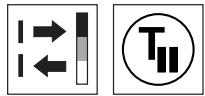


## KRTM 20



12mm  
20mm  
50mm



12-30V  
DC

50/25  
kHz

- Dynamic teach-in
- RGB transmitter
- Response time analog/digital (10µs/10µs or 10µs/20µs)
- Digital switching frequency 50kHz or 25kHz
- Resolution of 70 gray levels at the digital output
- Resolution of 400 gray levels at the analog output
- Analog output 1 ... 10mA
- Changeover to the switching threshold
- Changeover to the analysis depth
- L/D switching
- Pulse stretching



IEC 60947...



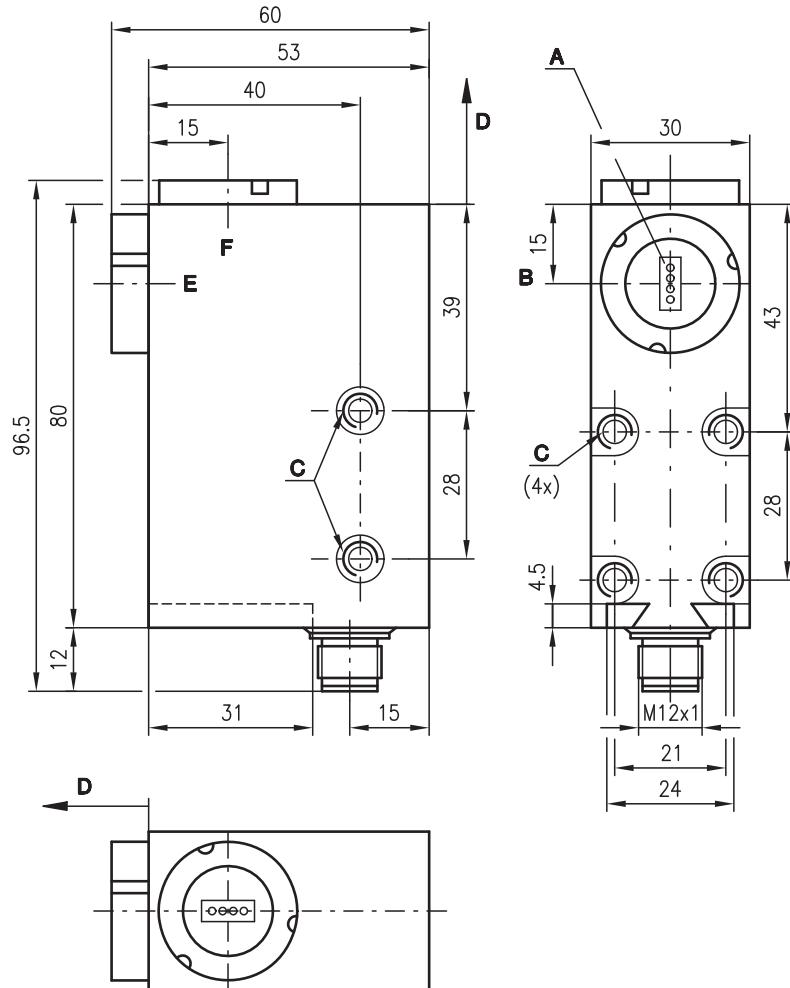
IEC 60947...

## Accessories:

(available separately)

- M12 connectors, 5-pin (KD ...)
- Ready-made cables (K-D ...)
- Interchangeable objectives
- Tool for changing objectives

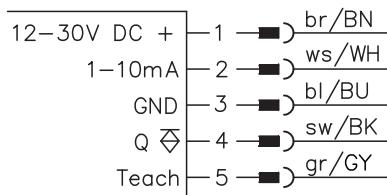
## Dimensioned drawing



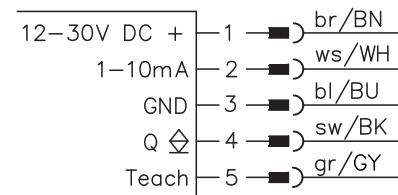
**A** Light spot orientation vertical  
**B** Optical axis  
**C** M5/5.5mm deep  
**D** Scanning range  
**E** Front  
**F** Head

## Electrical connection

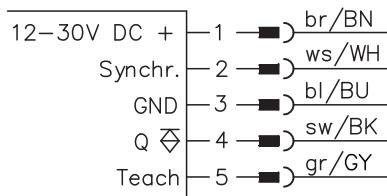
## PNP + analog



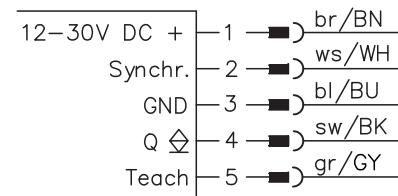
## NPN + analog



## PNP



## NPN



## Specifications

### Optical data

Scanning range with objective 1 1)	12mm $\pm$ 1 mm
Scanning range with objective 2 2)	20mm $\pm$ 2 mm
Scanning range with objective 3 1)	50mm $\pm$ 5 mm
Light spot dimension with objective 1 1)	3.0mmx1.0mm or round light spot D = 0.5mm
Light spot dimension with objective 2 2)	4.0mmx1.2mm or round light spot D = 0.6mm
Light spot dimension with objective 3 1)	10.0mmx2.0mm or round light spot D = 1.0mm
Light spot orientation	vertical or horizontal
Light source	LEDs (red, green, blue)

### Timing

Switching frequency digital output	25kHz/50kHz reversible (see remarks)
Response time digital output	20 $\mu$ s/10 $\mu$ s reversible (see remarks)
Response jitter digital output	10 $\mu$ s
Response time of analogue output	10 $\mu$ s
Delay before start-up	$\leq$ 250ms

### Electrical data

Operating voltage $U_B$	12 ... 30VDC (incl. residual ripple)
Residual ripple	$\leq$ 15 % of $U_B$
Switching output	PNP, NPN
Function characteristics	light or dark switching, reversible via button
Analog output	1 ... 10mA
Signal voltage high/low	$\geq (U_B - 2V) / \leq 2V$
Output current	max. 100mA
Open-circuit current	$\leq$ 60mA

### Indicators

After power-on:	device set to factory settings
ON LED on	device not set to factory settings
ON LED flashing slowly	(display only for approx. 10s after power-on)
After teach-in:	
ON LED on	switching threshold set to factory settings
ON LED flashing slowly	-> switching threshold in center
Q/T LED flashing quickly	switching threshold was reconfigured
In run mode:	-> switching threshold close to the mark
ON LED on	teaching error
Delay LED	
L/D LED	ready
Q/T LED on	pulse stretching on/off
Q/T LED flashing quickly	light/dark switching
In configuration mode:	mark detected
ON LED flashing quickly	device error
Delay LED off	
Delay LED on	device is in configuration mode
L/D LED off	2x analysis depth (response time 20 $\mu$ s)
L/D LED on	1x analysis depth (response time 10 $\mu$ s)

### Mechanical data

Housing	diecast zinc
Optics cover	glass
Weight	300g
Connection type	M12 connector, stainless steel, 5-pin

### Environmental data

Ambient temp. (operation/storage)	-25°C ... +60°C/-40°C ... +70°C
Protection class	IP 67
LED class	1 (acc. to EN 60825-1)
VDE safety class	II
Protective circuit 3)	2, 3
Standards applied	IEC 60947-5-2

### Options

<b>Synchronous input</b>	$U_B/0V$ or not connected
PNP: Stop/Start measurement	0V/ $U_B$ or not connected
NPN: Stop/Start measurement	$\leq$ 0.5ms

### Synchronization delay

### Teach input

PNP: active / not active	$U_B/0V$ or not connected
NPN: active/not active	0V/ $U_B$ or not connected
Teach delay	$\leq$ 10ms

### Pulse stretching

<b>Device configuration</b>	20ms, can be activated via button
Changeover switching threshold	continue to press the teach button during power-on
Changeover response time	see remarks

1) Interchangeable objective, available as accessory  
2) Standard objective, state on delivery  
3) 2=polarity reversal protection, 3=short-circuit protection for all outputs

## Order guide

See section **Preferred types**

## Remarks

● **Approved purpose:**  
This product may only be used by qualified personnel and must only be used for the approved purpose. This sensor is not a safety sensor and is not to be used for the protection of persons.

● With shiny objects, the sensor is to be mounted at an angle to the object surface.

### Device configuration:

1. Configuration mode is activated by holding down the teach button during power-on (ON LED flashes).

2. The analysis depth is changed over using the Delay button:

**Delay LED off** =  
2x analysis depth (response time 20 $\mu$ s)

**Delay LED on** =  
1x analysis depth (response time 10 $\mu$ s)

3. The switching threshold is changed over using the L/D button:

**L/D LED off** =  
Switching threshold in center

**L/D LED on** =  
Switching threshold close to the mark

4. Press the teach button to end device configuration.

5. Back to factory settings:  
Simultaneously hold down the Delay button and the L/D button during power-on to reset the sensor to factory settings.

## Function principle of the contrast scanner

These contrast scanners are devices that can, with the aid of multiple transmitter colors (red, green, blue), distinguish between minimal gray levels (contrasts). By means of the automatic transmitter selection after a teach-in, the optimum functional safety for the respective contrast is determined and set by the device itself. As a result, any combination of marks or backgrounds can be detected with optimum functional safety. Through constant measurement and regulation of the emitted light, the devices operate with very good temperature stability. Re-teaching of the mark is, thus, no longer necessary.

Each transmitter color consists of 4 LEDs. A longish light spot with four points is formed in the focal point. This very small, extremely bright light spot guarantees a high repeatability and positioning accuracy. For the case that the mark or background is not optimally printed, the light spot can be focused by slightly changing the scanning distance in such a way that a homogeneous, rectangular light spot is formed.

With this teaching type, background and mark must be placed statically below the light spot. Using the synchronization input, the switching output can be activated or deactivated.

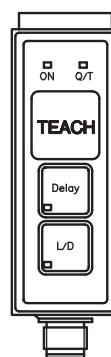
## Controls and indicators

ON LED on  
ON LED flashing slowly  
ON LED flashing quickly

ready / run mode  
device is not set to factory settings  
(Display only for approx. 10s after power-on)  
device is in configuration mode

Run mode:  
Delay LED  
Configuration mode:  
Delay LED off  
Delay LED on

pulse stretching on /off  
2x analysis depth (response time 20µs)  
1x analysis depth (response time 10µs)



Q/T LED on  
Q/T LED flashing quickly

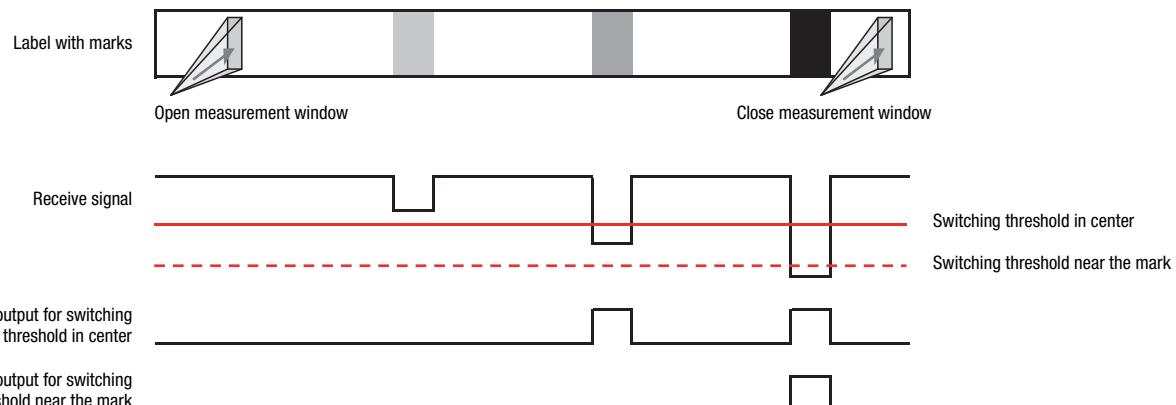
mark detected  
teach error or device error

Run mode:  
L/D LED  
Configuration mode:  
L/D LED off  
L/D LED on

light/dark switching  
switching threshold in center  
switching threshold close to the mark

## Signal response during teach-in

### Dynamic 2-point teach



## Teach process

The teach process is performed with the aid of the teach button or external teach lines. The two processes work in the same way.

Operation	Transmitter	Indicator LED
Position the light spot on the background	Red, green or blue light spot visible	
Press the teach button approx. 0.5s <b>or</b> set the teach line to high level	All colors are on White light spot visible	Q/T, Delay and L/D LEDs flash
Advance paper sheet for at least one pattern length	All colors are on White light spot visible	Q/T, Delay and L/D LEDs flash
Briefly press teach button <b>or</b> teach line to low level	Changeover to red, green or blue Red, green or blue light spot visible	ON LED on or flashes 3x Q/T LED on Q/T LED flashing -> error
Teaching error start new teaching process	All colors off	ON LED on Q/T LED flashing -> error

## Calibration - analog output 1 ... 10mA

This is an uncalibrated measurement value. The current value that is output is proportional to the last contrast ascertained by means of teach-in.

For rough calibration of the analog output, a teach-in with the following sequence is recommended .

1. Teach point on background      -> on white paper.
2. Teach point on mark      -> without object (into open space).

## Preferred types

Selection table		Order code →	KRTM 20M/P-12-6420-S12 Part No. 50116474						
Equipment ↓									
Scanning range	12mm	●							
	20mm								
	50mm								
Light spot orientation	vertical	●							
	horizontal								
	round								
Optical outlet	front								
	head	●							
Output wiring	PNP	●							
	NPN								
	analogue current								
Other features	static teach-in								
	dynamic teach-in	●							
	synchronous input	●							

Additional types on request