HRTL 3B Laser diffuse reflection light scanner with background suppression

en 03-2013/08 50114049

10 … 400(500)mm
170(250)mm with black/white error < 10%

10 - 30 V DC | 2 kHz | HF A²LS | ASIC

- Laser diffuse reflection light scanner with visible red light and adjustable background suppression
- Exact scanning range adjustment through 8-turn potentiometer
- Collimated light beam propagation with small beam diameter permits identical switching behavior within the specified scanning range
- Standard device in laser class 1 in accordance with EN 60825-1; extended scanning area with excellent black/white ratio in laser class 2
- High switching frequency and short response time for fast events and high-precision applications

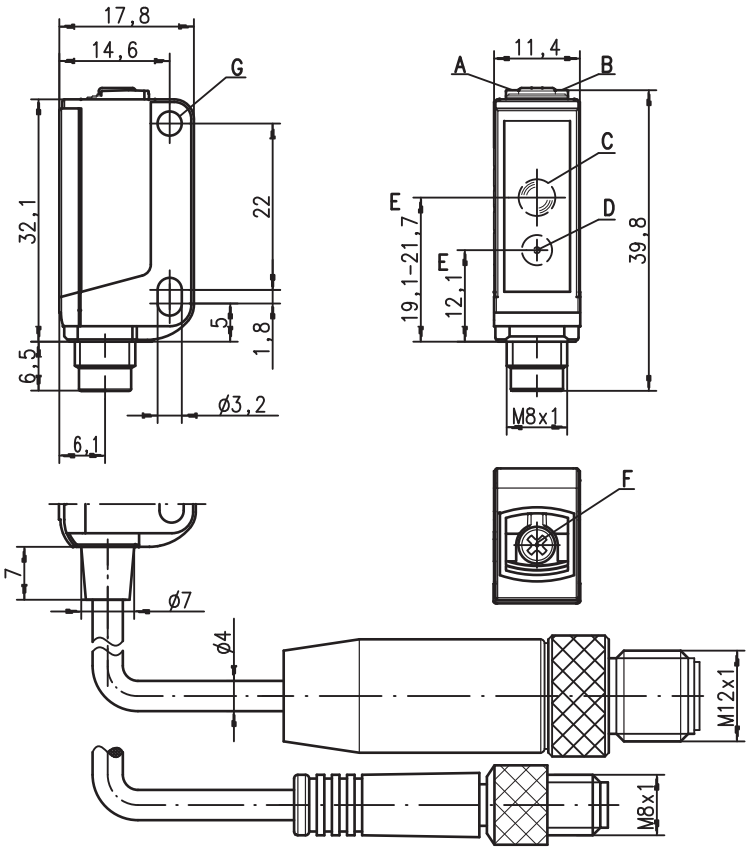
IEC 60947... | IEC 60947... | IP 67 | ECOLAB

Accessories:

(available separately)

- Mounting systems (BT 3…)
- Cable with M8 or M12 connector (K-D …)

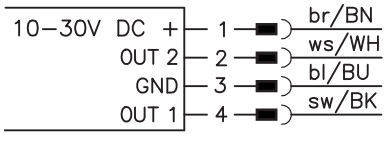
Dimensioned drawing



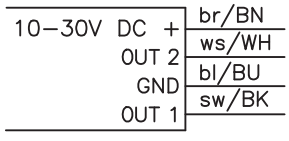
A Green indicator diode
B Yellow indicator diode
C Receiver
D Transmitter
E Optical axis
F 8-turn potentiometer for scanning range adjustment
G Mounting sleeve

Electrical connection

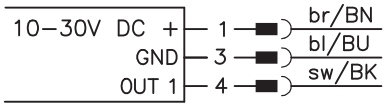
Plug connector, 4-pin



Cable, 4-wire



Plug connector, 3-pin



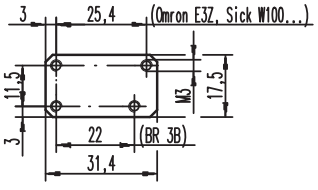
Specifications

		Laser class 1	Laser class 2
Optical data			
Typ. scanning range limit [1]		10 … 400mm	5 … 500mm
Scanning range [2]		see tables	
Adjustment range of the switching point		20 … 400mm	20 … 500mm
Black/white error < 10% up to		170mm	250mm
Light beam diameter		approx. 1mm, consistent	
Light beam characteristic		collimated	
Squint angle		typ. ± 2°	
Light source [3]		laser, pulsed	
Wavelength		650nm (visible red light)	
Max. output power		≤ 0.81mW	≤ 3.3mW
Pulse duration		7µs	7.6µs
Timing			
Switching frequency		2,000Hz	
Response time		0.25ms	
Response jitter		typ. 65µs	
Decay time		0.25ms	
Delay before start-up		≤ 300ms	
Electrical data			
Operating voltage U_B [4]		10 … 30VDC (incl. residual ripple)	
Residual ripple		≤ 10% of U_B	
Open-circuit current		≤ 20mA	
Switching output	…/66 [5]	2 push-pull switching outputs pin 2: PNP dark switching, NPN light switching pin 4: PNP light switching, NPN dark switching	
	…/6 [5]	1 push-pull switching output pin 4: PNP light switching, NPN dark switching	
Signal voltage high/low		≥ (U_B-2V)/≤ 2V	
Output current		max. 100mA	
Scanning range		adjustable via 8-turn potentiometer	
Indicators			
Green LED		ready	
Yellow LED		object detected - reflection	
Mechanical data			
Housing [6]		plastic (PC-ABS); 1 attachment sleeve, nickel-plated steel	
Color		red RAL 3000	
Optics cover		plastic (PMMA)	
Fastening		through-holes for 2 x M3	
Weight		with connector: 20g with 200mm cable and connector: 40g with 2m cable: 50g	
Connection type		2m cable (cross section 4x0.20mm²), connector M8 metal, 0.2m cable with connector M8 or M12	
Environmental data			
Ambient temp. (operation/storage)		-30°C … +55°C / -40°C … +70°C	
Protective circuit [7]		1, 2, 3	
VDE safety class		III	
Protection class		IP 67	
Laser class		1 in accordance with EN 60825-1:2007	2 in accordance with EN 60825-1:2007
Standards applied		IEC 60947-5-2	
Certifications		UL 508 [4]	

1) Typ. scan. range limit/adjustment range: max. achievable scanning range/adjustment range for light objects (white 90%)
2) Scanning range: recommended scanning range for objects with different diffuse reflection
3) Average life expectancy 50,000h at an ambient temperature of 25°C
4) For UL applications: for use in class 2 circuits according to NEC only
5) The push-pull switching outputs must not be connected in parallel
6) Patent Pending Publ. No. US 7,476,848 B2
7) 1=overload protection, 2=polarity reversal protection, 3=short circuit protection for all transistor outputs

Remarks

Adapter plate: BT 3.2 (part no. 501 03844) for alternate mounting on 25.4mm hole spacing (Omron E3Z, Sick W100…)



Tables

Models of laser class 1:

1	15	400
2	15	250
3	15	170

Models of laser class 2:

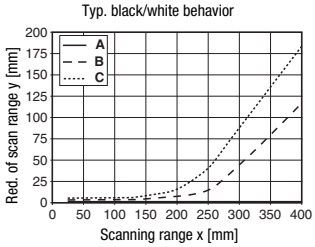
1	15	500
2	15	400
3	15	250

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

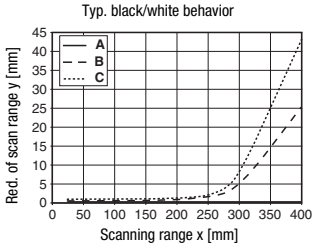
Scanning range [mm]

Diagrams

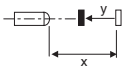
Models of laser class 1:



Models of laser class 2:



A white 90%
B gray 18%
C black 6%



Remarks

Mounting system:

① = BT 3
(part no. 50060511)

②+③ = BT 3.1 [1]
(part no. 50105585)

①+②+③ = BT 3B
(part no. 50105546)

1) Packaging unit: PU = 10 pcs.

HRTL 3B Laser diffuse reflection light scanner with background suppression

Part number code

H	R	T	L		3	B	/	6	6	.	C	2	,	2	0	0	a -	S	8	.	3

Operating principle

HRT	Diffuse reflection light scanners with background suppression

Operating principle

L	Laser (red light)

Construction/version

3B	Series 3B

Switching output/function (OUT 1: pin 4, OUT 2: pin 2)

/66	2 x push-pull transistor output, OUT 1: light switching, OUT 2: dark switching
/6	1 x push-pull transistor output, OUT 1: light switching, OUT 2: not connected (n. c.)

Equipment

N/A	Laser class 1 in accordance with EN 60825-1
.C2	Laser class 2 in accordance with EN 60825-1

Electrical connection

N/A	Cable, PVC, standard length 2000 mm, 4-wire
-S8.3	M8 connector, 3 pin (plug)
-S8	M8 connector, 4 pin (plug)
,200-S8.3	Cable, PVC, length 200 mm with M 8 connector, 3 pin, axial (plug)
,200-S8	Cable, PVC, length 200 mm with M 8 connector, 4 pin, axial (plug)
,200-S12	Cable, PVC, length 200 mm with M 12 connector, 4 pin, axial (plug)

Order guide

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

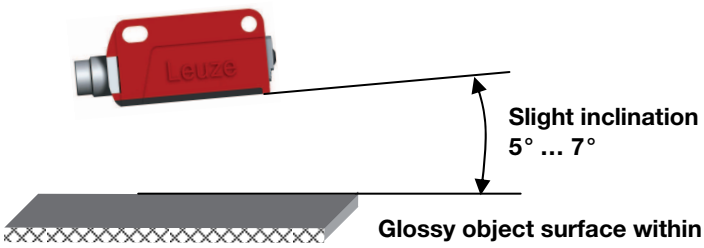
Order code	Part no.
HRTL 3B/66	50114760
HRTL 3B/66-S8	50114581
HRTL 3B/66, 200-S8	50114761
HRTL 3B/66, 200-S12	50114762
HRTL 3B/66-C2	50114763
HRTL 3B/66-C2-S8	50114582
HRTL 3B/66-C2, 200-S8	50114764
HRTL 3B/66-C2, 200-S12	50114765

Application notes

- **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.
- **Laser class 2 warning signs**:
  It is important to attach the stick-on labels delivered with the device! If the signs could be covered due to the installation location of the device, attach them close to the device so that it is not possible to look into the laser beam when reading the notices.

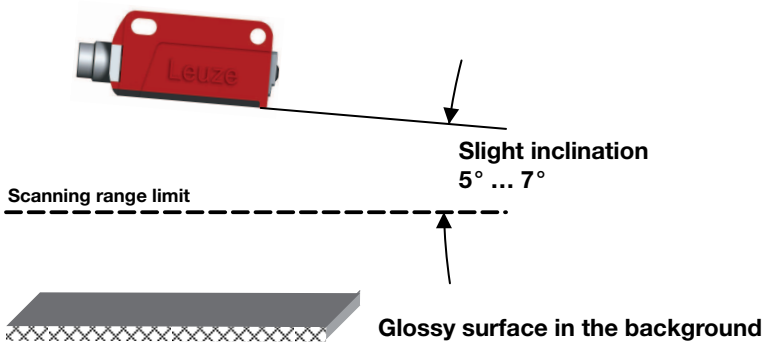
LASER LIGHT DO NOT STARE INTO BEAM	
Maximum output:	3.3 mW
Pulse duration:	7.6 µs
Wavelength:	650 nm
CLASS 2 LASER PRODUCT EN 60825–1:2007	

- **Detection of glossy surfaces within the scanning range**:
  When detecting glossy surfaces (e.g. metals), the light beam should not hit the object surface at a right angle. A slight inclination suffices to prevent undesirable direct reflections. The following rule of thumb applies: the smaller the scanning range, the larger the angle of the inclination (approx. 5° … 7°).



- **Avoiding interference from glossy surfaces in the background**:
  If a glossy surface is in the background (distance larger than scanning range limit), reflections may cause interfering signals. These may be avoided by mounting the device at a slight angle (see figure below).

Attention!
It is imperative to note the task and the associated inclination of the scanner of approx. 5° … 7°.

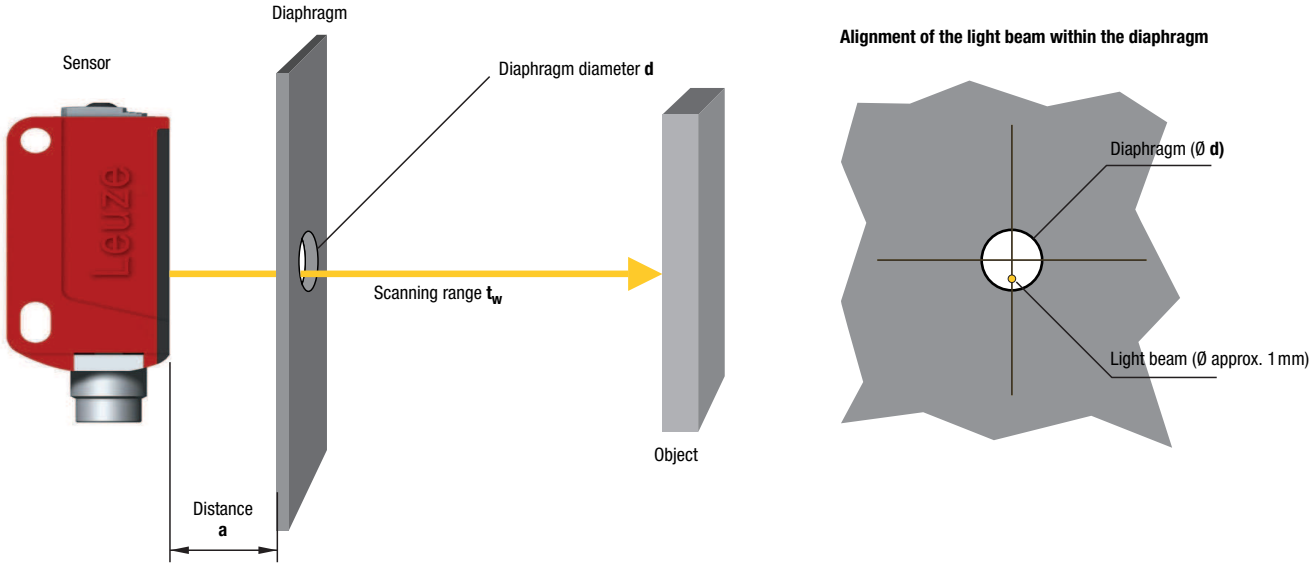


- Objects should only be moved in laterally from the right or left. Moving in objects from the connection side or operating side is to be avoided.
- Outside of the scanning range, the sensor operates as an energetic diffuse reflection light scanner. Light objects can still be reliably detected up to the scanning range limit.
- The sensors are equipped with effective measures for the maximum avoidance of mutual interference should they be mounted opposite one another. Opposite mounting of multiple sensors of the same type should, however, absolutely be avoided.

Object detection behind diaphragms

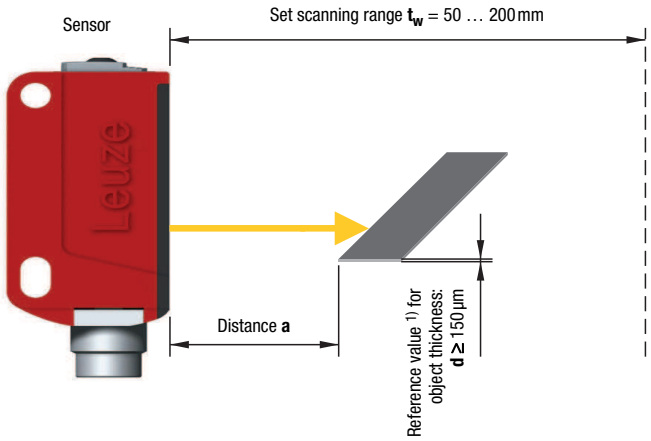
It is sometimes necessary to mount the sensor behind plant parts so that the light beam has to pass through an opening (diaphragm) that is as small as possible. Here, the detection depends, among other things, on set scanning range $\mathbf{t_w}$, distance **a** between diaphragm and sensor, and diaphragm diameter **d**. Here are some reference values [1]:

Distance a [mm] between sensor and diaphragm	Diaphragm diameter d [mm], dependent on scanning range t_w [mm] on a white object (90 % diffuse reflection) set on the sensor		
	t_w = 100	t_w = 200	t_w = 300
10	10	10	10
30	8	8	9
50	7	8	9
80	6	7	8
100	6	6	8
120		6	8
150		5	6
180		5	6
200		5	6



Detection of smallest objects

The laser scanner can also detect very thin parts (e.g., sheet metal plates or wire). Detection here depends, among other things, on set scanning range $\mathbf{t_w}$, distance **a** to the object, and object size/thickness **d**.



[1] Reference values are not guaranteed properties. Due to the multitude of possible influencing factors, they must be confirmed in the application.