265 | **KJR-D50FAN-DNIA-V2** | PNP | FE-ball D=1,0mm* | 100Hz | 50µA | I |
| 08317110065 | **KJR-D70AN-DNIA-V2** | NPN | FE-ball D=1,0mm* | 100Hz | 50µA | J |
| 08317000265 | **KJR-D100AN-DPIA-V2** | PNP | FE-ball D=1,3mm* | 100Hz | 50µA | K |
| 08317000165 | **KJR-D100AN-DNIA-V2** | NPN | FE-ball D=1,3mm* | 100Hz | 50µA | K |
| 08317090359 | **KJR-Q130AN-DNIA-VE** | PNP | FE-ball D=5,0mm | 100Hz | 500µA | L |
| 08317030265 | **KJR-D200AN-DPIA-V2** | NPN | FE-ball D=3,0mm | 100Hz | 50µA | M |
| 08317030165 | **KJR-D200AN-DNIA-V2** | PNP | FE-ball D=3,0mm | 100Hz | 50µA | M |
| 08317090259 | **KJR-Q290AN-DNIA-VE** | NPN | FE-ball D=12,0mm | 100Hz | 500µA | N |
| 08317040265 | **KJR-D300AN-DPIA-V2** | PNP | FE-ball D=4,0mm | 100Hz | 50µA | O |
| 08317040165 | **KJR-D300AN-DNIA-V2** | NPN | FE-ball D=4,0mm | 100Hz | 50µA | O |

Control unit and accessories on pages 15 and 16.

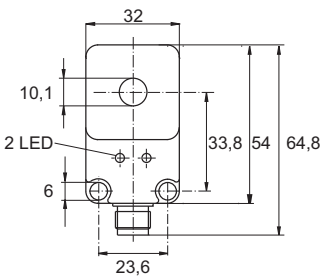
# HIGH SENSITIVITY (DYNAMIC PRINCIPLE)

## Dimensions

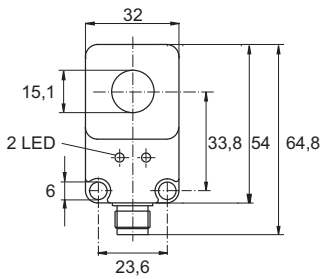
A)



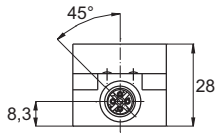

B)



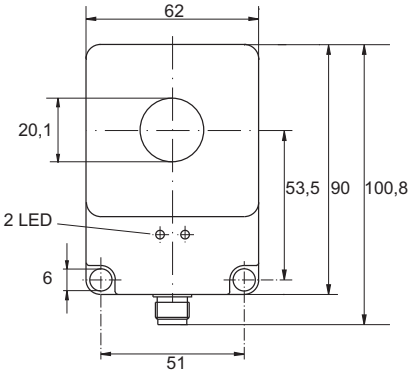

C)



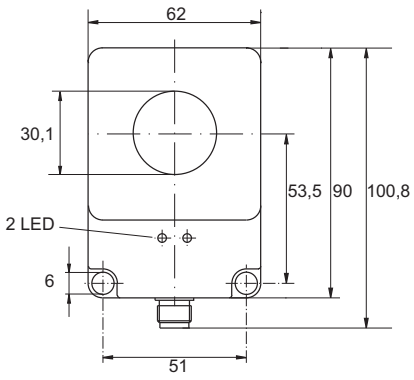

D)



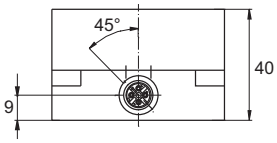

E)



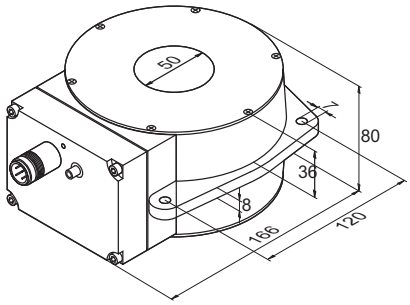

F)



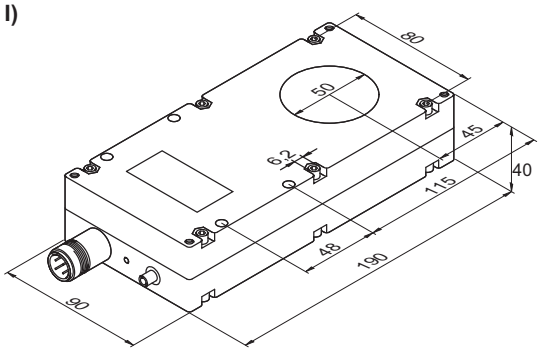

G)



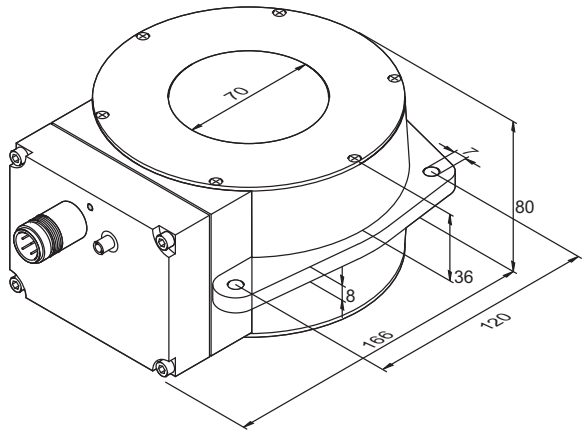

H)




I)




J)

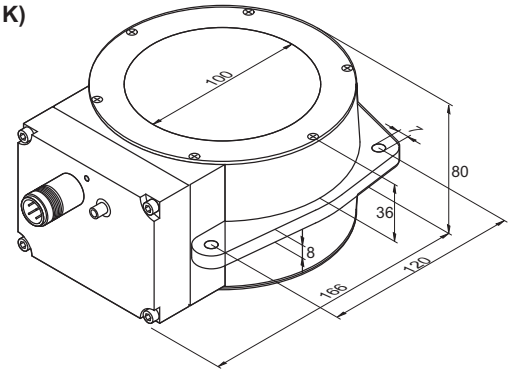



all data in mm

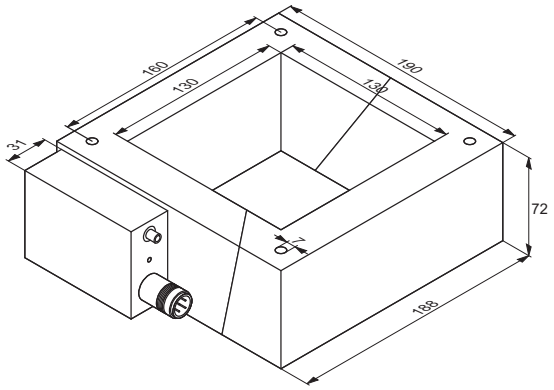
# HIGH SENSITIVITY (DYNAMIC PRINCIPLE)

## Dimensions

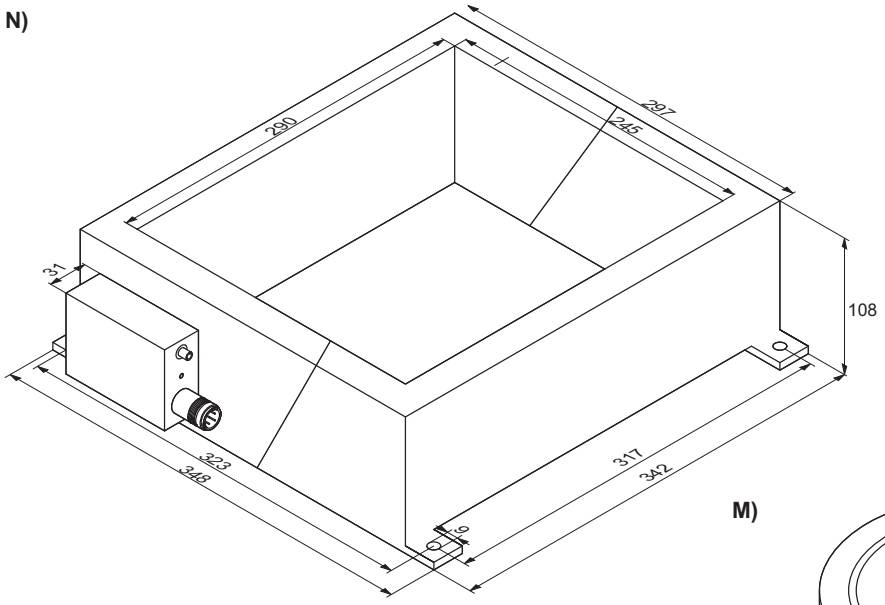
**K)**



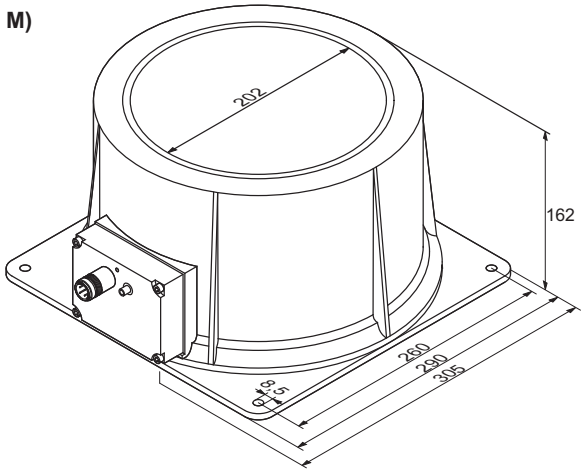

**L)**



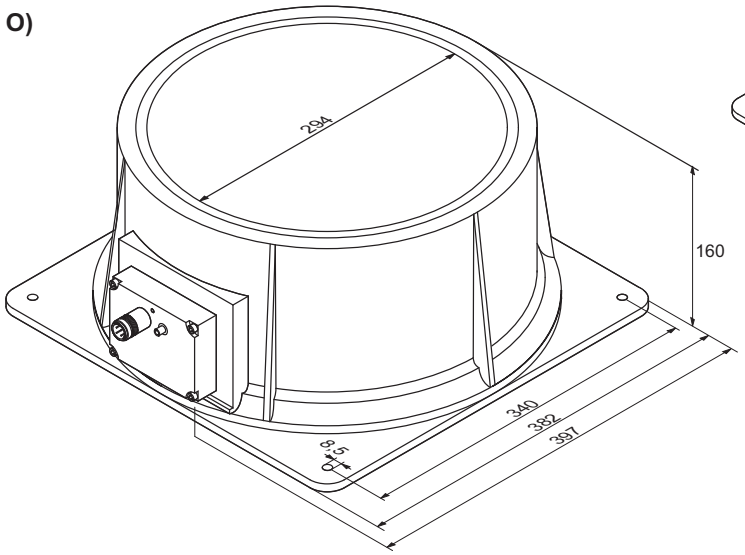

**N)**




**M)**




**O)**




all data in mm

# ANALOG

## General data

| | |
|---|---|
| **Mounting** | non shielded |
| **Output signal** | 0 ... 10V analog |
| **Operating voltage $U_b$** | 15 ... 30V DC |
| **Load Resistor $R_L$** | > 1kOhm |
| **Linearity** | ≤ +/- 5% |
| **Repeat accuracy** | ≤ 5% |
| **Off-state current $I_0$** | ≤ 10mA |
| **Operating temperature $T_a$** | -25°C ... +70°C |
| **Sensitivity over temp. range** | ≤ +/- 5% |
| **Protection class** | IP54 |
| **EMV-standard** | according to EN 60947-5-2 |
| **Switching state** | LED |
| **Housing material** | Ultramid B3EG3 |
| **Connection** | connector M12 4-pole |

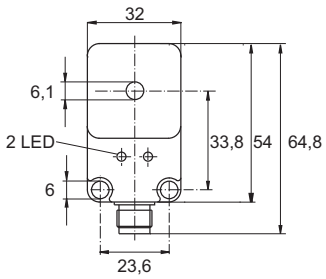
## Selection chart

| Article number | Designation | Sensitivity | Max. switching frequency f | Drawing |
|---|---|---|---|---|
| 08310000894 | **KJR-D6KN-ANU-V2** | FE-stick D=0,3 - 4,0mm | 100Hz | A + D |
| 08310000895 | **KJR-D10KN-ANU-V2** | FE-stick D=0,3 - 6,0mm | 100Hz | B + D |
| 08310000896 | **KJR-D15-KN-ANU-V2** | FE-stick D=0,5 - 8,0mm | 80Hz | C + D |
| 08310000897 | **KJR-D20KN-ANU-V2** | FE-stick D=0,5 - 15,0mm | 80Hz | E (next page) |
| 08310000898 | **KJR-D30KN-ANU-V2** | FE-ball D=1,0 - 20,0mm | 80Hz | F (next page) |

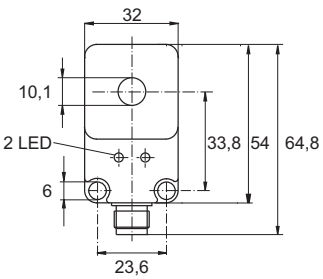
Control unit and accessories on pages 15 and 16.

## Dimensions

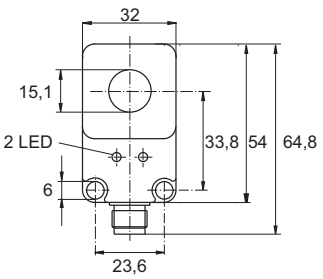
A)



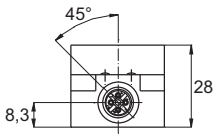

B)




C)




D)

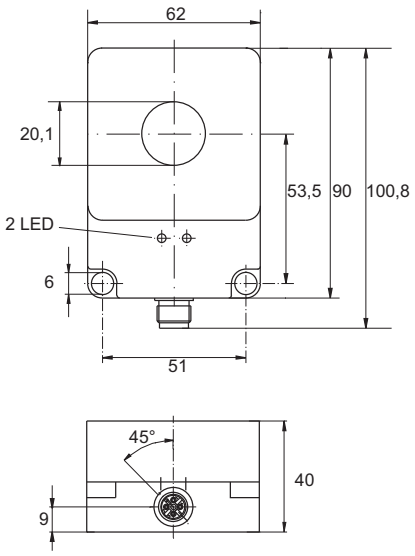



all data in mm

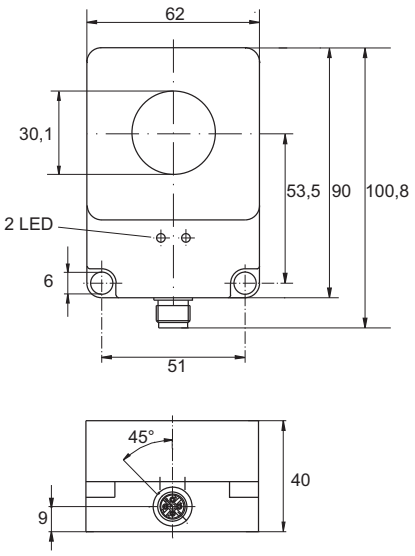
# ANALOG

## Dimensions

**D**




**E)**



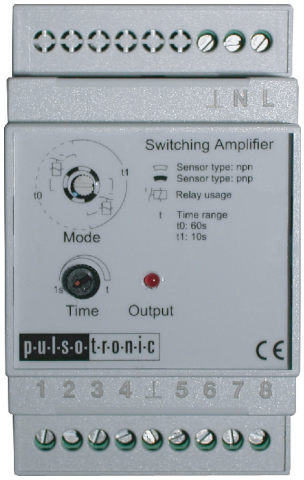

all data in mm

# CONTROL UNIT FOR RING SENSORS

## Functional description

This control unit can be operated with all sensors from the KJR series. The device serves for evaluating the signals of the sensor and at the same time provides the operating voltage for the sensor. It has been rated especially for mounting on a 35mm top hat rail. The control unit can be operated with all switching sensors with 24V operating voltage.

If the connected sensor excites a signal, it will be collected and lengthened on the adjusted period by the control unit. When during that time another signal is excited, it will be lengthened on the adjusted period again. After that the signal is output via a relay and a transistor output. The active switching state is indicated by an LED. The device can be operated with 24V direct current or alternatively with line voltage. All outputs provide short circuit protection as well as overload protection. All voltage inputs are protected against reverse polarity.

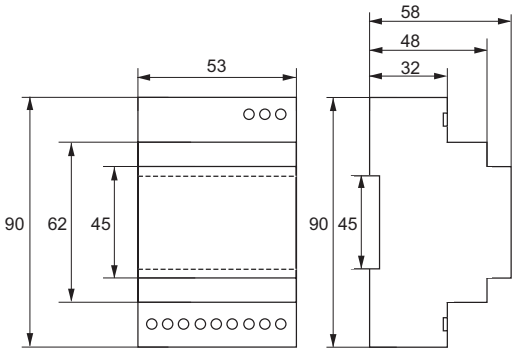



## Technical data

| | Control unit for ring sensors 230V AC / 24V DC | Control unit for ring sensors 230V AC / 24V DC |
|---|---|---|
| **Article number** | 08349005011 | 08349005013 |
| **Supply voltage** | 230V DC, 50/60Hz or 24V DC | 115V, 50/60Hz or 24V DC |
| **Sensor supply** | 24V DC, max. 80mA* | |
| **Transistor output** | 1 x NPN, 1 x PNP, 25mA open collector* | |
| **Relay output** | 1 potential-free changer, max. 250 V AC, 5A | |
| **Switching time per pulse** | 1 ... 10 / 1 ... 60s (adjustable) | |
| **Operating temperature** | -10°C ... +50°C | |
| **Storage temperature** | -10°C ... +60°C | |
| **Protection class** | IP20 | |
| **Housing material** | Polycarbonat (UL 94V-0) | |

* Overload and short circuit protected.

## Dimensions, operation

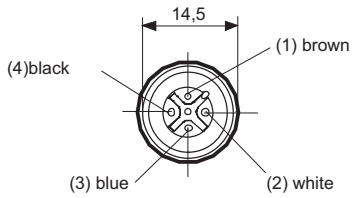



The period for a switching pulse can be adjusted via a potentiometer. The user chooses among two time domains. The selection of the time domain is realised via a rotary coding switch. Via this switch the user also defines if the relay shall be activated or if the connected sensor is NPN or PNP switching.

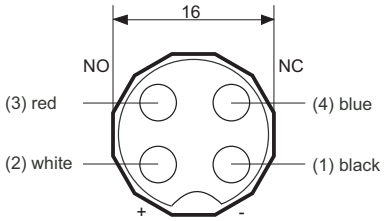
all data in mm

# ACCESSORIES

## Connectors




Connector M12, 4 pole




SD4K (Euchner)

The sensors in this catalogue are mostly listed in design with connector M12, 4-pole.
Optionally the sensors are also available with connector SD4K (Euchner) for the same price.

## Terminating cable

| | 2m connecting cable | 5m connecting cable |
|---|---|---|
| **Article number M12 4-pole** | 44505125310 | 44505125312 |
| **Article number SD4K (Euchner)** | 4455120200 | 44505120202 |

M12 4-pole

SD4K (Euchner)