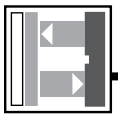
Series 28
Universal Sensors

- Extreme low temperature operation (-40 ºC/F) available
- LEDs visible from 15 m (50')
- Thru-hole or dovetail mounting options

4 IN 1 FOUR OUTPUTS ONE SENSOR

4 output options from 1 sensor: NPN normally open, NPN normally closed, PNP normally open, or PNP normally closed



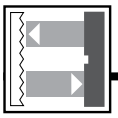
Diffuse Mode with Background Suppression

See pages 548-553

Features:
- Sharp sensing range cut-off
- Choice of infrared, visible red and laser light sources

Sensing Range: 400 mm, 700 mm, 1.5 m, 2 m

Outputs: NPN, PNP, 4-in-1, relay



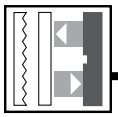
Retro-Reflective Mode

See pages 554-556

Features:
- Reliable detection of even the shiniest material
- Weak signal output available

Sensing Range: 12 m, 30 m

Outputs: NPN, PNP, 4-in-1, relay, AS-interface



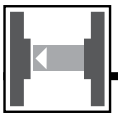
Retro-Reflective Mode with Foreground Suppression

See pages 557

Features:
- Glossy targets not erroneously identified as the reflector up to 200 mm away
- Reliable detection of shrink-wrapped pallets

Sensing Range: 9 m

Outputs: NPN, PNP



Thru-Beam Mode

See pages 558-560

Features:
- Alignment LED visible through lens for faster setup
- Laser versions for long-range sensing

Sensing Range: 30 m, 65 m, 300 m

Outputs: NPN, PNP, relay, AS-interface

See page 561-566 for Series 28 specifications, wiring and dimensions.

Diffuse Mode with Background Suppression

Specifications

SENSING RANGE		20-400 mm	20-400 mm	20-400 mm	20-400 mm
SENSITIVITY ADJUSTMENT		Yes	Yes	Yes	Yes
MODEL NUMBER(S)		RL28-8-H-400-RT/49/115 •	RL28-8-H-400-RT/49/105 •	RL28-8-H-400-RT/105/110 ϟ	RL28-8-H-400-FFP-RT/47/105 ϟ
		RL28-8-H-400-IR/49/115 •	RL28-8-H-400-IR/49/105 •	RL28-8-H-400-IR/105/110 ϟ	—
OUTPUT	*/47, /49, or /110*	1 NPN and 1 PNP	1 NPN and 1 PNP	4-in-1†	2 PNP
LOAD CURRENT		200 mA max.	200 mA max.	200 mA max.	200 mA max.
SHORT CIRCUIT AND OVERLOAD PROTECTION		Yes	Yes	Yes	Yes
REVERSE POLARITY PROTECTION		Yes	Yes	Yes	Yes
SUPPLY VOLTAGE		10-30 VDC	10-30 VDC	10-30 VDC	10-30 VDC
VOLTAGE RIPPLE		10%	10%	10%	10%
LED(s)		Yes (3)*	Yes (3)*	Yes (3)*	Yes (3)*
CURRENT CONSUMPTION		≤ 40 mA	≤ 40 mA	≤ 40 mA	≤ 40 mA
OPERATING MODE		Light on/dark on	Light on/dark on	Light on/dark on	Light on/dark on
RESPONSE TIME		≤ 2.0 ms	≤ 2.0 ms	≤ 2.0 ms	≤ 2.0 ms
TIMER FUNCTION (only on -Z models)		—	—	—	—
SWITCHING FREQUENCY		250 Hz	250 Hz	250 Hz	250 Hz
STANDARDS		EN 60947-5-2	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2
PROTECTION (IEC)		IP67	IP67	IP67	IP67
LIGHT SPOT DIAMETER	*-RT*	≈ 12mm at a range of 400 mm	≈ 12mm at a range of 400 mm	≈ 12mm at a range of 400 mm	≈ 4mm at a range of 250 mm
	-IR	≈ 14mm at a range of 400 mm	≈ 14mm at a range of 400 mm	≈ 14mm at a range of 400 mm	—
LIGHT BEAM ANGLE	*-RT*	1.2º transmitter/2º receiver	1.2º transmitter/2º receiver	1.2º transmitter/2º receiver	1.2º transmitter/2º receiver
	-IR	2º transmitter/2º receiver	2º transmitter/2º receiver	2º transmitter/2º receiver	—
LIGHT SOURCE	*-RT*	Visible red LED	Visible red LED	Visible red LED	Visible red LED
	-IR	Infrared LED	Infrared LED	Infrared LED	—
AMBIENT LIGHT RESISTANCE		≤ 50,000 lux	≤ 50,000 lux	≤ 50,000 lux	≤ 50,000 lux
TEMPERATURE RANGE	*WORKING*	-40 ºF to +140 ºF	-40 ºF to +140 ºF	-40 ºF to +140 ºF	-40 ºF to +140 ºF
	STORAGE	-40 ºF to +167 ºF	-40 ºF to +167 ºF	-40 ºF to +167 ºF	-40 ºF to +167 ºF
HOUSING MATERIAL		ABS	ABS	ABS	ABS
	LENS	Plastic	Plastic	Plastic	Plastic
WEIGHT		2.5 oz	2.5 oz	2.5 oz	2.5 oz
APPROVALS		CE UL CSA	CE UL CSA	CE UL CSA	CE UL CSA
ELECTRICAL CONNECTION		2.5-meter cable, 4-conductor	Quick disconnect type V15	Quick disconnect type V15	Quick disconnect type V15
ADDITIONAL DATA		*See pages 561-566*			

*See dimensional drawings for LED functions.

†NPN normally open, NPN normally closed, PNP normally open, or PNP normally closed

PEPPERL+FUCHS
SENSING YOUR NEEDS

Diffuse Mode with Background Suppression

Specifications		Laser		
SENSING RANGE		**100 mm-1.5 m**	**20 mm-2 m**	**20 mm-2 m**
SENSITIVITY ADJUSTMENT		Yes	Yes	Yes
MODEL NUMBER(S)		**RL28-8-H-1500-LAS/47/105** ●	**RL28-8-H-2000-IR/49/115** ●	**RL28-8-H-2000-IR/49/105** ●
		RL28-8-H-1500-LAS/105/110 ϟ	—	**RL28-8-H-2000-IR/105/110** ϟ
OUTPUT	*/47 or /49*	2 PNP	1 NPN and 1 PNP	1 NPN and 1 PNP
	/110	4-in-1†	—	4-in-1†
LOAD CURRENT		200 mA max.	200 mA max.	200 mA max.
SHORT CIRCUIT AND OVERLOAD PROTECTION		Yes	Yes	Yes
REVERSE POLARITY PROTECTION		Yes	Yes	Yes
SUPPLY VOLTAGE		10-30 VDC	10-30 VDC	10-30 VDC
VOLTAGE RIPPLE		10%	10%	10%
LED(s)		Yes (3)*	Yes (3)*	Yes (3)*
CURRENT CONSUMPTION		≤ 40 mA	≤ 40 mA	≤ 40 mA
OPERATING MODE		Light on/dark on	Light on/dark on	Light on/dark on
RESPONSE TIME		≤ 2.0 ms	≤ 2.0 ms	≤ 2.0 ms
TIMER FUNCTION (only on -Z models)		—	—	—
SWITCHING FREQUENCY		250 Hz	250 Hz	250 Hz
STANDARDS		EN 60947-5-2	EN 60947-5-2	EN 60947-5-2
PROTECTION (IEC)		IP67	IP67	IP67
LIGHT SPOT DIAMETER		≈ 4 mm at a range of 1.5 m	≈ 70 mm at a range of 2 m	≈ 70 mm at a range of 2 m
LIGHT BEAM ANGLE		0.15° transmitter/2° receiver	2° transmitter/2° receiver	2° transmitter/2° receiver
LIGHT SOURCE		Visible red laser 650 nm Class 2	Infrared LED	Infrared LED
AMBIENT LIGHT RESISTANCE		≤ 50,000 lux	≤ 50,000 lux	≤ 50,000 lux
TEMPERATURE RANGE	*WORKING*	+14 °F to +122 °F	-40 °F to +140 °F	-40 °F to +140 °F
	STORAGE	-4 °F to +167 °F	-40 °F to +167 °F	-40 °F to +167 °F
HOUSING MATERIAL		ABS	ABS	ABS
	LENS	Plastic	Plastic	Plastic
WEIGHT		2.5 oz	2.5 oz	2.5 oz
APPROVALS		CE UL CSA	CE UL CSA	CE UL CSA
ELECTRICAL CONNECTION		 Quick disconnect type V15	 2.5-meter cable, 4-conductor	 Quick disconnect type V15
ADDITIONAL DATA		***See pages 561-566***		

*See dimensional drawings for LED functions.
†NPN normally open, NPN normally closed, PNP normally open, or PNP normally closed

Diffuse Mode with Background Suppression

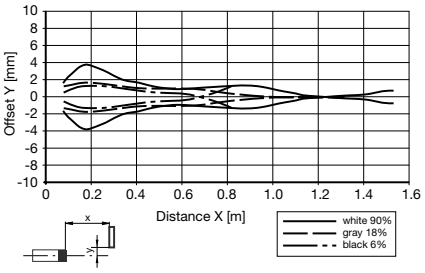
Specifications

SENSING RANGE	20 mm-2 m	20 mm-2 m
SENSITIVITY ADJUSTMENT	Yes	Yes
MODEL NUMBER(S)	RLK28-8-H-2000-IR-Z/31/116 ϟ	RLK28-8-H-2000-IR-Z/31/135 ϟ
	—	—
OUTPUT /31	1 SPDT relay	1 SPDT relay
ELECTRICAL CONTACT RATING	250 VDC/2 A 230 VAC/2 A	250 VDC/2 A 230 VAC/2 A
SHORT CIRCUIT AND OVERLOAD PROTECTION	—	—
REVERSE POLARITY PROTECTION	—	—
SUPPLY VOLTAGE	12-240 VAC/DC	12-240 VAC/DC
VOLTAGE RIPPLE	10%	10%
LED(s)	Yes (3)*	Yes (3)*
CURRENT CONSUMPTION	≤ 3 W	≤ 3 W
OPERATING MODE	Light on/dark on	Light on/dark on
RESPONSE TIME	≤ 20.0 ms	≤ 20.0 ms
TIMER FUNCTION (only on -Z models)	On Delay, Off Delay, One Shot, On Delay+One Shot, On Delay+Off Delay (0.1 to 10 sec.)	On Delay, Off Delay, One Shot, On Delay+One Shot, On Delay+Off Delay (0.1 to 10 sec.)
SWITCHING FREQUENCY	25 Hz	25 Hz
STANDARDS	EN 60947-5-2	EN 60947-5-2
PROTECTION (IEC)	IP67	IP67
LIGHT SPOT DIAMETER	≈ 70 mm at a range of 2 m	≈70mm at a range of 2m
LIGHT BEAM ANGLE	2° transmitter/2° receiver	2° transmitter/2° receiver
LIGHT SOURCE	Infrared LED	Infrared LED
AMBIENT LIGHT RESISTANCE	≤50,000 lux	≤50,000 lux
TEMPERATURE RANGE *WORKING*	-40 °F to +140 °F	-40 °F to +140 °F
TEMPERATURE RANGE *STORAGE*	-40 °F to +167 °F	-40 °F to +167 °F
HOUSING MATERIAL	ABS	ABS
HOUSING MATERIAL *LENS*	Plastic	Plastic
WEIGHT	3.5 oz	3.5 oz
APPROVALS	CE UL CSA	CE UL CSA
ELECTRICAL CONNECTION	Spring-loaded terminal connection	Quick disconnect type V95
ADDITIONAL DATA	*See pages 561-566*	

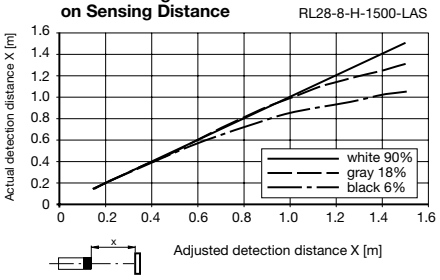
*See dimensional drawings for LED functions.

Sensing Characteristics

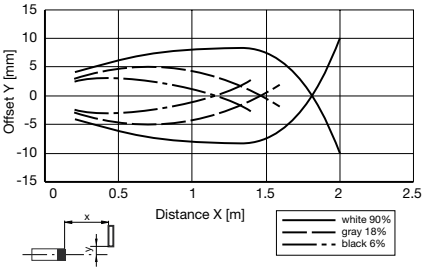
Movement Characteristics RL28-8-H-1500-LAS



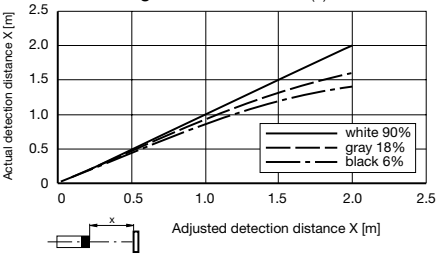
Effect of Target Color on Sensing Distance RL28-8-H-1500-LAS



Movement Characteristics RL(K)28-8-H-2000-IR



Effect of Target Color on Sensing Distance RL(K)28-8-H-2000-IR



Retro-Reflective Mode

Specifications

SENSING RANGE	0-12 m	0-12 m	0-12 m	0-12 m
SENSITIVITY ADJUSTMENT	Yes	Yes	Yes	Yes
REFLECTOR DISTANCE	50 mm-12 m	50 mm-12 m	50 mm-12 m	50 mm-12 m
POLARIZED FILTER	Yes	Yes	Yes	Yes
MODEL NUMBER(S)	**RL28-55/49/82b/115** •	**RL28-55/49/82b/105** •	**RLK28-55/31/116** ϟ	**RLK28-55-Z/31/116** ϟ
	—	**RL28-55/82b/105/110** ϟ	—	—
OUTPUT */49 or /31*	1 NPN and 1 PNP	1 NPN and 1 PNP	1 SPDT relay	1 SPDT relay
/110	—	4-in-1†	—	—
LOAD CURRENT OR ELECTRICAL CONTACT RATING	200 mA max.	200 mA max.	30 VDC/2 A 230 VAC/2 A	30 VDC/2 A 230 VAC/2 A
SHORT CIRCUIT AND OVERLOAD PROTECTION	Yes	Yes	—	—
REVERSE POLARITY PROTECTION	Yes	Yes	—	—
SUPPLY VOLTAGE	10-30 VDC	10-30 VDC	12-240 VAC/DC	12-240 VAC/DC
VOLTAGE RIPPLE	10%	10%	10%	10%
LED(s)	Yes (3)*	Yes (3)*	Yes (3)*	Yes (3)*
CURRENT CONSUMPTION	≤ 40 mA	≤ 40 mA	≤ 3 VA	≤ 3 VA
OPERATING MODE	Light on/dark on	Light on/dark on	Light on/dark on	Light on/dark on
RESPONSE TIME	≤ 0.5 ms	≤ 0.5 ms	≤ 20.0 ms	≤ 20.0 ms
TIMER FUNCTION (only on -Z models)	—	—	—	On Delay, Off Delay, One Shot (0.1 to 10 sec.)
SWITCHING FREQUENCY	1 kHz	1 kHz	25 Hz	25 Hz
STANDARDS	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2
PROTECTION (IEC)	IP67	IP67	IP67	IP67
LIGHT SPOT DIAMETER	≈ 200mm at a range of 12 m	≈ 200mm at a range of 12 m	≈ 200mm at a range of 12 m	≈ 200mm at a range of 12 m
LIGHT BEAM ANGLE	1.2° transmitter/2° receiver	1.2° transmitter/2° receiver	1.2° transmitter/2° receiver	1.2° transmitter/2° receiver
LIGHT SOURCE	Visible red LED	Visible red LED	Visible red LED	Visible red LED
AMBIENT LIGHT RESISTANCE	≤ 80,000 lux	≤ 80,000 lux	≤ 80,000 lux	≤ 80,000 lux
TEMPERATURE RANGE *WORKING*	-40 °F to +140 °F	-40 °F to +140 °F	-40 °F to +140 °F	-40 °F to +140 °F
STORAGE	-40 °F to +167 °F	-40 °F to +167 °F	-40 °F to +167 °F	-40 °F to +167 °F
HOUSING MATERIAL	ABS	ABS	ABS	ABS
LENS	Plastic	Plastic	Plastic	Plastic
WEIGHT	2.5 oz	2.5 oz	3.5 oz	3.5 oz
APPROVALS	CE UL CSA	CE UL CSA	CE UL CSA	CE UL CSA
ELECTRICAL CONNECTION	 2.5-meter cable, 4-conductor	 Quick disconnect type V15	 Spring-loaded terminal connection	 Spring-loaded terminal connection
ADDITIONAL DATA	*See pages 561-566*			

*See dimensional drawings for LED functions.
†NPN normally open, NPN normally closed, PNP normally open, or PNP normally closed

Thru-Beam Mode

Specifications			Laser		
SENSING RANGE		**0-65 m**	**0-300 m**	**0-300 m**	**0-300 m**
SENSITIVITY ADJUSTMENT		Yes	Yes	Yes	Yes
MODEL NUMBER(S)	*Transmitter*	**LA28-F1/116** ϟ	**LD28-LAS-F1/76a/105** •	**LD28-LAS-F1-B3B/73c**	**LA28-LAS-F1/116** •
	Receiver	**LK28-Z-F1/31/116** ϟ	**LV28-LAS-F1/47/82b/105** •	**LV28-LAS-F1-B3B/73c**	**LK28-LAS-F1-Z/31/116** •
OUTPUT	*/47 or /49,*	1 SPDT relay	2 PNP	AS-Interface	1 SPDT relay
	LOAD CURRENT OR ELECTRICAL CONTACT RATING	250 VDC/2 A 250 VAC/2 A	200 mA max.	—	250 VDC/2 A 250 VAC/2 A
	SHORT CIRCUIT AND OVERLOAD PROTECTION	—	Yes	—	—
	REVERSE POLARITY PROTECTION	—	Yes	—	—
SUPPLY VOLTAGE		12-240 VAC/DC	10-30 VDC	from AS-Interface	12-240 VAC/DC
VOLTAGE RIPPLE		—	10%	—	—
LED(s)		Yes (2) plus alignment LED*	Yes (2) plus alignment LED*	Yes (3) plus alignment LED*	Yes (2) plus alignment LED*
CURRENT CONSUMPTION		≤ 3.5 VA	≤ 55 mA transmitter ≤ 35 mA receiver	—	≤ 3.5 VA
OPERATING MODE		Light on/dark on	Light on/dark on	Light on/dark on	Light on/dark on
RESPONSE TIME		≤ 20 ms	≤ 0.5 ms	≤ 0.5 ms	≤ 20.0 ms
TIMER FUNCTION (only on -Z models)		On Delay, Off Delay, One Shot (0.1 to 10 sec.)	—	One-shot (50 ms) through AS-Interface	On Delay, Off Delay, One Shot (0.1 to 10 sec.)
SWITCHING FREQUENCY		25 Hz	1 kHz	1 kHz	25 Hz
TRANSMITTER FREQUENCY		F1 = 25 kHz	F1 = 25 kHz	F1 = 25 kHz	F1 = 25 kHz
STANDARDS		EN 60947-5-2	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2
PROTECTION (IEC)		IP67	IP67	IP67	IP67
LIGHT SPOT SIZE		≈ 1.3 m at a range of 65 m	≈ 6 mm at a range of 5 m, ≈ 75 x 300 mm at a range of 300 m (parallel to housing)	≈ 7 x 4.5 mm at a range of 0.1m, ≈ 6 mm at a range of 5 m, ≈ 75 x 300 mm at a range of 300 m (parallel to housing)	≈ 6 mm at a range of 5 m, ≈ 75 x 300 mm at a range of 300 m (parallel to housing)
LIGHT BEAM ANGLE		1.2º transmitter/5º receiver	0.06º transmitter/5º receiver	0.06º transmitter/5º receiver	0.06º transmitter/5º receiver
LIGHT SOURCE		Visible red LED 660 nm	Visible red laser 650 nm Class 2	Visible red laser 650 nm Class 2	Visible red laser 650 nm Class 2
AMBIENT LIGHT RESISTANCE		≤ 50,000 lux	≤ 50,000 lux	≤ 50,000 lux	≤ 50,000 lux
TEMPERATURE RANGE	*WORKING*	-40 ºF to +140 ºF	+14 ºF to +122 ºF	+14 ºF to +122 ºF	+14 ºF to +122 ºF
	STORAGE	-40 ºF to +167 ºF	-4 ºF to +167 ºF	-4 ºF to +167 ºF	-4 ºF to +167 ºF
HOUSING MATERIAL		ABS	ABS	ABS	ABS
	LENS	Plastic	Plastic	Plastic	Plastic
WEIGHT		4.2 oz per housing	2.8 oz per housing	2.8 oz per housing	4.2 oz per housing
APPROVALS		CE UL CSA	CE UL CSA	CE UL CSA	CE UL CSA
ELECTRICAL CONNECTION		 Spring-loaded terminal connection	 Quick disconnect type V15	 Quick disconnect type V15	 Spring-loaded terminal connection
ADDITIONAL DATA		***See pages 561-566***			

*See dimensional drawings for LED functions.

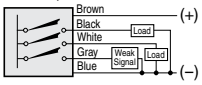
Wiring Diagrams

DC

Cable Connection

Light On/Dark On
PNP Outputs

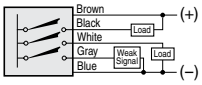
/47/82b



Weak Signal Output: Output is on for adequate gain.

Light On/Dark On
NPN and PNP Outputs

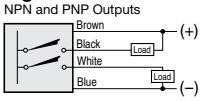
/49/82b



Weak Signal Output: Output is off when weak signal is present for 10s, or immediately when four light beam interruptions occur.

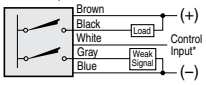
Light On/Dark On
NPN and PNP Outputs

/49



Light On/Dark On
NPN Output

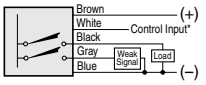
/76a/82b/110



* **Control Input:** transmitter deactivated when connected to (+)
Weak Signal Output: Output is on for adequate gain.

Light On/Dark On
PNP Output

/76a/82b/110

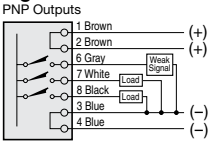


* **Control Input:** transmitter deactivated when connected to (+)
Weak Signal Output: Output is on for adequate gain.

Terminal Connection

Light On/Dark On
PNP Outputs

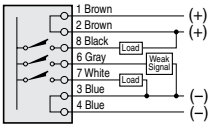
/47/82b



Weak Signal Output: Output is on for adequate gain.

Light On/Dark On
NPN and PNP Outputs

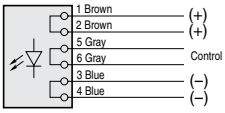
/49/82b



Weak Signal Output: Output is on for adequate gain.

Transmitter (thru-beam models)

LD28



* **Control Input:** transmitter deactivated when connected to (+)

Quick Disconnect

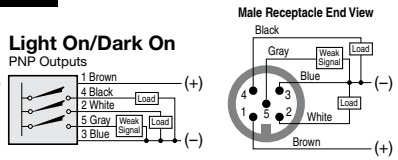
Note: Wiring diagrams show quick disconnect pin numbers.

V15 Type

Male Receptacle End View

Light On/Dark On
PNP Outputs

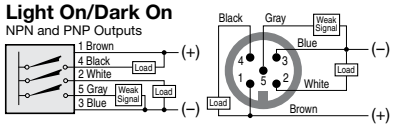
/47/82b



Weak Signal Output: Output is on for adequate gain.

Light On/Dark On
NPN and PNP Outputs

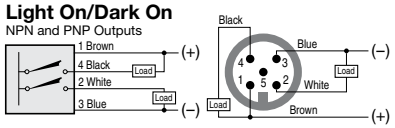
/49/82b



Weak Signal Output: Output is off when weak signal is present for 10s, or immediately when four light beam interruptions occur.

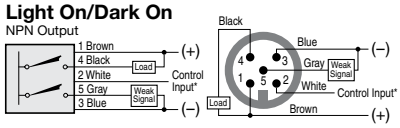
Light On/Dark On
NPN and PNP Outputs

/49



Light On/Dark On
NPN Output

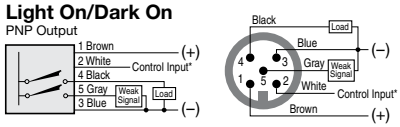
/76a/82b/110



* **Control Input:** transmitter deactivated when connected to (+)
Weak Signal Output: Output is on for adequate gain.

Light On/Dark On
PNP Output

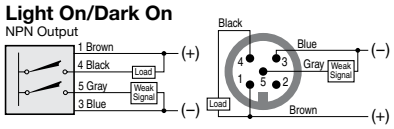
/76a/82b/110



* **Control Input:** transmitter deactivated when connected to (+)
Weak Signal Output: Output is on for adequate gain.

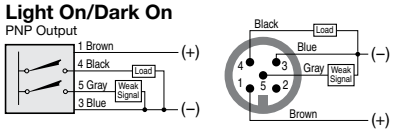
Light On/Dark On
NPN Output

/82b/110



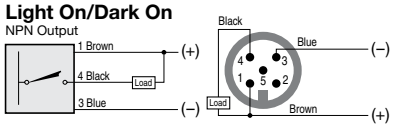
Light On/Dark On
PNP Output

/82b/110



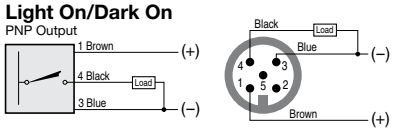
Light On/Dark On
NPN Output

/110

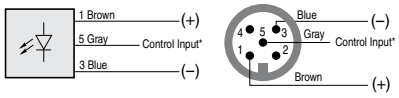


Light On/Dark On
PNP Output

/110



Transmitter (thru-beam models)



* **Control Input:** transmitter deactivated when connected to (+)

Wiring Diagrams

AC/DC

Terminal Connection

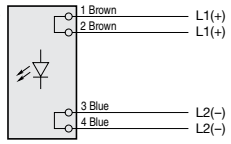
Light On/Dark On

RLK28

LO/DO Switch set to LO: Terminal 7 Normally Closed
Terminal 8 Normally Open
LO/DO Switch set to DO: Terminal 7 Normally Open
Terminal 8 Normally Closed

Transmitter (thru-beam models)

LA28



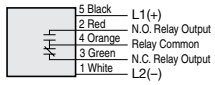
Quick Disconnect

Note: Wiring diagrams show quick disconnect pin numbers.

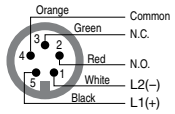
V95 Type

Light On/Dark On

RLK28



Male Receptacle End View



AS-Interface

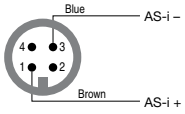
Quick Disconnect

Note: Wiring diagrams show quick disconnect pin numbers.

V1 Type

-AS-I

Male Receptacle End View

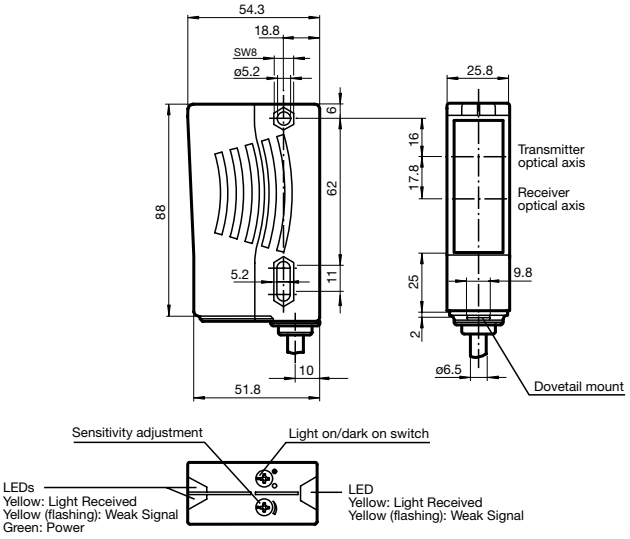


4-in-1 Output

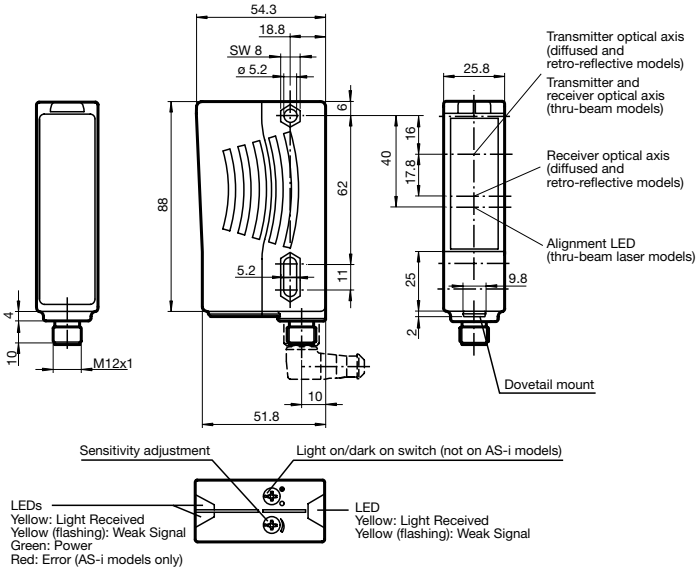
The 4-in-1 output offers one normally open and one normally closed output, both of which automatically detect the connected load, so the outputs either source or sink current depending on the load. A single sensor can operate as NPN normally open, NPN normally closed, PNP normally open, or PNP normally closed.

Dimensions (mm)

RL28-.../115



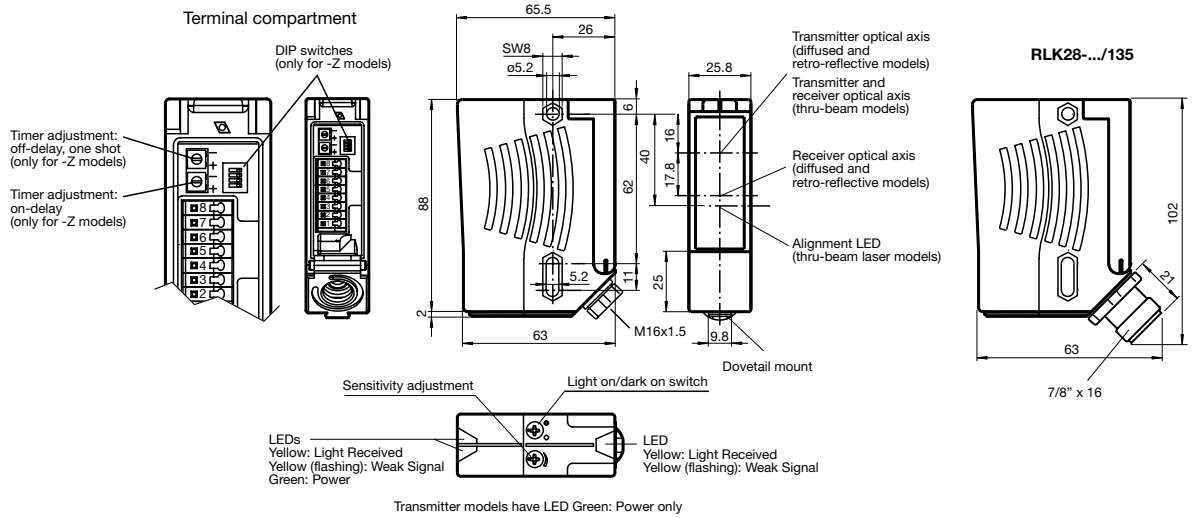
LD28-.../105, LV28-.../105, RL28-.../105, RL28-.../73c



Transmitter models have LED Green: Power only

Dimensions (mm)

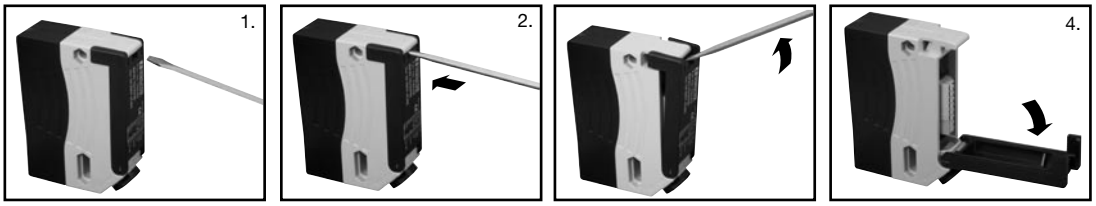
LA28-.../116, LK28-.../116, RLK28-.../116



Transmitter models have LED Green: Power only

Opening the Terminal Compartment (.../116 Models)

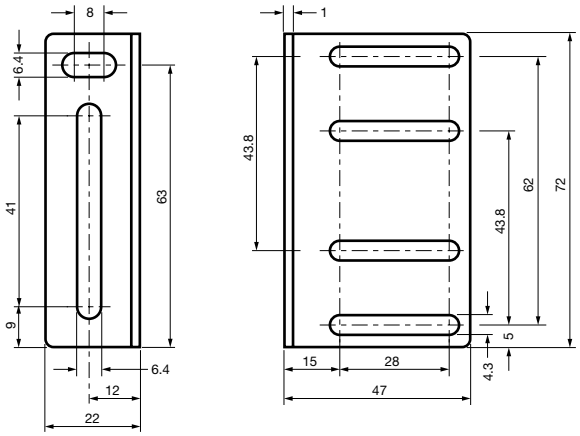
1. A flat-head screwdriver is needed to open the terminal compartment.
2. Insert the flat-head screwdriver into the center notch under the LED window next to the printed black door with the blade all the way to the back of this notch.
3. Push the screwdriver upward toward the direction of the LED.
4. The hinged door with printing will pivot outward, exposing the terminal compartment.To close, simply push the hinged door to its original position so that it snaps back into position.



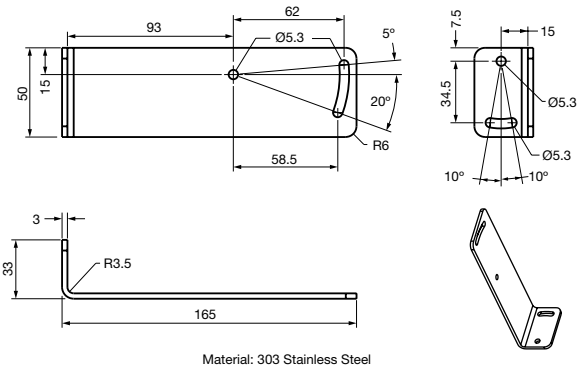
Accessories

(Dimensions in mm)

Mounting Bracket Model OMH-RL25



Mounting Bracket Model OMH-21-T
High-profile right angle mounting bracket



Material: 303 Stainless Steel