**20mm**

**12 - 30 V**
**DC**

**25 kHz**

- Static teach-in procedure
- Can store 128 data records
- Response time digital/analogue: 20µs/ 6.25µs
- 3 transmitters in the colours red, green, blue
- Programming via teach-in button

C E

c(UL)us LISTED

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** M5/5.5 mm deep
**D** Scanning range
**E** Front
**F** Head

## Electrical connection

KRTM 20M/V−20−0004−S12

| | | |
|---|---|---|
| 12−30V DC + | 1 | br/BN |
| 1−10mA | 2 | ws/WH |
| GND | 3 | bl/BU |
| DSA/Q | 4 | sw/BK |
| DSS | 5 | gr/GR |

**DSA** Data set acknowledgement (**D**ata **S**et **A**cknowledge)
**DSS** Data set selection (**D**ata **S**et **S**elect)

## Specifications

**Optical data**

| | |
|---|---|
| Scanning range with objective 1 (accessory) | 12 mm ± 1 mm |
| Scanning range with objective 2 | 20 mm ± 2 mm |
| Scanning range with objective 3 (accessory) | 50 mm ± 5 mm |
| Light spot dimensions with objective 1 | 3.0 mm x 1.0 mm |
| Light spot dimensions with objective 2 | 4.0 mm x 1.2 mm |
| Light spot dimensions with objective 3 | 10.0 mm x 2.0 mm |
| Light spot orientation | vertical |
| Light source | LEDs (red, green, blue) |

**Timing**

| | |
|---|---|
| Digital switching frequency | max. 25 kHz |
| Response time digital/analogue | min. 20 µs/6.25 µs |
| Delay before start-up | ≤ 250 ms |

**Electrical data**

| | |
|---|---|
| Operating voltage $U_B$ | 12 … 30 VDC (incl. residual ripple) |
| Residual ripple | ≤ 15 % of $U_B$ |
| Switching output | PNP |
| Function characteristics | light or dark switching, reversible via button |
| Analogue output | 1 … 10 mA |
| Signal voltage high/low | ≥ ($U_B$-2V)/≤ 2 V |
| Output current | max. 100 mA |
| Bias current | ≤ 60 mA |

**Indicators**

| | |
|---|---|
| LED green 1 | ON "ready" |
| LED green 2 | "ON/OFF" delay |
| LED green 3 | L/D "light/dark switching" |
| LED yellow | Q/T "object detected" |
| LED yellow flashing | Q/T "device error, teach error" |

**Keyboard**

| | |
|---|---|
| Release | via bit 9 of the data protocol |

**Mechanical data**

| | |
|---|---|
| Housing | diecast zinc |
| Optics cover | glass |
| Weight | 300 g |
| 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 [1] | 2, 3 |
| Standards applied | IEC 60947-5-2 |

**Options**

**Input for data-record selection**

| | |
|---|---|
| PNP: active / not active | $U_B$/0V or not connected |
| **Pulse stretching** | 20 ms, can be activated via button |

1) 2=polarity reversal protection, 3=short-circuit protection for all outputs

## Order guide

See section **5. Preferred types**

## Remarks

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

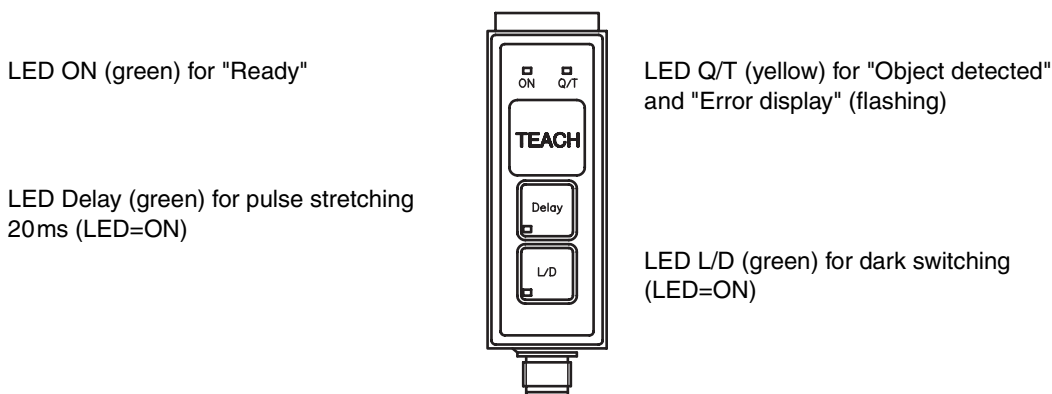- The objectives and objective covers must not be removed.

## KRTM 20

# 1. Method of function of the cut-marking system

With this contrast scanning system, 128 data records can be stored in the sensor in zero-voltage-safe memory. A simple and asynchronous protocol is used for data-record selection and assignment. The transmission rate is specified by the controller by means of the start-bit pulse width. As a result, the contrast scanning system can work together with any controller system. A standardised serial interface, e.g. RS 232, is not required as communication is realised via standard PNP signals. Adjustment is performed by means of static teach-in via the keyboard, i.e. background and mark must be statically positioned below the light spot.

Contrast detection is achieved with the aid of multiple transmitter colours (red, green, blue). This allows the detection of minimal differences in contrast (grey tones). Each transmitter colour 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 marker 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.

# 2. Controls and indicators

LED ON (green) for "Ready"

LED Delay (green) for pulse stretching
20ms (LED=ON)

LED Q/T (yellow) for "Object detected"
and "Error display" (flashing)

LED L/D (green) for dark switching
(LED=ON)

# 3. Protocol procedure for selecting a data record
- 1. The sensor system determines the period length **T** ($T = n*10ms$) from the start bit. The start bit must be a multiple of 10ms. Maximum period duration $T_{max} = 200ms$.
- 2. A pause lasting **3T** follows the start bit.
- 3. Transmission of bit 9 ... bit 0 (evaluation of the level in the middle of the period)
- 4. Acknowledgement of the data record following reception of bit 0. The sensor system repeats the entire protocol (start bit + 3T + bit 9 ...  bit 0) at the switching output.
- 5. During data-record selection, mark detection is not active.

**Data-record selection by the controller via pin 5 and
acknowledgement of the data record by the sensor system via pin 4 (switching output Q):**

Bit 9 - button lock
(1=all buttons disabled, 0=all buttons enabled)

Bit 8 - no function

Bit 7 - no function

Bit 6 - most significant bit of the data-record number
(1=high level, 0=low level)

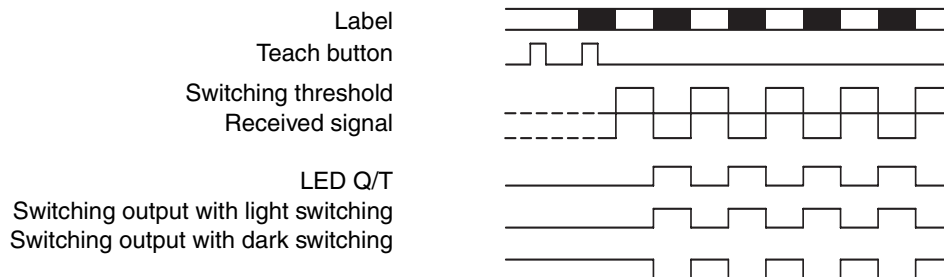Bit 0 - least significant bit of the data-record number
(1=high level, 0=low level)

$T=n*10ms \ (T_{max} =200ms)$

Start bit

Bit: 9 8 7 6 5 4 3 2 1 0
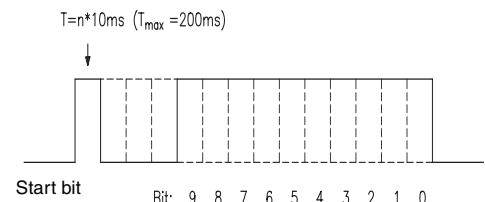
## 4. Teach process

The teach process is performed with the aid of the Teach button. The keyboard is enabled via bit 9.

| Operation | Transmitter | Indicator LED |
|---|---|---|
| Position the light spot on the background | Red, green or blue light spot visible | |
| Press the Teach button approx. 1s | All colours are on<br>White light spot visible | All LEDs flash |
| Position the light spot on the marker | All colours are on<br>White light spot visible | All LEDs flash |
| Press the Teach button approx. 1s | Changeover to red, green or blue<br>Red, green or blue light spot visible | ON (green) illuminated<br>Q/T (yellow) off<br>Q/T (yellow) flashing (error) |
| Teaching error<br>start new teaching process | All colours off | ON (green) illuminated<br>Q/T (yellow) flashing (error) |

## Signal response during teach-in



Label
Teach button
Switching threshold
Received signal

LED Q/T
Switching output with light switching
Switching output with dark switching

## 5. Preferred types

| Selection table<br><br>Order code ➔<br><br>Equipment ⬇ | | KRTM 20M/V-20-0004-S12<br>Part No. 500 41007 | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Scanning range | 12 mm | | | | | | | | | | |
| | 20 mm | ● | | | | | | | | | |
| | 50 mm | | | | | | | | | | |
| Transmitter colour | RGB | ● | | | | | | | | | |
| | green | | | | | | | | | | |
| Light spot orientation | vertical | ● | | | | | | | | | |
| | horizontal | | | | | | | | | | |
| | round | | | | | | | | | | |
| Optical outlet | front | | | | | | | | | | |
| | head | ● | | | | | | | | | |
| Output wiring | PNP | ● | | | | | | | | | |
| | NPN | | | | | | | | | | |
| | analogue current | ● | | | | | | | | | |
| Other features | cut-marking system | ● | | | | | | | | | |
| | can store 128 data records | ● | | | | | | | | | |
| | static teach-in | ● | | | | | | | | | |
| | teach-in, background | | | | | | | | | | |
| | synchronous input | | | | | | | | | | |

Additional types on request