KRTM 20 — High Resolution Multicolor Contrast Scanner

en 03-2014/04 50113452-01

12mm
20mm
50mm

12 - 30 V DC

50/25 kHz

- **Static** 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

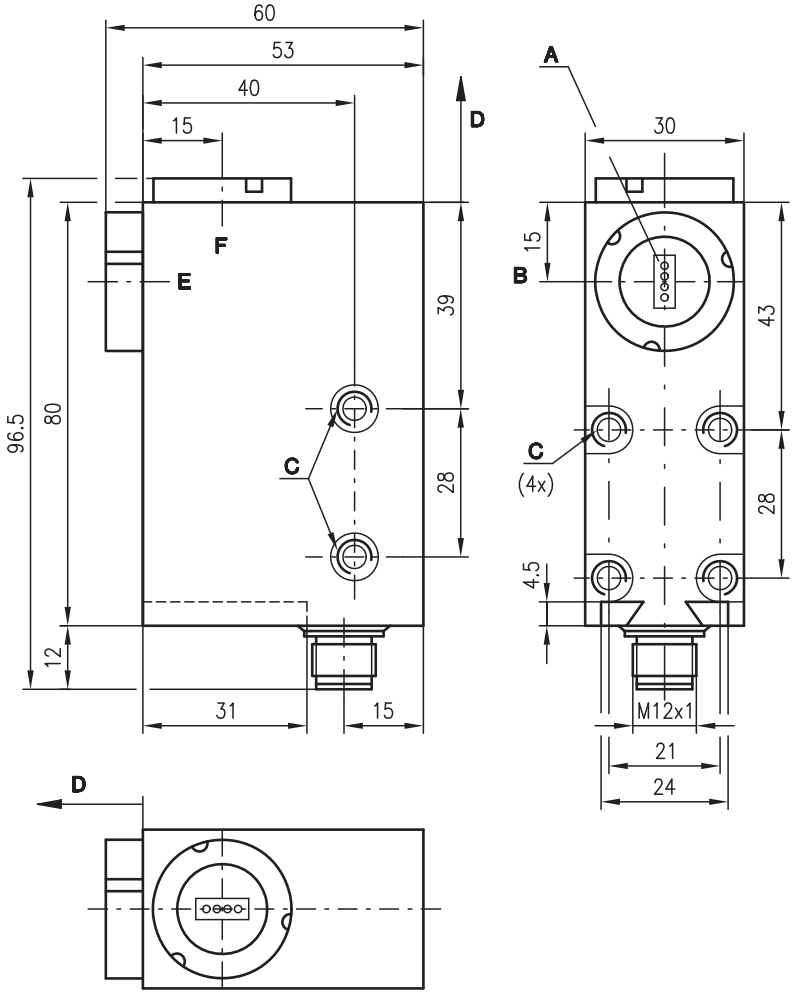
IEC 60947... IEC 60947... IP 67

Accessories:

(available separately)

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

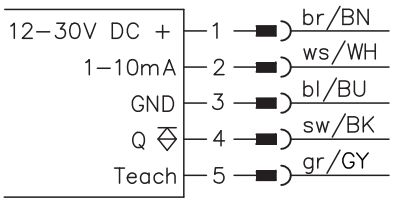
Dimensioned drawing



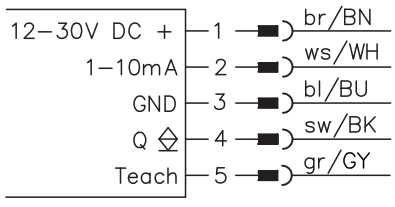
A Light spot orientation vertical
B Optical axis
C M5/5.5mm deep
D Scanning range
E Front
F Head

Electrical connection

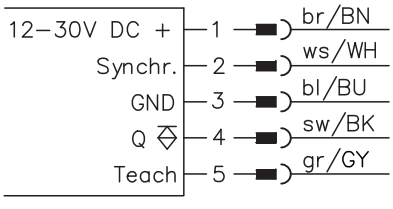
PNP + analog



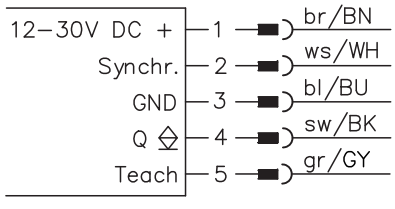
NPN + analog



PNP



NPN



Specifications

Optical data

Scanning range with objective 1 [1]	12mm ± 1mm
Scanning range with objective 2 [2]	20mm ± 2mm
Scanning range with objective 3 [1]	50mm ± 5mm
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	20µs/10µs reversible (see remarks)
Response jitter digital output	10µs
Response time of analogue output	10µs
Delay before start-up	≤ 250ms

Electrical data

Operating voltage U_B [3]	12 … 30VDC (incl. residual ripple)
Residual ripple	≤ 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	≥ (U_B-2V)/≤ 2V
Output current	max. 100mA
Open-circuit current	≤ 60mA

Indicators

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

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
Light source	free group (in accordance with EN 62471)
VDE safety class	II
Protective circuit [4]	2, 3
Standards applied	IEC 60947-5-2
Certifications	UL 508, C22.2 No.14-13 [3] [5]

Options

Synchronous input	
PNP: Stop/Start measurement	U_B/0V or not connected
NPN: Stop/Start measurement	0V/U_B or not connected
Synchronization delay	≤ 0.5ms
Teach input	
PNP: active / not active	U_B/0V or not connected
NPN: active/not active	0V/U_B or not connected
Teach delay	≤ 10ms
Pulse stretching	20ms, can be activated via button
Device configuration	continue to press the teach button during power-on
Changeover switching threshold	see remarks
Changeover response time	see remarks

1) Interchangeable objective, available as accessory
2) Standard objective, state on delivery
3) For UL applications: for use in class 2 circuits according to NEC only
4) 2=polarity reversal protection, 3=short-circuit protection for all outputs
5) These proximity switches shall be used with UL Listed Cable assemblies rated 30V, 0.5A min, in the field installation, or equivalent (categories: CYJV/CYJV7 or PVVA/PVVA7)

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 20µs)
   Delay LED on =
   1x analysis depth
   (response time 10µs)
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.

Order guide

The sensors listed here are preferred types; current information at www.leuze.com.

Selection table Equipment ↓	Order code →	KRTM 20M/P-20-6320-S12 Part No. 50113435	KRTM 20M/N-20-6320-S12 Part No. 50113436	KRTM 20M/C-20-6526-S12 Part No. 50113438	KRTM 20M/C-20-6626-S12 Part No. 50113437	KRTM 20M/P-20-3320-S12 Part No. 50114202	KRTM 20M/N-20-3320-S12 Part No. 50114201	KRTM 20M/P-50-6320-S12 Part No. 50116177	
Scanning range	12 mm								
	20 mm	●	●	●	●	●	●		
	50 mm							●	
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	●	●			●	●	●	

Function principle of the contrast scanner

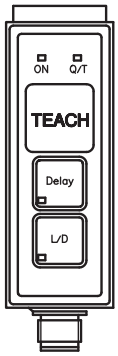
These contrast scanners are devices that can, with the aid of multiple transmitter colors (red, green, blue), distinguish between minimal gray levels (contrasts). By means of the automatic transmitter selection after a teach-in, the optimum functional safety for the respective contrast is determined 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

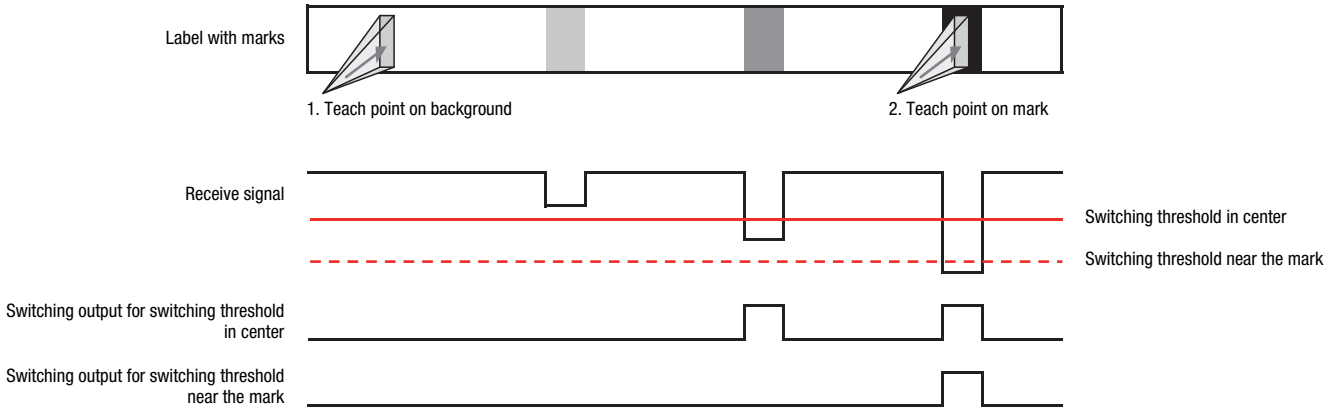
ON LED on	ready / run mode
ON LED flashing slowly	device is not set to factory settings (Display only for approx. 10s after power-on)
ON LED flashing quickly	device is in configuration mode
Run mode:	
Delay LED	pulse stretching on /off
Configuration mode:	
Delay LED off	2x analysis depth (response time 20µs)
Delay LED on	1x analysis depth (response time 10µs)



Q/T LED on	mark detected
Q/T LED flashing quickly	teach error or device error
Run mode:	
L/D LED	light/dark switching
Configuration mode:	
L/D LED off	switching threshold in center
L/D LED on	switching threshold close to the mark

Signal response during teach-in

Static 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 **or** set the teach line to high level	All colors are on White light spot visible	Q/T, Delay and L/D LEDs flash
Position the light spot on the mark	All colors are on White light spot visible	Q/T, Delay and L/D LEDs flash
Briefly press teach button **or** 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).