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NOTES



INDUCTIVE SENSORS RING SENSORS

DESIGNATION CODE

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

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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	Magneto-resistive		
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 detailed description



INDUCTIVE SENSORS RING SENSORS

CIRCUIT DIAGRAMS

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

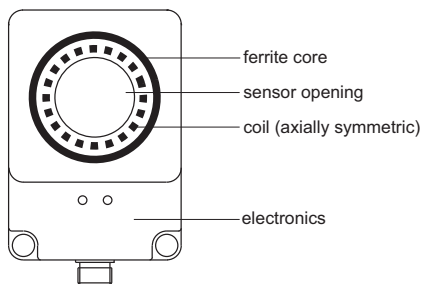


Illustration 1: front view ring sensor

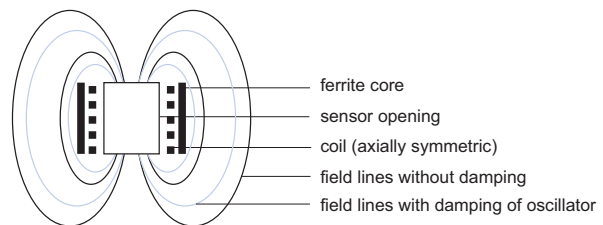


Illustration 2: course of field lines in the sensor
(top view ring sensor)

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.





INDUCTIVE SENSORS RING SENSORS

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	$\leq 10\%$
Voltage drop U_d	$\leq 2,4V$
Max. load current	$\leq 200mA$ (KJR-Q130... $\leq 50mA$)
Off-state current I_o	KJR-D6... to KJR-D100...: $\leq 15mA$ KJR-D130... to KJR-D300...: $\leq 10mA$
Residual current	$\leq 10\mu A$
Hysteresis H	$\leq 15\%$
Operating temperature T_a	$-25^\circ C \dots +70^\circ C$
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 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)
0831000982	KJR-D6KN-DPA-V2	PNP	FE-ball D=1,5mm	600Hz	A + D
0831000983	KJR-D6KN-DNA-V2	NPN	FE-ball D=1,5mm	600Hz	A + D
0831000984	KJR-D10KN-DPA-V2	PNP	FE-ball D=1,8mm	600Hz	B + D
0831000985	KJR-D10KN-DNA-V2	NPN	FE-ball D=1,8mm	600Hz	B + D
0831000986	KJR-D15-KN-DPA-V2	PNP	FE-ball D=2,4mm	500Hz	C + D
0831000987	KJR-D15-KN-DNA-V2	NPN	FE-ball D=2,4mm	500Hz	C + D
0831000988	KJR-D20KN-DPA-V2	PNP	FE-ball D=3,0mm	400Hz	E + G
0831000989	KJR-D20KN-DNA-V2	NPN	FE-ball D=3,0mm	400Hz	E + G
0831000990	KJR-D30KN-DPA-V2	PNP	FE-ball D=4,0mm	300Hz	F + G
0831000991	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

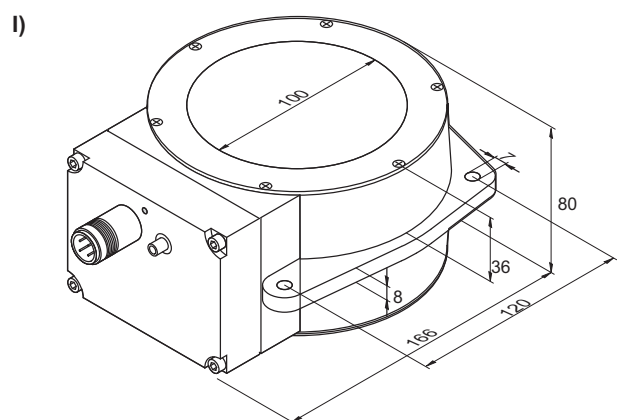
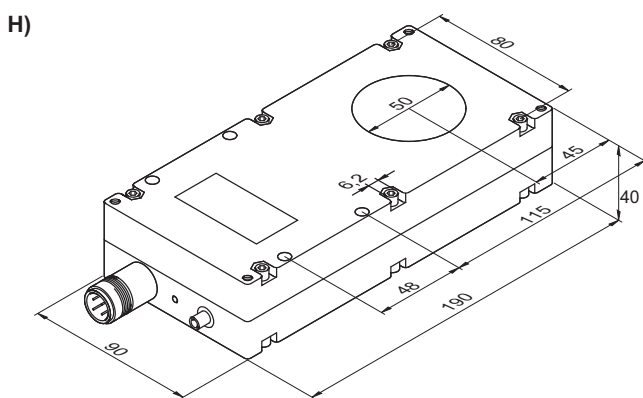
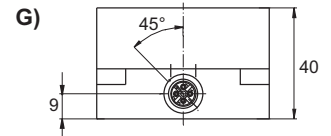
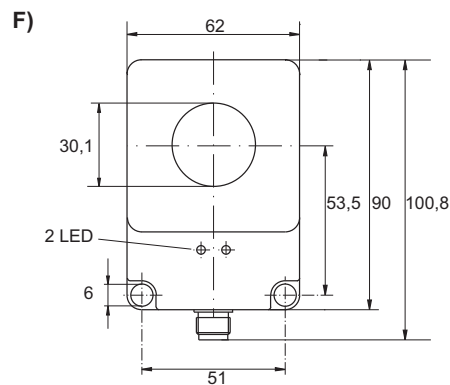
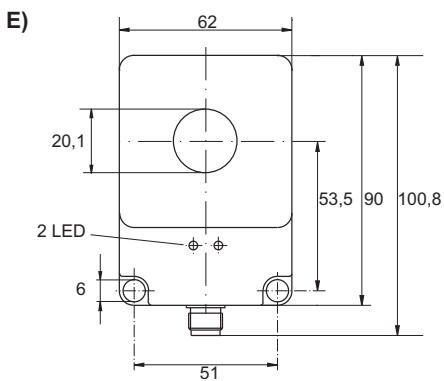
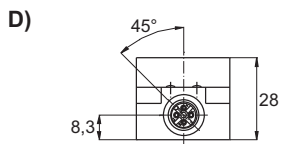
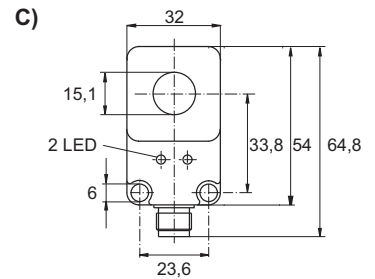
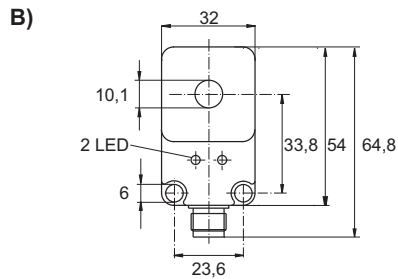
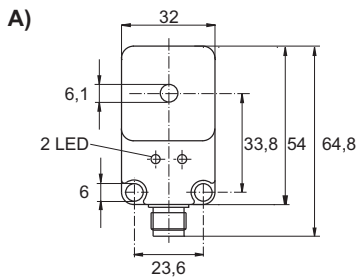
Control unit and accessories on pages 15 and 16.



INDUCTIVE SENSORS RING SENSORS

NORMAL SENSITIVITY (STATIC PRINCIPLE)

Dimensions



all data in mm

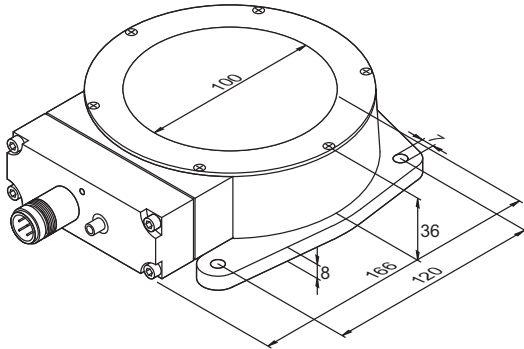


INDUCTIVE SENSORS RING SENSORS

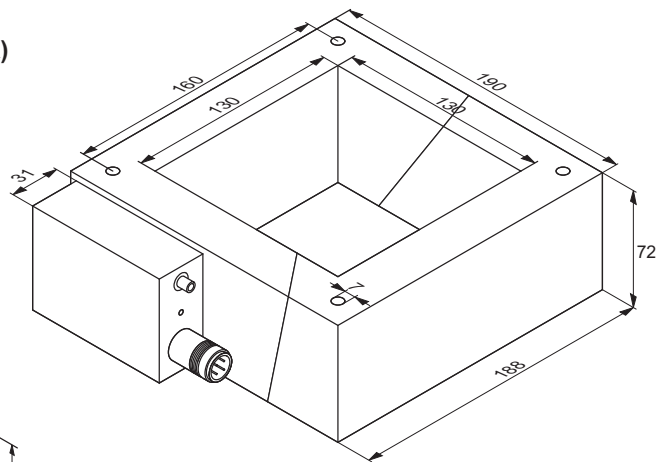
NORMAL SENSITIVITY (STATIC PRINCIPLE)

Dimensions

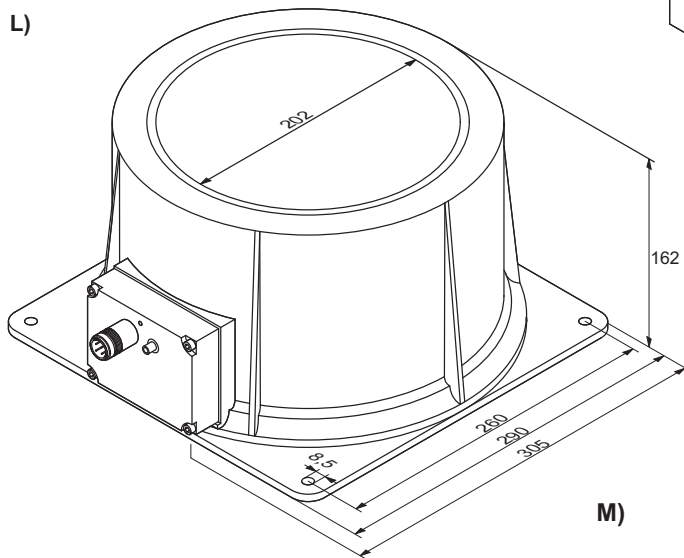
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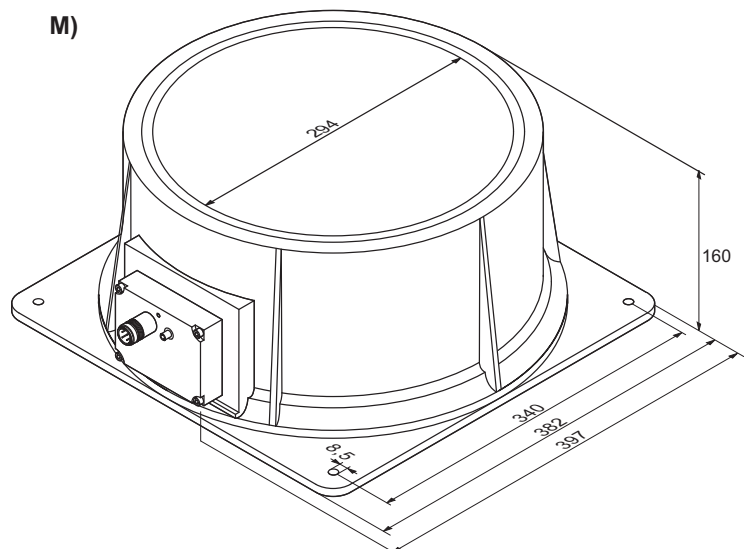
K)



L)



M)



all data in mm



INDUCTIVE SENSORS RING SENSORS

HIGH SENSITIVITY (DYNAMIC PRINCIPLE)

General data

Mounting	non shielded
Operating voltage U_b	11 ... 30V DC
Ripple voltage U_b	$\leq 10\%$
Voltage drop U_d	$\leq 2,4V$
Max. load current	KJR-D6... to KJR-D30: $\leq 200mA$ KJR-D50... to KJR-D300: $\leq 50mA$
Off-state current I_o	KJR-D6... to KJR-D30: $\leq 15mA$ KJR-D50... to KJR-D300: $\leq 25mA$
Hysteresis H	$\leq 15\%$
Operating temperature T_a	$-25^\circ C \dots +70^\circ C$
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 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	10 μ A	A + D
08310001008	KJR-D6KN-DNIA-V2	NPN	FE-ball D=0,4mm	10Hz	10 μ A	A + D
08310001004	KJR-D10KN-DPIA-V2	PNP	FE-ball D=0,5mm	10Hz	10 μ A	B + D
08310001009	KJR-D10KN-DNIA-V2	NPN	FE-ball D=0,5mm	10Hz	10 μ A	B + D
08310001005	KJR-D15-KN-DPIA-V2	PNP	FE-ball D=0,6mm	10Hz	10 μ A	C + D
08310001010	KJR-D15-KN-DNIA-V2	NPN	FE-ball D=0,6mm	10Hz	10 μ A	C + D
08310001006	KJR-D20KN-DPIA-V2	PNP	FE-ball D=0,7mm	10Hz	10 μ A	E + G
08310001011	KJR-D20KN-DNIA-V2	NPN	FE-ball D=0,7mm	10Hz	10 μ A	E + G
08310001007	KJR-D30KN-DPIA-V2	PNP	FE-ball D=1,0mm	10Hz	10 μ A	F + G
08310001012	KJR-D30KN-DNIA-V2	NPN	FE-ball D=1,0mm	10Hz	10 μ A	F + G
08317010865	KJR-D50FAN-DPIA-V2	PNP	FE-ball D=0,6mm*	100Hz	50 μ A	H
08317010765	KJR-D50AN-DNIA-V2	NPN	FE-ball D=0,6mm*	100Hz	50 μ A	H
08317010265	KJR-D50FAN-DNIA-V2	PNP	FE-ball D=1,0mm*	100Hz	50 μ A	I
08317110065	KJR-D70AN-DNIA-V2	NPN	FE-ball D=1,0mm*	100Hz	50 μ A	J
08317000265	KJR-D100AN-DPIA-V2	PNP	FE-ball D=1,3mm*	100Hz	50 μ A	K
08317000165	KJR-D100AN-DNIA-V2	NPN	FE-ball D=1,3mm*	100Hz	50 μ A	K
08317090359	KJR-Q130AN-DNIA-VE	PNP	FE-ball D=5,0mm	100Hz	500 μ A	L
08317030265	KJR-D200AN-DPIA-V2	NPN	FE-ball D=3,0mm	100Hz	50 μ A	M
08317030165	KJR-D200AN-DNIA-V2	PNP	FE-ball D=3,0mm	100Hz	50 μ A	M
08317090259	KJR-Q290AN-DNIA-VE	NPN	FE-ball D=12,0mm	100Hz	500 μ A	N
08317040265	KJR-D300AN-DPIA-V2	PNP	FE-ball D=4,0mm	100Hz	50 μ A	O
08317040165	KJR-D300AN-DNIA-V2	NPN	FE-ball D=4,0mm	100Hz	50 μ A	O

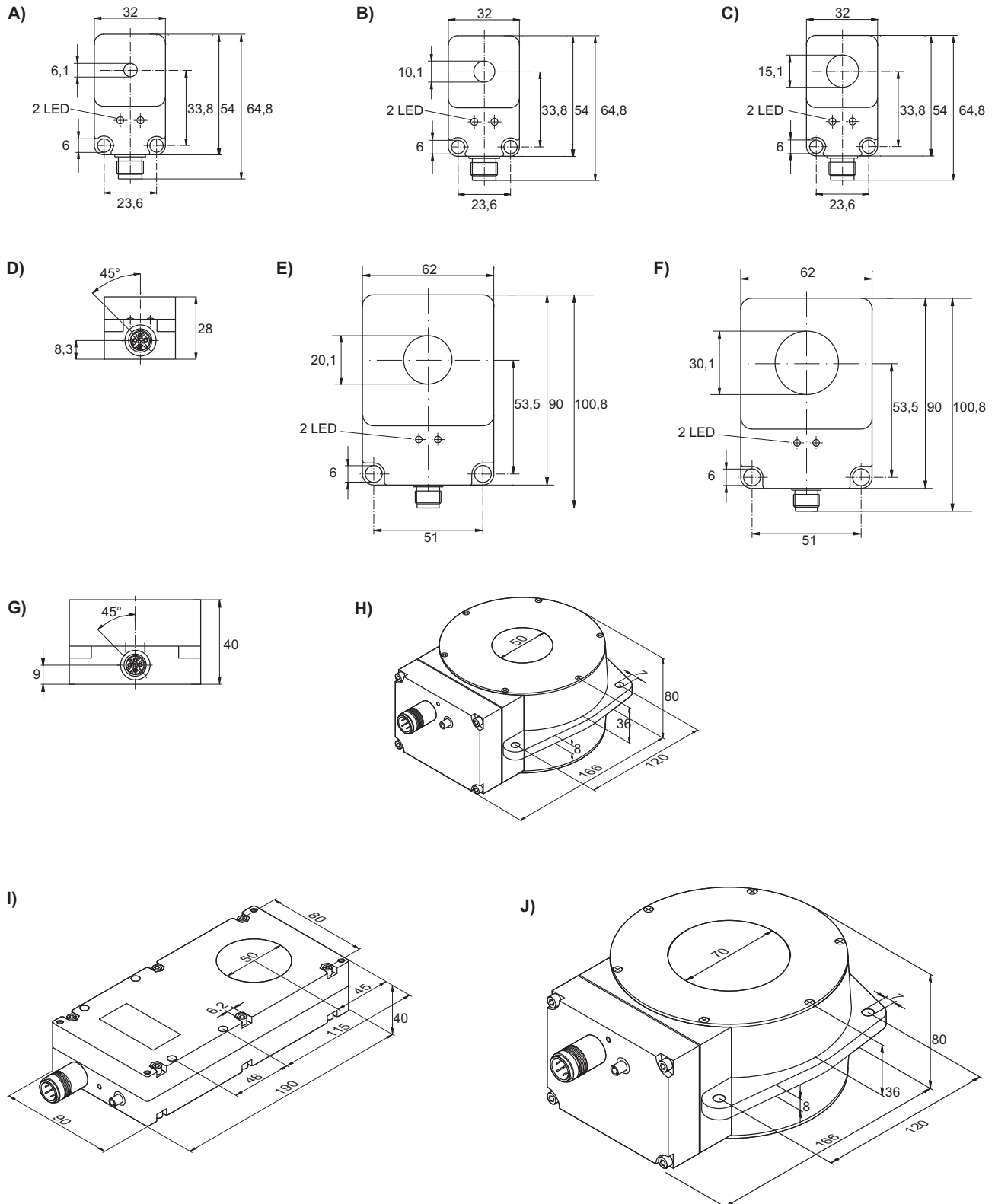
Control unit and accessories on pages 15 and 16.



INDUCTIVE SENSORS RING SENSORS

HIGH SENSITIVITY (DYNAMIC PRINCIPLE)

Dimensions

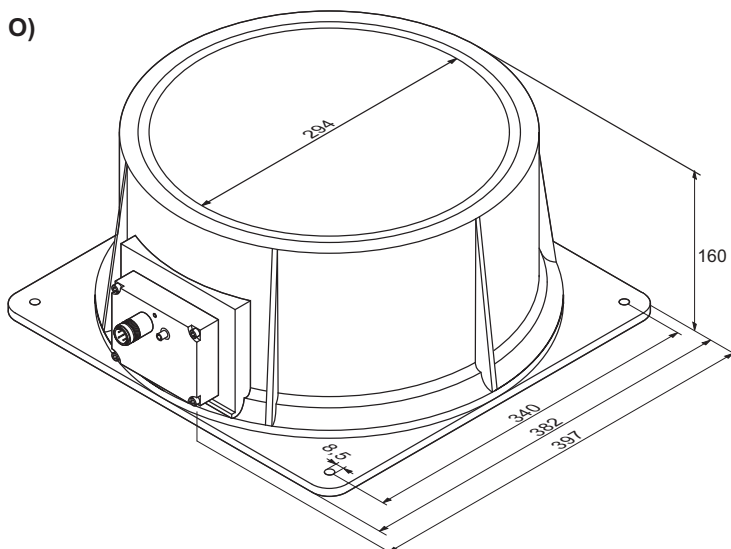
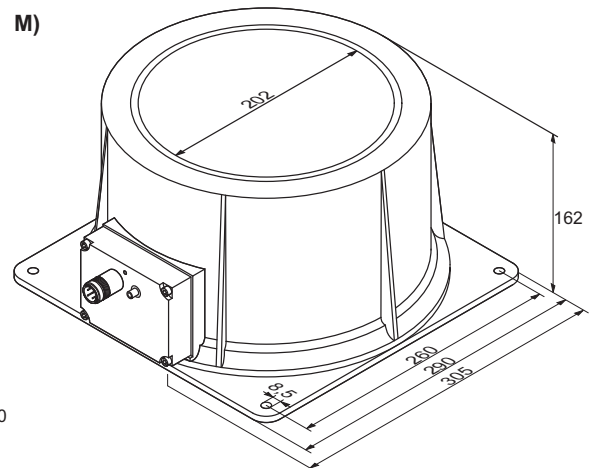
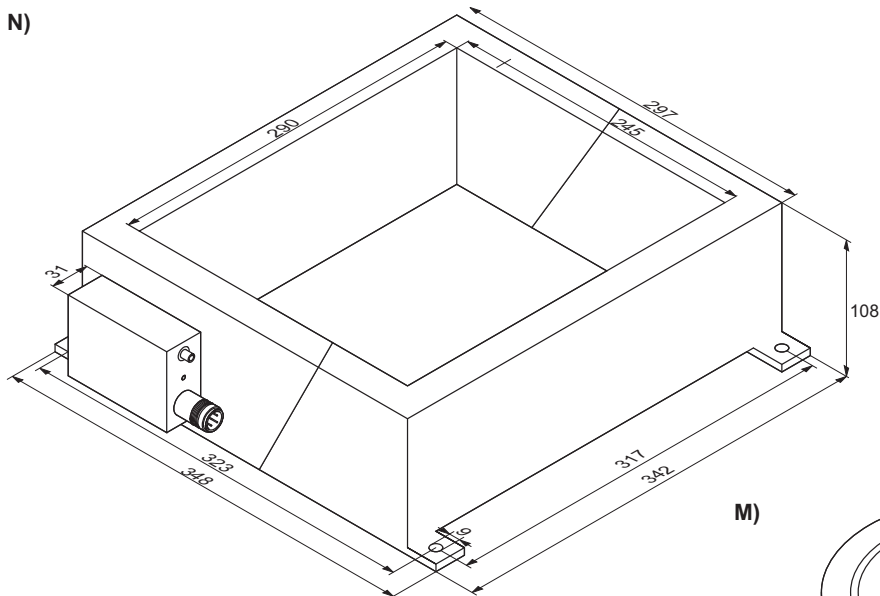
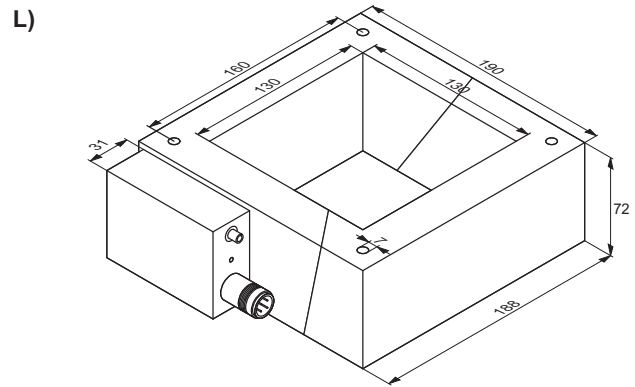
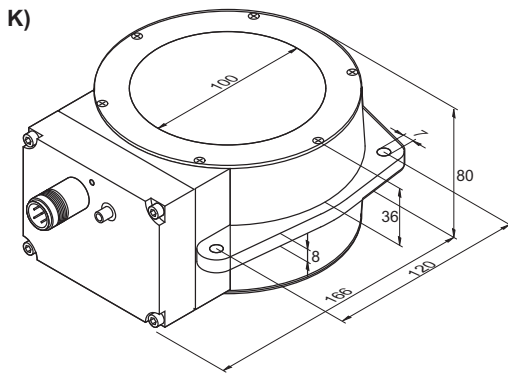


all data in mm



HIGH SENSITIVITY (DYNAMIC PRINCIPLE)

Dimensions



all data in mm



INDUCTIVE SENSORS RING SENSORS

ANALOG

General data

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

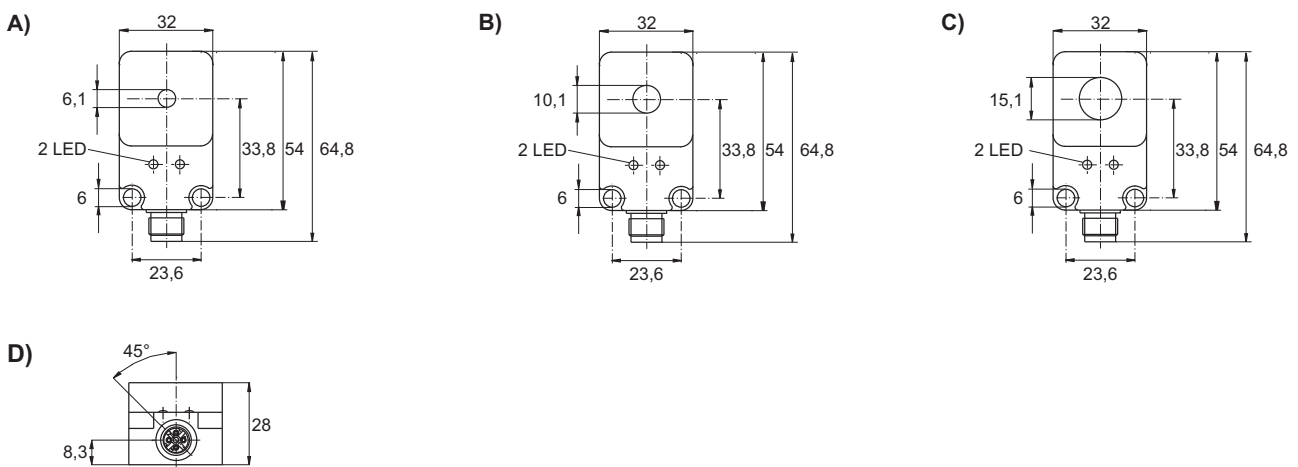


Selection chart

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



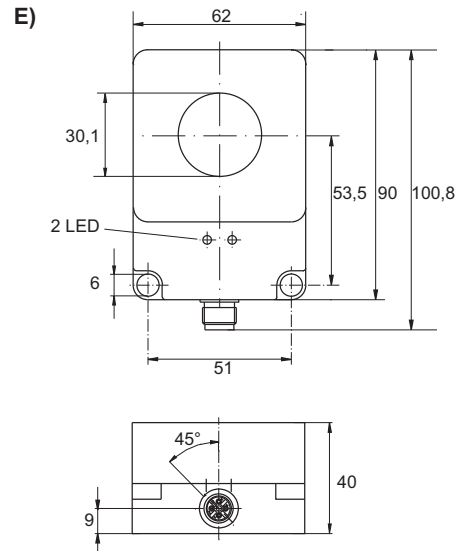
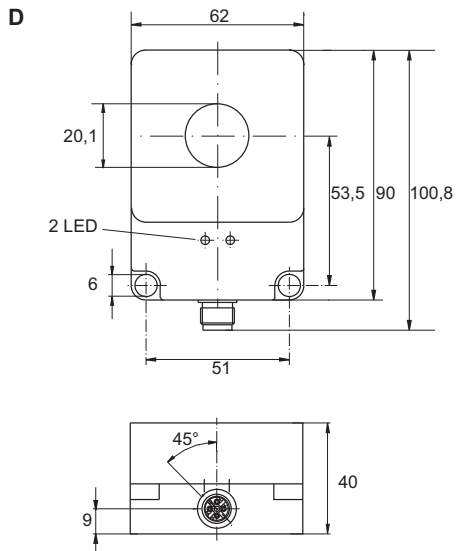
all data in mm



INDUCTIVE SENSORS RING SENSORS

ANALOG

Dimensions



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.

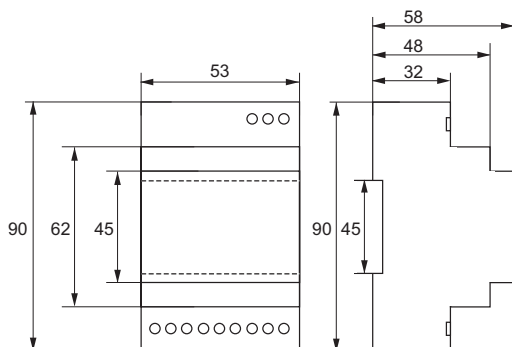


Technical data

	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.

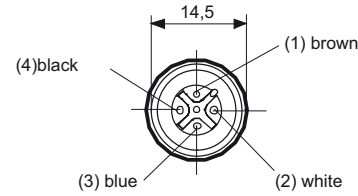
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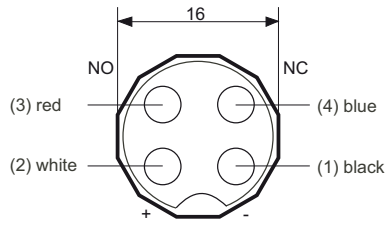
INDUCTIVE SENSORS RING SENSORS

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	4450512531	44505125312
Article number SD4K (Euchner)	4455120200	44505120202



M12 4-pole



SD4K (Euchner)