



LS 97

Throughbeam photoelectric sensors

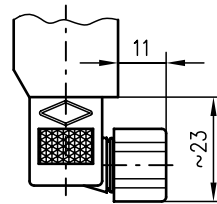
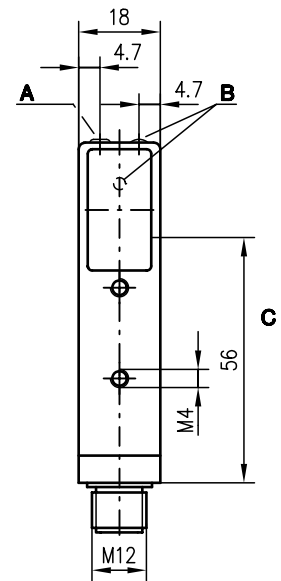
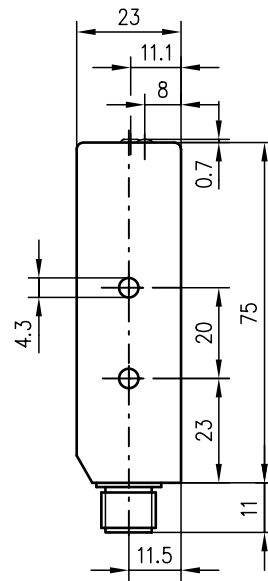


9m

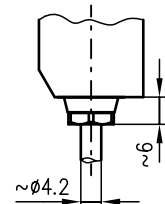
10 - 30 V  
DC

- Throughbeam photoelectric sensor with infrared light or visible red light
- Small construction with glass cover and robust metal housing for protection against environmental influences
- Connection via M12 connector, plug or cable
- Activation input for testing and interlinking
- Additional indicator diode on the front part (for exact alignment)

Dimensioned drawing



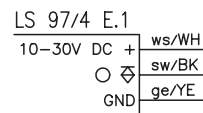
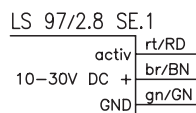
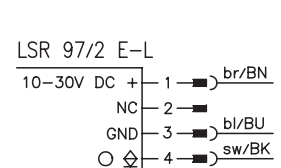
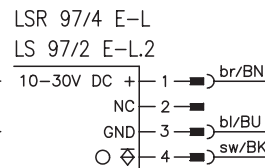
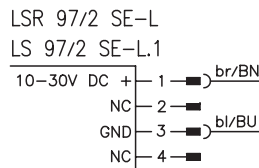
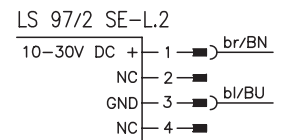
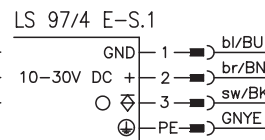
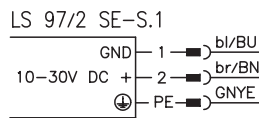
LS 97/2 SE-S.1  
LS 97/4 E-S.1



LS 97/2.8 SE.1  
LS 97/4 E.1

- A Sensitivity adjustment (only for LS 97/4 E-L.2)
- B Indicator diode
- C Optical axis

Electrical connection



We reserve the right to make changes • 97\_a01e.fm



Accessories:

(available separately)

- Mounting systems (BT 92, UMS 1, UMS 96-95)
- Diaphragm (BL 97.1)
- M12 connectors (KD ...)
- Ready-made cables (KB ...)

## Specifications

### Optical data

Typ. operating range limit <sup>1)</sup>  
 Operating range <sup>2)</sup>  
 Light source  
 Wavelength

### LS 97...

0 ... 9m  
 0 ... 5m  
 LED (modulated light)  
 880nm (infrared)/660nm (visible red light)

### LS 97/4 L.2

0 ... 6m  
 0 ... 3.5m

### Timing

Switching frequency  
 Response time  
 Delay before start-up

200Hz  
 2.5ms  
 ≤ 100ms

### Electrical data

Operating voltage  $U_B$   
 Residual ripple  
 Bias current  
 Switching output  
 Function characteristics  
 Signal voltage high/low  
 Output current  
 Sensitivity

10 ... 30VDC (incl. residual ripple)  
 ≤ 15% of  $U_B$   
 ≤ 40mA  
 PNP or NPN transistor output  
 light switching  
 $\geq (U_B - 2V) / \leq 2V$   
 max. 100mA

adjustable with  
 12-turn potentiometer

### Indicators

LED yellow  
 LED yellow flashing

light path free  
 light path free, no performance reserve

### Mechanical data

Housing  
 Optics cover  
 Weight  
 Connection type

diecast zinc  
 glass  
 85g  
 M12 connector 4-pin, stainless steel,  
 connector 4-pin or cable 2m (cross section 3x0.25mm<sup>2</sup>)

### Environmental data

Ambient temp. (operation/storage)  
 Protective circuit <sup>3)</sup>  
 VDE safety class <sup>4)</sup>

-20°C ... +60°C/-30°C ... +70°C  
 2, 3  
 I (for S types)  
 II, all-insulated (for all L and cable types)  
 IP 67/IP 65 (for all S types)  
 1 (acc. to EN 60825-1)  
 IEC 60947-5-2

Protection class  
 LED class  
 Standards applied

### Options

Activation input active  
 Transmitter active/not active  $\geq 8V / \leq 2V$  or not connected

- 1) Typ. operating range limit: max. attainable range without performance reserve
- 2) Operating range: recommended range with performance reserve
- 3) 2=polarity reversal protection, 3=short-circuit protection for all outputs
- 4) Rating voltage 250VAC

## Order guide

Selection table		Order code →						
Equipment ↓		LSR 97/2 L Part No. 500 29648 (Tr) Part No. 500 29647 (Re)	LS 97/4 S.1 Part No. 500 29651 (Tr) Part No. 500 29655 (Re)	LSR 97/4 L Part No. 500 29648 (Tr) Part No. 500 29649 (Re)	LS 97/4 L.2 Part No. 500 29650 (Tr) Part No. 500 29654 (Re)	LS 97/4.8.1 Part No. 500 29652 (Tr) Part No. 500 29653 (Re)		
Switching output	PNP transistor		●	●	●	●		
	NPN transistor	●						
Light source	red light	●		●				
	infrared light		●		●	●		
Connection	M12 connector	●		●	●			
	cable					●		
	plug		●					
Features	sensitivity adjustment				●			
	activation input					●		
	UL	●	●	●	●			

## Tables

### LS 97...

0	5	9
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Operating range [m]  
 Typ. operating range limit [m]

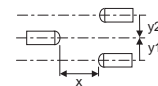
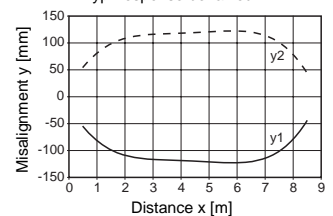
### LS 97/4 L.2

0	3.5	6
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Operating range [m]  
 Typ. operating range limit [m]

## Diagrams

Typ. response behaviour



## Remarks

- The S types are shipped with connectors.



RK 97

Retro-reflective photoelectric sensors

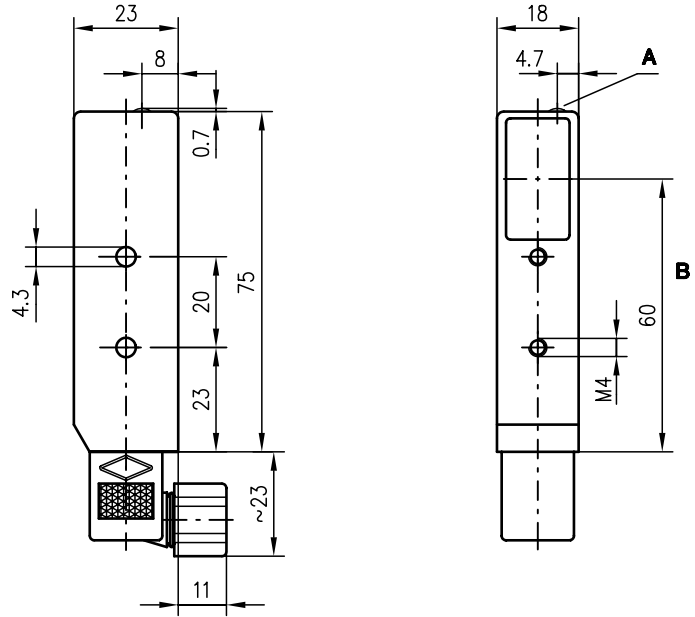


0.1 ... 6m



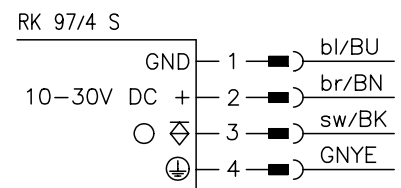
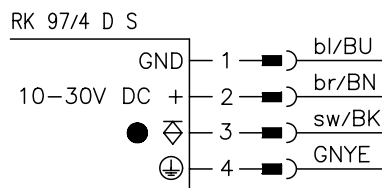
- Retro-reflective photoelectric sensors with infrared light
- Small construction with glass cover and robust metal housing for protection against environmental influences
- Connection via plug

Dimensioned drawing



- A Indicator diode
- B Optical axis

Electrical connection



Accessories:

(available separately)

- Mounting systems (BT 92, UMS 1, UMS 96-95)
- Diaphragm (BL 97.1)
- Ready-made cables (KB ...)
- Reflectors
- Reflective tapes

We reserve the right to make changes • 97\_b01e.fm



### Specifications

#### Optical data

Typ. operating range limit (TK(S) 100x100) <sup>1)</sup> 0.1 ... 6m  
 Operating range <sup>2)</sup> see table  
 Light source LED (modulated light)  
 Wavelength 880nm (infrared)

#### Timing

Switching frequency 200Hz  
 Response time 2.5ms  
 Delay before start-up ≤ 100ms

#### Electrical data

Operating voltage U<sub>B</sub> 10 ... 30VDC (incl. residual ripple)  
 Residual ripple ≤ 15% of U<sub>B</sub>  
 Bias current ≤ 30mA  
 Switching output PNP transistor output  
 Function characteristics light/dark switching  
 Signal voltage high/low ≥ (U<sub>B</sub>-2V)/≤ 2V  
 Output current max. 100mA

#### Indicators

LED yellow light path free  
 LED yellow flashing light path free, no performance reserve

#### Mechanical data

Housing diecast zinc  
 Optics cover glass  
 Weight 85g  
 Connection type connector 4-pin

#### Environmental data

Ambient temp. (operation/storage) -20°C ... +60°C/-30°C ...+70°C  
 Protective circuit <sup>3)</sup> 2, 3  
 VDE safety class I  
 Protection class IP 65  
 LED class 1 (acc. to EN 60825-1)  
 Standards applied IEC 60947-5-2

1) Typ. operating range limit: max. attainable range without performance reserve  
 2) Operating range: recommended range with performance reserve  
 3) 2=polarity reversal protection, 3=short-circuit protection for all outputs

### Tables

Reflectors			Operating range
1	TK(S)	100x100	0.1 ... 4m
2	MTK(S)	50x50	0.1 ... 3m
3	TK(S)	30x50	0.1 ... 1.7m
4	TK(S)	20x40	0.1 ... 1.5m
5	Tape 2	100x100	0.15 ... 1.4m

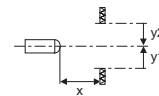
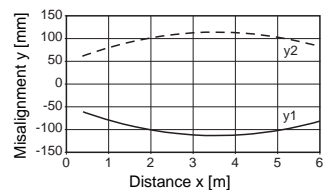
1	0.1		4	6
2	0.1		3	4.5
3	0.1	1.7	2.6	
4	0.1	1.5	2.4	
5	0.15	1.4	2.4	

Operating range [m]  
 Typ. operating range limit [m]

TK ... = adhesive  
 TKS ... = screw type  
 Tape 2 = adhesive

### Diagrams

Typ. response behaviour (TK 100x100)



### Order guide

	Designation	Part No.
light switching	RK 97/4 S	500 00556
dark switching	RK 97/4 DS	500 00557

### Remarks

- The devices are shipped with connectors.



PRK 97

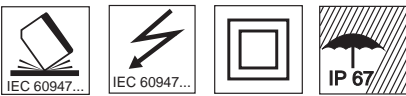
Retro-reflective photoelectric sensors with polarisation filter



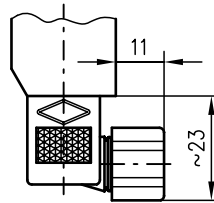
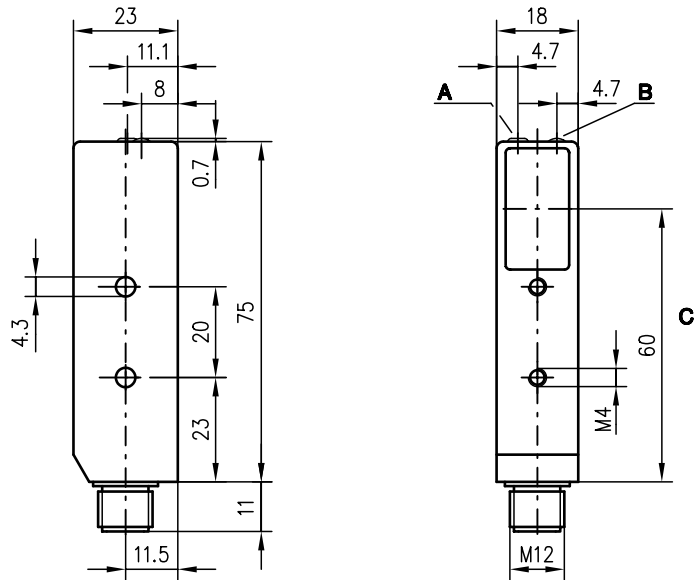
0.1 ... 6m



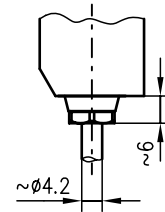
- Polarised retro-reflective photoelectric sensors with visible red light
- Small construction with glass cover and robust metal housing for protection against environmental influences
- Adjustable sensitivity with high resolution allows detection of transparent objects
- Connection via M12 connector, plug or cable
- Activation input for testing and interlinking



Dimensioned drawing



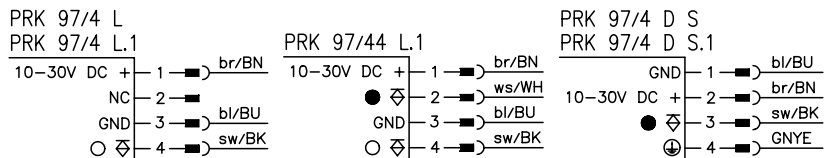
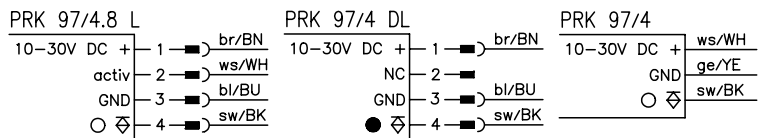
PRK 97/4 D S.1  
PRK 97/4 S



PRK 97/4

- A Sensitivity adjustment (only PRK 97/4 L.1)
- B Indicator diode
- C Optical axis

Electrical connection



We reserve the right to make changes • 97\_b02e.fm

Accessories:

(available separately)

- Mounting systems (BT 92, UMS 1, UMS 96-95)
- Diaphragm (BL 97.1)
- M12 connectors (KD ...)
- Ready-made cables (KB ...)
- Reflectors
- Reflective tapes



### Specifications

#### Optical data

Typ. operating range limit (TK(S) 100x100) <sup>1)</sup> 0.1 ... 6m  
 Operating range <sup>2)</sup> see table  
 Light source LED (modulated light)  
 Wavelength 660nm (visible red light, polarised)

#### Timing

Switching frequency 200Hz  
 Response time 2.5ms  
 Delay before start-up ≤ 100ms

#### Electrical data

Operating voltage U<sub>B</sub> 10 ... 30VDC (incl. residual ripple)  
 Residual ripple ≤ 15% of U<sub>B</sub>  
 Bias current ≤ 30mA  
 Switching output PNP or NPN transistor output  
 Function characteristics light/dark switching  
 (PRK 97/44 L with complementary outputs)  
 Signal voltage high/low ≥ (U<sub>B</sub>-2V)/≤ 2V  
 Output current max. 100mA  
 Sensitivity adjustable with 12-turn potentiometer for PRK 97/4 L.1

#### Indicators

LED yellow light path free  
 LED yellow flashing light path free, no performance reserve

#### Mechanical data

Housing diecast zinc  
 Optics cover glass  
 Weight 85g  
 Connection type M12 connector 4-pin, stainless steel,  
 connector 4-pin or cable 2m (cross section 3x0.25mm<sup>2</sup>)

#### Environmental data

Ambient temp. (operation/storage) -20°C ... +60°C/-30°C ... +70°C  
 Protective circuit <sup>3)</sup> 2, 3  
 VDE safety class <sup>4)</sup> I (for S types)  
 II, all-insulated (for all L and cable types)  
 Protection class IP 67/IP 65 (for all S types)  
 LED class 1 (acc. to EN 60825-1)  
 Standards applied IEC 60947-5-2

#### Options

Activation input active  
 Transmitter active/not active ≥ 8V/≤ 2V or not connected

- 1) Typ. operating range limit: max. attainable range without performance reserve
- 2) Operating range: recommended range with performance reserve
- 3) 2=polarity reversal protection, 3=short-circuit protection for all outputs
- 4) Rating voltage 250VAC

### Tables

Reflectors			Operating range	
1	TK(S)	100x100	0.1 ... 4m	
2	MTK(S)	50x50	0.1 ... 3m	
3	TK(S)	30x50	0.1 ... 1.7m	
4	TK(S)	20x40	0.1 ... 1.4m	
5	Tape 2	100x100	0.15 ... 1.4m	

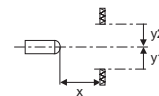
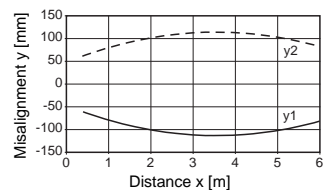
1	0.1		4	6
2	0.1		3	4.5
3	0.1	1.7	2.6	
4	0.1	1.4	2.1	
5	0.15	1.4	2.4	

□ Operating range [m]  
 ▒ Typ. operating range limit [m]

TK ... = adhesive  
 TKS ... = screw type  
 Tape 2 = adhesive

### Diagrams

Typ. response behaviour (TK 100x100)



### Order guide

Selection table		Order code →									
Equipment ↓		PRK 97/4.8 L Part No. 500 80474	PRK 97/4 L Part No. 500 19663	PRK 97/4 S Part No. 500 17092	PRK 97/4 DS.1 Part No. 500 25686	PRK 97/4 DL Part No. 500 29642	PRK 97/4 Part No. 500 80994	PRK 97/4 L.1 Part No. 500 25324	PRK 97/2 L Part No. 500 29641	PRK 97/44 L Part No. 500 35301	PRK 97/4 DS Part No. 500 81305
Switching output	PNP transistor	●	●	●	●	●	●	●		●	●
	NPN transistor								●		
Switching	light switching	●	●	●			●	●	●		
	dark switching				●	●					●
	compl. switch. outputs									●	
Connection	M12 connector	●	●			●		●	●	●	
	cable			●	●						●
	plug						●				
Features	activation input	●									
	sensitivity							●			
	UL	●	●	●	●	●	?	●	?	●	●

### Remarks

- PRK 97/4 S and PRK 97/4 DS are shipped with cable connector.



## RK(R) 97

## Energetic diffuse reflection light scanner

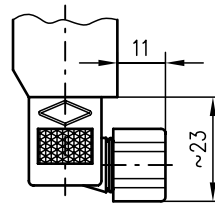
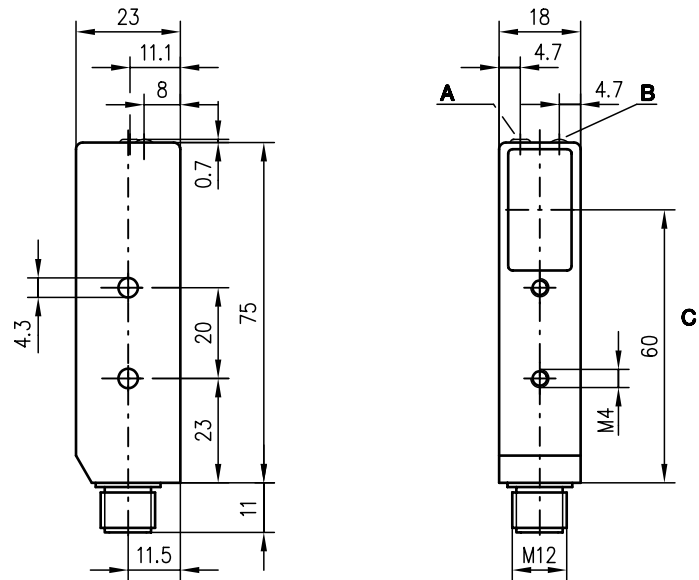


2 ... 100 mm  
2 ... 200 mm

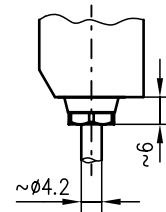


- Energetic scanner with sensitivity adjustment in visible red light or fixed scanning range with infrared light
- Small construction with glass cover and robust metal housing for protection against environmental influences
- Adjustable sensitivity with high resolution allows optimal adaptation to applications
- Connection via M12 connector, plug or cable
- Activation input for testing and interlinking

### Dimensioned drawing



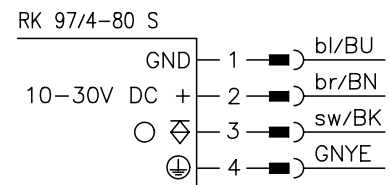
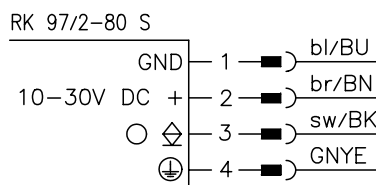
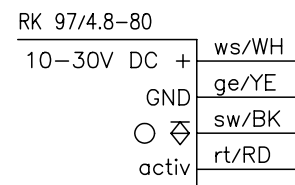
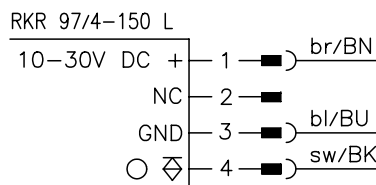
RK 97/4-80 S  
RK 97/2-80 S



RK 97/4.8-80

- A** Sensitivity adjustment (only PRK 97/4 150 L)
- B** Indicator diode
- C** Optical axis

### Electrical connection



### Accessories:

(available separately)

- Mounting systems (BT 92, UMS 1, UMS 96-95)
- M12 connectors (KD ...)
- Ready-made cables (KB ...)

We reserve the right to make changes • 97\_c01e.fm



### Specifications

#### Optical data

Typ. scanning range limit (white 90%) <sup>1)</sup>  
Scanning range <sup>2)</sup>  
Adjustment range  
Light source  
Wavelength

#### RK 97/...

2 ... 100mm  
2 ... 80mm  
LED (modulated light)  
880nm

#### RKR 97/...

2 ... 200mm  
2 ... 150mm  
60 ... 200mm  
LED (modulated light)  
660nm (visible red light)

#### Timing

Switching frequency  
Response time  
Delay before start-up

200Hz  
2.5ms  
≤ 100ms

#### Electrical data

Operating voltage U<sub>B</sub>  
Residual ripple  
Bias current  
Switching output  
Function characteristics  
Signal voltage high/low  
Output current  
Sensitivity

10 ... 30VDC (incl. residual ripple)  
≤ 15% of U<sub>B</sub>  
≤ 30mA  
PNP or NPN transistor output  
light switching  
≥ (U<sub>B</sub>-2V)/≤ 2V  
max. 100mA

adjustable via  
12-turn potentiometer

#### Indicators

LED yellow

light path free

#### Mechanical data

Housing  
Optics cover  
Weight  
Connection type

diecast zinc  
glass  
85g  
M12 connector 4-pin, stainless steel,  
connector 4-pin or cable 2m (cross section 4x0.38mm<sup>2</sup>)

#### Environmental data

Ambient temp. (operation/storage)  
Protective circuit <sup>3)</sup>  
VDE safety class <sup>4)</sup>

-20°C ... +60°C/-30°C ... +70°C  
2, 3  
I (for S types)  
II, all-insulated (for all L and cable types)  
IP 67/IP 65 (for all S types)  
1 (acc. to EN 60825-1)  
IEC 60947-5-2

Protection class  
LED class  
Standards applied

#### Options

Activation input active  
Transmitter active/not active ≥ 8V/≤ 2V or not connected

- 1) Typ. scanning range limit: max. attainable range without performance reserve
- 2) Scanning range: recommended range with performance reserve
- 3) 2=polarity reversal protection, 3=short-circuit protection for all outputs
- 4) Rating voltage 250VAC

### Tables

#### RK 97...

1	2	80	100
2	8	60	80
3	12	50	70

1	white 90%
2	grey 18%
3	black 6%

Scanning range [mm]  
Typ. scanning range limit [mm]

#### RKR 97...

1	2	150	200
2	20	110	140
3	30	90	100

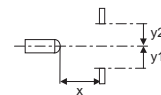
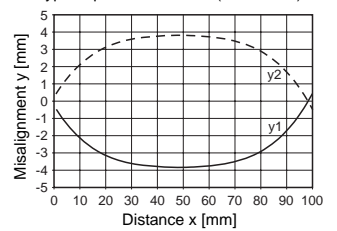
1	white 90%
2	grey 18%
3	black 6%

Scanning range [mm]  
Typ. scanning range limit [mm]

### Diagrams

#### RK 97...

Typ. response behaviour (white 90%)



### Order guide

Selection table		Order code →									
Equipment ↓		RKR 97/4-150 L Part No. 500 29644	RK 97/4-80 S Part No. 500 00558	RK 97/4-8-80 Part No. 500 06884	RK 97/2-80 S Part No. 500 06572						
Switching output	PNP transistor	●	●	●							
	NPN transistor				●						
Light source	red light	●									
	infrared light		●	●	●						
Connection	M12 connector	●									
	cable			●	●						
	plug		●								
Features	sensitivity adjustment	●									
	activation input			●							
	UL	●	●	?	●						

### Remarks

- The upper and lower scanning range limits can change with poorly reflecting materials.
- The S types are shipped with connectors.



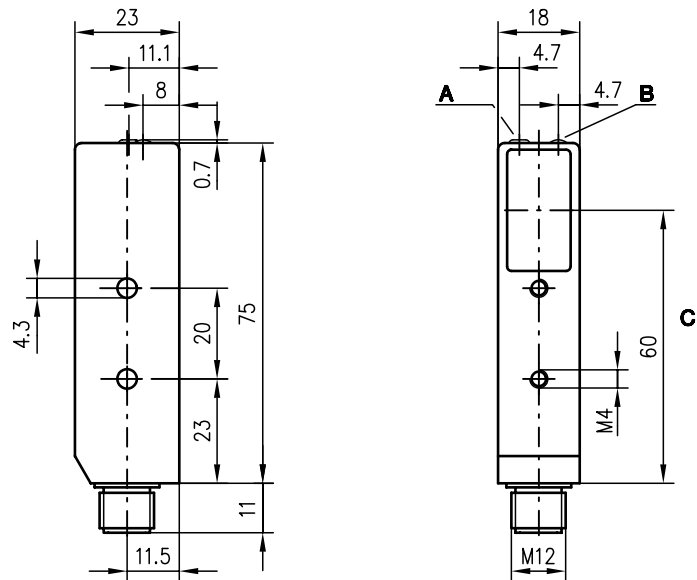


FRKR 97

Diffuse reflection light scanner with background suppression



Dimensioned drawing



2 ... 150mm



- Scanner with adjustable background suppression
- Visible red light for fast and easy alignment
- Very good black/white performance, exact adjustment via multiturn potentiometer
- Small construction with glass cover and robust metal housing for protection against environmental influences

- A Scanning range adjustment
- B Indicator diode
- C Optical axis

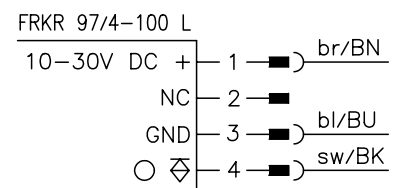
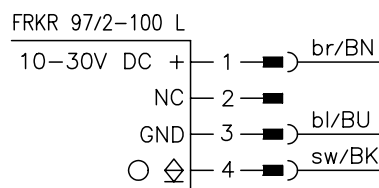
Electrical connection



Accessories:

(available separately)

- Mounting systems (BT 92, UMS 1, UMS 96-95)
- M12 connectors (KD ...)
- Ready-made cables (KB ...)



We reserve the right to make changes • 97\_d01e.fm



### Specifications

#### Optical data

Typ. scanning range limit (white 90%) <sup>1)</sup>	2 ... 150mm
Scanning range <sup>2)</sup>	2 ... 100mm
Adjustment range	30 ... 150mm
Light beam characteristic	focussed at 80mm
Light source	LED (modulated light)
Wavelength	660nm (visible red light)

#### Timing

Switching frequency	200Hz
Response time	2.5ms
Delay before start-up	≤ 100ms

#### Electrical data

Operating voltage U <sub>B</sub>	10 ... 30VDC (incl. residual ripple)
Residual ripple	≤ 15% of U <sub>B</sub>
Bias current	≤ 30mA
Switching output	PNP or NPN transistor output
Function characteristics	light switching
Signal voltage high/low	≥ (U <sub>B</sub> -2V) ≤ 2V
Output current	max. 100mA

#### Indicators

LED yellow	light path free
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#### Mechanical data

Housing	diecast zinc
Optics cover	glass
Weight	85g
Connection type	M12 connector, 4-pin, stainless steel

#### Environmental data

Ambient temp. (operation/storage)	-20°C ... +60°C/-30°C ...+70°C
Protective circuit <sup>3)</sup>	2, 3
VDE safety class <sup>4)</sup>	II, all-insulated
Protection class	IP 67
LED class	1 (acc. to EN 60825-1)
Standards applied	IEC 60947-5-2

- 1) Typ. scanning range limit: max. attainable range without performance reserve
- 2) Scanning range: recommended range with performance reserve
- 3) 2=polarity reversal protection, 3=short-circuit protection for all outputs
- 4) Rating voltage 250VAC

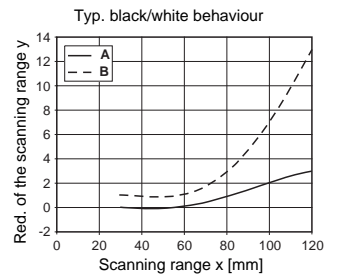
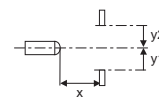
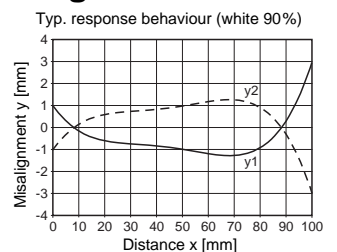
### Tables

1	2	100	150
2	4	98	135
3	9	93	120

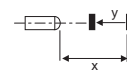
1	white 90%
2	grey 18%
3	black 6%

- Scanning range [mm]
- Typ. scanning range limit [mm]

### Diagrams



- A grey 18%
- B black 6%



### Order guide

	Designation	Part No.	UL
PNP transistor output	FRKR 97/4-100 L	500 29646	●
NPN transistor output	FRKR 97/2-100 L	500 29645	?

### Remarks

- With the set scanning range, a tolerance of the upper scanning range limit is possible depending on the reflection properties of the material surface.