



# PHOTOELECTRIC SENSORS



## HIGHLIGHTS:

- ✓ Sub-miniature sensors
- ✓ Precise background suppression
- ✓ Fiber-optic solutions
- ✓ Right-angle and spherical optics for precise detection
- ✓ Laser devices
- ✓ IO-Link
- ✓ Teach-in

## NEW:

- ✓ Color sensor
- ✓ Fiber-optic amplifier with digital display (IO-Link)
- ✓ Sensors with analog output
- ✓ Excellent background suppression

Inductive

**Photoelectric**

Optical fibers

Ultrasonic

Capacitive

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## PHOTOELECTRIC SENSORS

## PROGRAM OVERVIEW

| HOUSING SIZE                  | SENSING RANGE   |       |        |          |           |            | OUTPUT |     |             |        |
|-------------------------------|-----------------|-------|--------|----------|-----------|------------|--------|-----|-------------|--------|
|                               | 1 mm            | 10 mm | 100 mm | 1,000 mm | 10,000 mm | 100,000 mm | PNP    | NPN | AC/DC relay | Analog |
| <b>DIFFUSE SENSORS</b>        |                 |       |        |          |           |            |        |     |             |        |
| Ø 4 mm / M5                   | 10 mm           |       |        |          |           |            | ✓      | ✓   |             |        |
| Ø 4 mm / M5                   | 20 mm           |       |        |          |           |            | ✓      | ✓   |             |        |
| Ø 4 mm / M5                   | 50 mm           |       |        |          |           |            | ✓      | ✓   |             |        |
| 5 x 7 mm                      | 20 mm           |       |        |          |           |            | ✓      | ✓   |             |        |
| 5 x 7 mm                      | 50 mm           |       |        |          |           |            | ✓      | ✓   |             |        |
| 5 x 7 mm                      | 90 mm           |       |        |          |           |            | ✓      | ✓   |             |        |
| M12                           | 300 mm          |       |        |          |           |            | ✓      | ✓   |             |        |
| M18 (M18W)                    | 600 mm          |       |        |          |           |            | ✓      | ✓   |             |        |
| M18 △                         | 40...250 mm*    |       |        |          |           |            | ✓      | ✓   |             |        |
| M18 △                         | 60 ... 600 mm*  |       |        |          |           |            | ✓      | ✓   |             |        |
| 30 x 30 mm                    | 600 mm          |       |        |          |           |            | ✓      | ✓   |             |        |
| 30 x 30 mm                    | 1200 mm         |       |        |          |           |            | ✓      | ✓   |             |        |
| 40 x 40 mm                    | 2000 mm         |       |        |          |           |            | ✓      | ✓   |             |        |
| 40 x 50 mm                    | 30 ... 1200 mm* |       |        |          |           |            | ✓      | ✓   |             |        |
| 50 x 50 mm (DC)               | 300 mm          |       |        |          |           |            | ✓      | ✓   |             |        |
| 50 x 50 mm (AC/DC)            | 300 mm          |       |        |          |           |            |        |     | ✓           |        |
| 50 x 50 mm (DC)               | 800 mm          |       |        |          |           |            | ✓      | ✓   |             |        |
| 50 x 50 mm (AC/DC)            | 800 mm          |       |        |          |           |            |        |     | ✓           |        |
| 65 x 83 mm (DC)               | 2000 mm         |       |        |          |           |            | ✓      | ✓   |             |        |
| 65 x 83 mm (AC/DC)            | 2000 mm         |       |        |          |           |            |        |     | ✓           |        |
| <b>BACKGROUND SUPPRESSION</b> |                 |       |        |          |           |            |        |     |             |        |
| M18 (M18W)                    | 10 ... 120 mm*  |       |        |          |           |            | ✓      | ✓   |             |        |
| 30 x 30 mm                    | 15 ... 200 mm*  |       |        |          |           |            | ✓      | ✓   |             |        |
| 40 x 50 mm                    | 20 ... 500 mm*  |       |        |          |           |            | ✓      | ✓   |             |        |
| 65 x 83 mm (DC)               | 50 ... 1000 mm* |       |        |          |           |            | ✓      | ✓   |             |        |
| 65 x 83 mm (AC/DC)            | 50 ... 1000 mm* |       |        |          |           |            |        |     | ✓           |        |
| <b>REFLEX SENSORS</b>         |                 |       |        |          |           |            |        |     |             |        |
| M12                           | 1500 mm         |       |        |          |           |            | ✓      | ✓   |             |        |
| M18 (M18W)                    | 2000 mm         |       |        |          |           |            | ✓      | ✓   |             |        |
| 30 x 30 mm                    | 2000 mm         |       |        |          |           |            | ✓      | ✓   |             |        |
| 30 x 30 mm                    | 4000 mm         |       |        |          |           |            | ✓      | ✓   |             |        |
| 40 x 40 mm                    | 6000 mm         |       |        |          |           |            | ✓      | ✓   |             |        |
| 40 x 50 mm                    | 4000 mm         |       |        |          |           |            | ✓      | ✓   |             |        |
| 40 x 50 mm                    | 8000 mm         |       |        |          |           |            | ✓      | ✓   |             |        |
| 50 x 50 mm (DC)               | 4000 mm         |       |        |          |           |            | ✓      | ✓   |             |        |
| 50 x 50 mm (AC/DC)            | 4000 mm         |       |        |          |           |            |        |     | ✓           |        |
| 65 x 83 mm (DC)               | 6000 mm         |       |        |          |           |            | ✓      | ✓   |             |        |
| 65 x 83 mm (AC/DC)            | 6000 mm         |       |        |          |           |            |        |     | ✓           |        |
| <b>ANALOG SENSORS</b>         |                 |       |        |          |           |            |        |     |             |        |
| M12                           | 10 ... 100 mm*  |       |        |          |           |            |        |     |             | ✓      |
| 30 x 30 mm                    | 10 ... 100 mm*  |       |        |          |           |            |        |     |             | ✓      |

\* setting range

|          |         |                           |            |               |                |       |       |          |            |                          | SUPPLY VOLTAGE $U_B$      | CONNECTION   |               | HOUSING |                | PAGE |     |       |           |
|----------|---------|---------------------------|------------|---------------|----------------|-------|-------|----------|------------|--------------------------|---------------------------|--------------|---------------|---------|----------------|------|-----|-------|-----------|
| Light-ON | Dark-ON | Light-/dark-ON switchable | Changeover | Excess-gain** | Polarized (LR) | Relay | Timer | Teach-in | Blue light | High switching frequency |                           | Connector S8 | Connector S12 | Cable   | Screw terminal | PBTP | ABS | Metal |           |
| ✓        |         |                           |            |               |                |       |       |          |            |                          | 10 ... 30 VDC             | ✓            |               | ✓       |                |      |     | ✓     | 147, 148  |
| ✓        |         |                           |            |               |                |       |       |          |            |                          | 10 ... 30 VDC             | ✓            |               | ✓       |                |      |     | ✓     | 147, 148  |
| ✓        |         |                           |            |               |                |       |       |          |            |                          | 10 ... 30 VDC             | ✓            |               | ✓       |                |      |     | ✓     | 145, 146  |
|          | ✓       |                           |            |               |                |       |       |          |            |                          | 10 ... 30 VDC             |              |               | ✓       |                |      |     | ✓     | 149       |
| ✓        | ✓       |                           |            |               |                |       |       |          |            |                          | 10 ... 30 VDC             |              |               | ✓       |                |      |     | ✓     | 149       |
| ✓        | ✓       |                           |            |               |                |       |       |          |            |                          | 10 ... 30 VDC             |              |               | ✓       |                |      |     | ✓     | 149       |
| ✓        |         |                           |            |               |                |       |       |          |            |                          | 10 ... 36 VDC             |              | ✓             | ✓       |                |      |     | ✓     | 151       |
| ✓        |         |                           | ✓          | ✓             |                |       |       |          |            |                          | 10 ... 36 VDC             |              | ✓             | ✓       |                |      |     | ✓     | 158 (160) |
| ✓        |         |                           | ✓          | ✓             |                |       |       |          |            |                          | 10 ... 36 VDC             |              | ✓             | ✓       |                |      |     | ✓     | 163       |
| ✓        |         |                           | ✓          | ✓             |                |       |       |          |            |                          | 10 ... 36 VDC             |              | ✓             | ✓       |                |      |     | ✓     | 163       |
| ✓        |         |                           | ✓          | ✓             |                |       |       |          |            |                          | 10 ... 36 VDC             | ✓            |               | ✓       |                | ✓    |     |       | 168       |
| ✓        |         |                           | ✓          | ✓             |                |       |       |          |            |                          | 10 ... 36 VDC             | ✓            |               | ✓       |                | ✓    |     |       | 165       |
| ✓        |         |                           | ✓          | ✓             |                |       |       |          |            |                          | 10 ... 36 VDC             | ✓            |               | ✓       |                | ✓    |     |       | 173       |
| ✓        |         |                           | ✓          | ✓             |                |       |       |          |            |                          | 10 ... 36 VDC             |              | ✓             |         |                | ✓    |     |       | 177       |
| ✓        |         |                           |            |               |                |       |       |          |            |                          | 10 ... 36 VDC             | ✓            |               | ✓       |                |      | ✓   |       | 183       |
| ✓        |         |                           | ✓          | ✓             |                |       |       |          |            |                          | 20...250 VAC/20...300 VDC |              |               | ✓       |                |      | ✓   |       | 183       |
| ✓        |         |                           | ✓          | ✓             |                |       |       |          |            |                          | 10 ... 36 VDC             | ✓            |               | ✓       |                |      | ✓   |       | 183       |
| ✓        |         | ✓                         |            |               |                | ✓     |       |          |            |                          | 20...250 VAC/20...300 VDC |              |               | ✓       |                |      | ✓   |       | 183       |
| ✓        |         | ✓                         | ✓          | ✓             |                | ✓     | ✓     |          |            |                          | 10 ... 36 VDC             |              | ✓             |         | ✓              | ✓    |     |       | 193       |
|          |         |                           |            |               |                |       |       |          |            |                          | 20...265 VAC/20...320 VDC |              | ✓             |         | ✓              | ✓    |     |       | 193       |
|          |         |                           |            |               |                |       |       |          |            |                          |                           |              |               |         |                |      |     |       |           |
| ✓        |         |                           |            |               |                |       |       |          |            |                          | 10 ... 36 VDC             |              | ✓             | ✓       |                |      |     | ✓     | 157 (159) |
| ✓        |         |                           | ✓          | ✓             |                |       |       |          |            |                          | 10 ... 36 VDC             | ✓            |               | ✓       |                | ✓    |     |       | 165, 168  |
| ✓        |         |                           | ✓          | ✓             |                |       |       |          |            |                          | 10 ... 36 VDC             |              | ✓             |         |                | ✓    |     |       | 177       |
|          |         | ✓                         | ✓          | ✓             |                |       | ✓     |          |            |                          | 10 ... 36 VDC             |              | ✓             |         | ✓              | ✓    |     |       | 193       |
| ✓        |         | ✓                         |            | ✓             |                | ✓     | ✓     |          |            |                          | 20...265 VAC/20...320 VDC |              | ✓             |         | ✓              | ✓    |     |       | 193       |
|          |         |                           |            |               |                |       |       |          |            |                          |                           |              |               |         |                |      |     |       |           |
|          | ✓       |                           |            |               | ✓              |       |       |          |            |                          | 10 ... 36 VDC             |              | ✓             | ✓       |                |      |     | ✓     | 151       |
|          | ✓       |                           |            |               | ✓              |       |       |          |            |                          | 10 ... 36 VDC             |              | ✓             | ✓       |                |      |     | ✓     | 157 (159) |
|          | ✓       |                           |            |               | ✓              |       |       |          |            |                          | 10 ... 36 VDC             | ✓            |               |         |                | ✓    |     |       | 169       |
| ✓        |         |                           | ✓          | ✓             | ✓              |       |       |          |            |                          | 10 ... 36 VDC             | ✓            |               | ✓       |                | ✓    |     |       | 166       |
| ✓        |         |                           | ✓          | ✓             | ✓              |       |       |          |            |                          | 10 ... 36 VDC             | ✓            |               | ✓       |                | ✓    |     |       | 173       |
| ✓        |         |                           | ✓          | ✓             | ✓              |       |       |          |            |                          | 10 ... 36 VDC             |              | ✓             |         |                | ✓    |     |       | 178       |
| ✓        |         |                           | ✓          | ✓             | ✓              |       |       |          |            |                          | 10 ... 36 VDC             |              | ✓             |         |                | ✓    |     |       | 178       |
| ✓        |         |                           | ✓          | ✓             |                |       |       |          |            |                          | 10 ... 36 VDC             | ✓            |               | ✓       |                |      | ✓   |       | 184       |
| ✓        |         |                           |            |               | ✓              |       | ✓     |          |            |                          | 20...250 VAC/20...300 VDC |              |               | ✓       |                |      | ✓   |       | 184       |
|          |         | ✓                         | ✓          | ✓             | ✓              |       |       | ✓        |            |                          | 10 ... 36 VDC             |              | ✓             |         | ✓              | ✓    |     |       | 194       |
| ✓        |         | ✓                         |            | ✓             | ✓              | ✓     | ✓     |          |            |                          | 20...265 VAC/20...320 VDC |              | ✓             |         | ✓              | ✓    |     |       | 194       |
|          |         |                           |            |               |                |       |       |          |            |                          |                           |              |               |         |                |      |     |       |           |
|          |         |                           |            |               |                |       |       |          |            |                          | 10 ... 30 VDC             |              |               | ✓       |                |      |     | ✓     | 153       |
|          |         |                           |            |               |                |       |       |          |            |                          | 10 / 15 ... 30 VDC        | ✓            |               | ✓       |                | ✓    |     |       | 171       |

\*\* For LH: Reception indication



## PHOTOELECTRIC SENSORS

## PROGRAM OVERVIEW

| HOUSING SIZE           | SENSING RANGE |       |        |          |           |            | OUTPUT |     |             |         |
|------------------------|---------------|-------|--------|----------|-----------|------------|--------|-----|-------------|---------|
|                        | 1 mm          | 10 mm | 100 mm | 1,000 mm | 10,000 mm | 100,000 mm | PNP    | NPN | AC/DC relay | IO-Link |
|                        |               |       |        |          |           |            |        |     |             |         |
| THROUGH-BEAM SENSORS   |               |       |        |          |           |            |        |     |             |         |
| Ø 4 mm / M5            | 250 mm        |       |        |          |           |            | ✓      | ✓   |             |         |
| M12                    | 10,000 mm     |       |        |          |           |            | ✓      | ✓   |             |         |
| M12 ⚠                  | 50,000 mm     |       |        |          |           |            | ✓      | ✓   |             |         |
| M18 (M18W)             | 20,000 mm     |       |        |          |           |            | ✓      | ✓   |             |         |
| M18 ⚠                  | 50,000 mm     |       |        |          |           |            | ✓      | ✓   |             |         |
| 30 x 30 mm             | 6,000 mm      |       |        |          |           |            | ✓      | ✓   |             |         |
| 30 x 30 mm             | 12,000 mm     |       |        |          |           |            | ✓      | ✓   |             |         |
| 40 x 40 mm             | 15,000 mm     |       |        |          |           |            | ✓      | ✓   |             |         |
| 40 x 50 mm             | 50,000 mm     |       |        |          |           |            | ✓      | ✓   |             |         |
| 50 x 50 mm (DC)        | 15,000 mm     |       |        |          |           |            | ✓      | ✓   |             |         |
| 50 x 50 mm (AC/DC)     | 15,000 mm     |       |        |          |           |            |        |     | ✓           |         |
| 50 x 50 mm (DC)        | 50,000 mm     |       |        |          |           |            | ✓      | ✓   |             |         |
| 50 x 50 mm (AC/DC)     | 50,000 mm     |       |        |          |           |            |        |     | ✓           |         |
| 65 x 83 mm (DC)        | 50,000 mm     |       |        |          |           |            | ✓      | ✓   |             |         |
| 65 x 83 mm (AC/DC)     | 50,000 mm     |       |        |          |           |            |        |     | ✓           |         |
| FIBER-OPTIC AMPLIFIERS |               |       |        |          |           |            |        |     |             |         |
| 30 x 30 mm             | 60 mm         |       |        |          |           |            | ✓      | ✓   |             |         |
| 30 x 30 mm             | 120 mm        |       |        |          |           |            | ✓      | ✓   |             |         |
| 40 x 40 mm             | 150 mm        |       |        |          |           |            | ✓      | ✓   |             |         |
| 31 x 60 mm             | 100 mm        |       |        |          |           |            | ✓      | ✓   |             |         |
| 31 x 60 mm             | 140 mm        |       |        |          |           |            | ✓      | ✓   |             |         |
| 31 x 60 mm             | 200 mm        |       |        |          |           |            | ✓      | ✓   |             | ✓       |
| COLOR SENSOR           |               |       |        |          |           |            |        |     |             |         |
| 40 x 50 mm             | 30 ... 40 mm* |       |        |          |           |            | ✓      | ✓   |             |         |

\* operating range

|          |         |                           |            |             |       |       |          |            |                          | SUPPLY VOLTAGE U <sub>B</sub> | CONNECTION   |               |       |                | HOUSING | PAGE |       |             |
|----------|---------|---------------------------|------------|-------------|-------|-------|----------|------------|--------------------------|-------------------------------|--------------|---------------|-------|----------------|---------|------|-------|-------------|
| Light-ON | Dark-ON | Light-/dark-ON switchable | Changeover | Excess-gain | Relay | Timer | Teach-in | Blue light | High switching frequency |                               | Connector S8 | Connector S12 | Cable | Screw terminal | PBTP    | ABS  | Metal |             |
|          | ✓       |                           |            |             |       |       |          |            |                          | 10 ... 30 VDC                 | ✓            |               | ✓     |                |         |      | ✓     | 145, 146    |
| ✓        | ✓       |                           |            |             |       |       |          |            |                          | 10 ... 36 VDC                 |              | ✓             | ✓     |                |         |      | ✓     | 152         |
| ✓        | ✓       |                           |            |             |       |       |          |            |                          | 10 ... 36 VDC                 |              | ✓             | ✓     |                |         |      | ✓     | 155         |
| ✓        |         |                           |            |             |       |       |          |            |                          | 10 ... 36 VDC                 |              | ✓             | ✓     |                |         |      | ✓     | 158 (160)   |
| ✓        |         |                           | ✓          | ✓           |       |       |          |            |                          | 10 ... 36 VDC                 |              | ✓             | ✓     |                |         |      | ✓     | 163         |
| ✓        | ✓       |                           |            |             |       |       |          |            |                          | 10 ... 36 VDC                 | ✓            |               | ✓     |                | ✓       |      |       | 169         |
| ✓        |         |                           | ✓          | ✓           |       |       |          |            |                          | 10 ... 36 VDC                 | ✓            |               | ✓     |                | ✓       |      |       | 166         |
| ✓        |         |                           | ✓          | ✓           |       |       |          |            |                          | 10 ... 36 VDC                 | ✓            |               | ✓     |                | ✓       |      |       | 174         |
| ✓        |         |                           | ✓          | ✓           |       |       |          |            |                          | 10 ... 36 VDC                 |              | ✓             |       |                | ✓       |      |       | 179         |
| ✓        |         |                           | ✓          | ✓           |       |       |          |            |                          | 10 ... 36 VDC                 | ✓            |               | ✓     |                |         | ✓    |       | 185         |
| ✓        |         |                           | ✓          | ✓           | ✓     |       |          |            |                          | 20...250 VAC/20...300 VDC     |              |               | ✓     |                |         | ✓    |       | 185         |
| ✓        |         |                           | ✓          | ✓           |       |       |          |            |                          | 10 ... 36 VDC                 | ✓            |               | ✓     |                |         | ✓    |       | 185         |
|          |         |                           |            |             | ✓     |       |          |            |                          | 20...250 VAC/20...300 VDC     |              |               | ✓     |                |         | ✓    |       | 185         |
|          |         | ✓                         | ✓          | ✓           |       | ✓     |          |            |                          | 10 ... 36 VDC                 |              | ✓             |       | ✓              | ✓       |      |       | 194         |
| ✓        |         | ✓                         |            | ✓           | ✓     | ✓     |          |            |                          | 20...265 VAC/20...320 VDC     |              | ✓             |       | ✓              | ✓       |      |       | 194         |
|          |         |                           |            |             |       |       |          |            |                          |                               |              |               |       |                |         |      |       |             |
| ✓        | ✓       |                           |            |             |       |       |          |            |                          | 10 ... 36 VDC                 | ✓            |               | ✓     |                | ✓       |      |       | 170         |
| ✓        |         |                           |            | ✓           | ✓     |       |          |            |                          | 10 ... 36 VDC                 | ✓            |               | ✓     |                | ✓       |      |       | 167         |
| ✓        |         |                           |            | ✓           | ✓     |       |          |            |                          | 10 ... 36 VDC                 | ✓            |               | ✓     |                | ✓       |      |       | 174         |
|          |         | ✓                         |            | ✓           |       | ✓     | ✓        | ✓          |                          | 10 ... 30 VDC                 | ✓            |               | ✓     |                | ✓       |      |       | 188,190     |
|          |         | ✓                         |            | ✓           |       | ✓     | ✓        |            | ✓                        | 10 ... 30 VDC                 | ✓            |               | ✓     |                | ✓       |      |       | 187,189     |
|          |         | ✓                         |            | ✓           |       | ✓     | ✓        |            |                          | 10 ... 30 VDC                 | ✓            |               | ✓     |                | ✓       |      |       | 187,189,191 |
|          |         |                           |            |             |       |       |          |            |                          |                               |              |               |       |                |         |      |       |             |
| ✓        |         |                           |            |             |       |       | ✓        |            |                          | 10 ... 30 VDC                 |              | ✓             |       |                | ✓       |      |       | 181         |

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## OPERATING PRINCIPLE

The light-emitting diode (LED) emits a beam of modulated light towards the target. This beam is interrupted by the target, causing partial reflection. A part of the reflected light reaches the sensing face of the receiver. Depending on the operating principle, either the interrupted beam or the reflected light is used for further processing.

Fig. 10 shows the essential functional blocks of a photoelectric sensor.

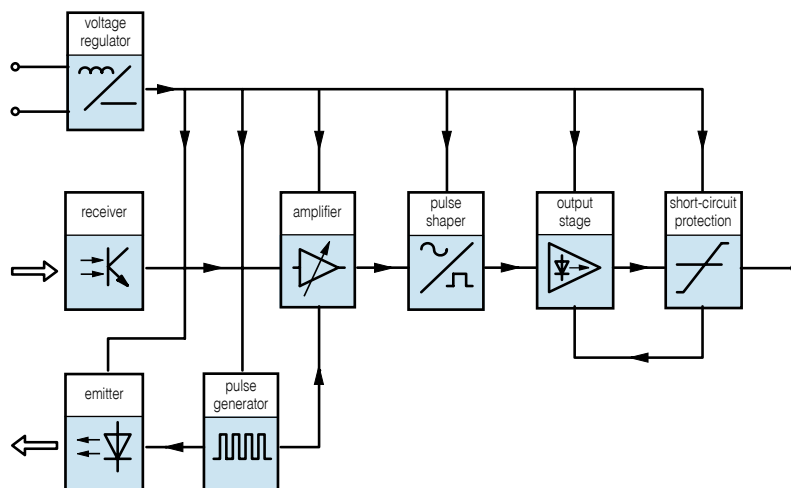


Fig. 10

## AVAILABLE MODELS

The Contrinex photoelectric program includes energetic diffuse sensors, diffuse sensors with background suppression, reflex sensors, through-beam sensors and fiber-optic amplifiers.

### DIFFUSE SENSORS, ENERGETIC

The pulsed light from the emitting diode falls on an object of any shape or color. It is reflected in a diffuse manner, and part of it reaches the light receiver located in the same unit (Fig. 11). If the intensity of the received light is sufficient, the output is switched. The attainable sensing range depends on the target size and color, as well as its surface structure, and can be adjusted within a wide range by means of the built-in potentiometer.

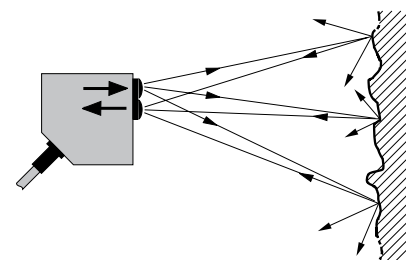


Fig. 11

This range also contains models with analog output.

### DIFFUSE SENSORS WITH BACKGROUND SUPPRESSION

These devices basically function in an identical manner to energetic diffuse sensors, but using the angle of incidence, rather than the amount, of reflected light. For this reason, the sensing range depends to only a slight extent on target size, color, or surface structure. The target can therefore be accurately recognized, even on a light background.

## REFLEX SENSORS

The pulsed light from the emitting diode is focused by means of a lens, and directed via a polarization filter at a reflector (principle of a 3-way mirror - Fig. 12). Part of the reflected light passes through a further polarization filter, before reaching the receiver. The filters are selected and adjusted in such a way that only light returning from the reflector reaches the receiver. This ensures reliable detection results, even with bright and shiny targets, which otherwise would not be detected, due to a strong direct reflection. Furthermore, thanks to the optics used, the sensing range is increased considerably.

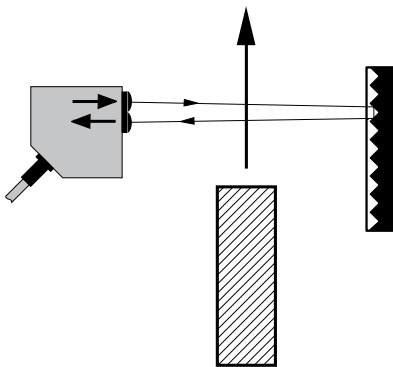


Fig. 12

An object interrupting the light beam which passes from the emitter via the reflector to the receiver causes the output to switch. For reliable operation, the target size should be at least equal to the diameter of the reflector.

Series 4050 also includes executions that work with non-polarized light. While these devices feature very long sensing ranges, they are not suitable for the detection of bright and shiny targets.

## THROUGH-BEAM SENSORS

These devices consist of an emitter and a receiver in separate housings. The emitter is aligned so that the greatest possible amount of pulsed light from its diode reaches the receiver (Fig. 13). The receiver processes the incoming light in such a way

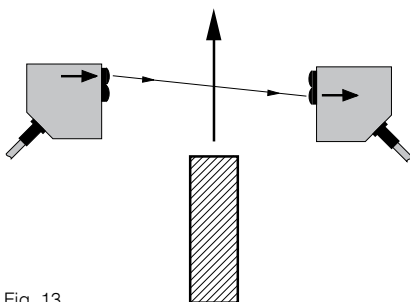


Fig. 13

that it is clearly separated from ambient and other light sources. Any interruption of the light beam between emitter and receiver causes the output to be switched. For reliable operation, the target must be completely opaque, and its size should be at least equal to the diameter of the receiver's aperture.

## FIBER-OPTIC AMPLIFIERS

Optical fibers are fitted in front of the emitter and receiver (the basic operation is identical for both glass and synthetic optical fibers). These fibers work as the extended "eye" of the photo sensor. As optical fiber conductors are very small and flexible, they provide a truly practical solution to the problem of sensing in highly inaccessible places. Furthermore, they do not carry any electrical potential, and sensing operations are therefore possible without special safety measures, even in areas where there is an explosion risk, or in the presence of strong electrical and magnetic fields (high-voltage equipment, electrical welding equipment). Even the tiniest objects can be detected by using appropriately thin fibers. Optical fibers can act as both through-beam (Fig. 14) and diffuse sensors (Fig. 15).

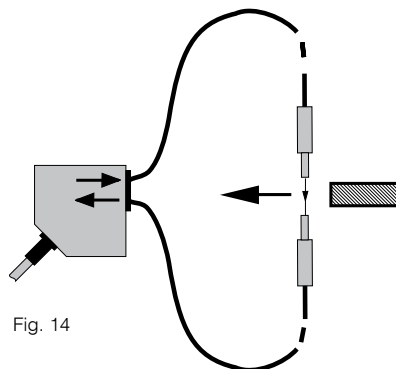


Fig. 14

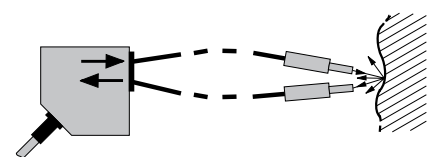


Fig. 15

## COLOR SENSOR

The Contrinex color sensors are well suited for color control as well as for use in color sorting processes. The devices feature 3 teachable color channels with independent outputs, which allow for three color tones to be programmed. For teaching, 5 different switching tolerance levels may be selected. Whereas small tolerances allow for minimal color differences to be recognized, larger tolerances permit a certain color variation.

## SPECIAL EXECUTIONS

In addition to the types described in this catalog, a number of special executions are available, in particular devices with different cable lengths, different cable types (e.g. with oil-resistant, highly flexible PUR insulation), and different housing materials (e.g. stainless steel).



## PRODUCT OVERVIEW

### SERIES 1000

This series features a great variety of sizes and functions in widely used standardized cylindrical housings (smooth and threaded types). The program includes devices in sizes diameter 4 mm, M5, M12, M18 and M18W for right-angle sensing. The  $\varnothing$  4 mm and M5 devices are the smallest self-contained photoelectric sensors on the market, and are now also available with cylindrical light beam and well-defined operating range. They replace larger models in case of space problems, and optical fibers if the latter do not prove satisfactory. In addition, they can also be used instead of inductive sensors of equal size if their operating distances are insufficient.



The series 1000 now also includes a M12-device with analog output as well as laser devices in sizes M12 and M18, which compared to conventional LED sensors, are distinguished by a narrowly collimated red laser beam. The latter allows for the detection of very small objects across a large distance.

### SERIES 0507

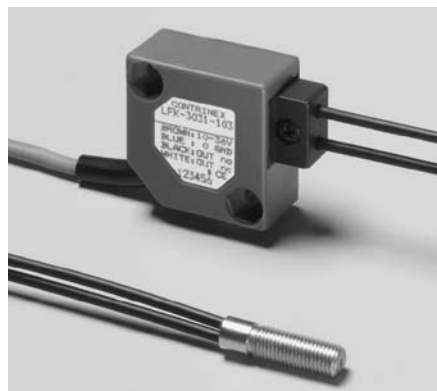
These rectangular miniature diffuse sensors (5 x 7 x 40 mm) feature a narrowly focused, virtually cylindrical light beam. The latter allows for vertical and horizontal mounting directly on the supporting surface as well as for reliable detection of objects through holes and gaps.

### SERIES 3030 / 3130

This series combines high performance with small size (30 x 30 x 15 mm housing). Available types include energetic diffuse sensors, diffuse sensors with background suppression, reflex sensors, diffuse sensors with analog output, through-beam sensors and fiber-optic amplifiers. Despite their small size, they feature all the usual protection functions, are robust and can be used for demanding industrial applications.



### SERIES 3031 / 3131



This series combines good performance with moderate cost. It is intended for general use, particularly where small size is required (housing 30 x 30 x 15 mm). The program includes energetic diffuse sensors, diffuse sensors with background suppression, reflex sensors, through-beam sensors and fiber-optic amplifiers. These robust devices are suitable for industrial use, and feature all the usual protection functions.

## SERIES 4040

Maximum performance in a 40 x 40 x 19 mm housing. These devices are ideally suited for demanding applications, thanks to sensing ranges of 2 m (diffuse sensor) and 6 m (reflex sensor). As a result of a built-in power saving module, these values are attained using very little energy. Available types include diffuse sensors, reflex sensors, through-beam sensors and fiber-optic amplifiers for glass fibers.

## SERIES 4050

Series 4050 devices feature high performance in a compact standard 40 x 50 x 15 mm housing. The range includes diffuse sensors, diffuse sensors with precise background suppression, polarized and non-polarized reflex sensors, as well as through-beam sensors.



The series also comprises color sensors featuring 3 teachable color channels and 5 switching tolerance levels.

## SERIES 5050

This series of photoelectric sensors in the universally used rectangular size 50 x 50 mm offers top quality, designed to cost. The range includes diffuse, through-beam, and reflex sensors in DC and AC/DC execution with relay output.



## SERIES 3060 / 3065 / 3066

The fiber-optic amplifiers for DIN-rail mounting (DIN/EN 50022) feature long sensing ranges, outstanding detection properties for both long and very short ranges, high temperature stability and durability, thanks to stabilized light power (teach-in model only), and high switching frequency. For the teach-in versions, built-in adjustable pulse delay and stretching are standard. The housing width of only 10 mm allows for optimum stacking of even a large number of switches. In addition, the devices are optimized for simple and easily understandable operation. Presently, the series offers distance setting by means of potentiometer and teach-in; the latter with additional manual fine adjustment. According to choice, Teach 1 (only on background), Teach 2 (first on target, then on background), or "Dynamic Teach" may be used. The teach process can be launched from a distance via a separate input. The devices are available as blue and red-light, as well as high-frequency models, in cable and connector executions.



## SERIES 6080

This series is suitable for conveyors and other applications where extremely robust devices in large housings are required. It offers an extensive functional program contained in a 65 x 83 x 25 mm housing. Available models include energetic diffuse sensors, diffuse sensors with background suppression, reflex sensors, and through-beam sensors.

All models are available in DC or combined AC/DC (20...265 VAC, 20...320 VDC) execution with relay output. Connection is via connector or screw terminal. All variations can be delivered with a timer.



## GLASS OPTICAL FIBERS

A large range of glass optical fibers is available for the 4040 series, and partially for the 3030 / 3031 series. The program includes types suitable for the most difficult operating conditions and the widest range of sensing applications. Moreover, custom-made models are available at a low extra cost, even for small order quantities.



## SYNTHETIC OPTICAL FIBERS

For 3030 / 3031 and 3060 / 3065 / 3066 series switches, this catalog includes a comprehensive range of synthetic optical fibers for the detection of smallest objects, and for use in highly inaccessible areas. The fibers can be cut on site to the length required for a specific application.



Inductive

Photoelectric

Optical fibers

Ultrasonic

Capacitive

Cables & connectors

Accessories

Glossary

Index



## PHOTOELECTRIC SENSORS: SUB-MINIATURE SERIES 1040/50 & 0507



- ✓ **Sub-miniature sensors**
- ✓ Rugged **metal housing**
- ✓ **Accurate target detection** due to cylindrical light beam
- ✓ Rugged sapphire-glass or glass sensing face, **scratch & chemically resistant**
- ✓ **Shock & vibration resistant** due to fully vacuum-potted electronics
- ✓ **High system reserves** (excess gain)
- ✓ **Pre-failure warning** (pollution monitoring)

### TECHNICAL DATA

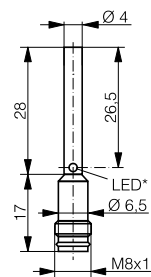
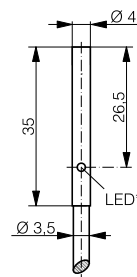
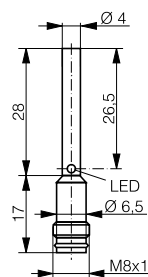
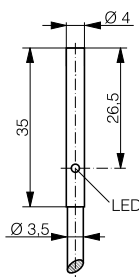
|                                                |                        |
|------------------------------------------------|------------------------|
| (according to IEC 60947-5-2)                   |                        |
| Housing material                               | Stainless steel V2A    |
| Hysteresis                                     | 10% typ.               |
| Supply voltage range $U_B$                     | 10 ... 30 VDC          |
| Max. ripple content                            | 20 %                   |
| Output current                                 | $\leq 100$ mA          |
| Output voltage drop                            | $\leq 2.0$ V at 100 mA |
| Max. switching frequency                       | 250 Hz                 |
| Switching time ( $\uparrow$ and $\downarrow$ ) | 2.5 msec               |
| Max. ambient light:                            |                        |
| halogen                                        | 5,000 Lux              |
| sun                                            | 10,000 Lux             |
| Ambient temperature range                      | 0 ... +55 °C           |
| Degree of protection                           | IP 67                  |
| EMC protection:                                |                        |
| IEC 60947-5-2 (7.2.3.1)                        | 1 kV                   |
| IEC 61000-4-2                                  | Level 2                |
| IEC 61000-4-3                                  | Level 3                |
| IEC 61000-4-4                                  | Level 2                |
| Short-circuit protection                       | Built-in               |
| Polarity reversal protection                   | Built-in               |
| Power-on reset                                 | Built-in               |

Rugged sub-miniature sensors  $\varnothing$  4 mm, M5,  $\nabla$  5 x 7 mm in metal housings for precise target detection in limited spaces. Shock and vibration, scratch and chemically resistant with high system reserves (excess gain). Pollution monitoring (blinking LED) in case of reduced system reserves prevents downtime caused by pollution. Particularly suited for rough industrial environments and where space is limited:

- ✓ **semiconductor industry**
- ✓ **printed circuit board production**
- ✓ **electronics industry**
- ✓ **gripper arms on handling machines**
- ✓ **solar module manufacturing**
- ✓ **vending machines**

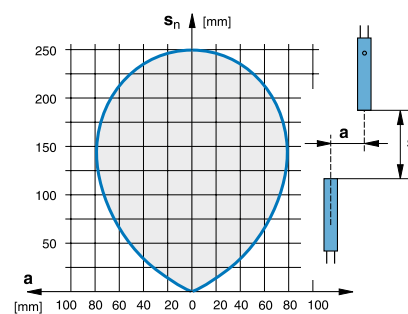
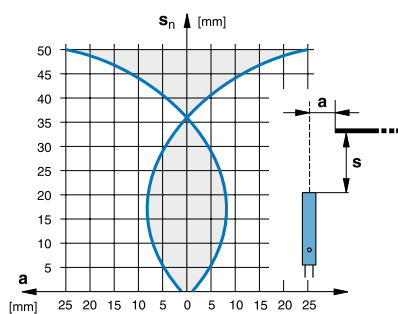
| HOUSING SIZE  | Ø 4                     |                               |
|---------------|-------------------------|-------------------------------|
| SENSING RANGE | DIFFUSE SENSOR<br>50 mm | THROUGH-BEAM SENSOR<br>250 mm |

Dimensions:



\* receiver only

Response curves:

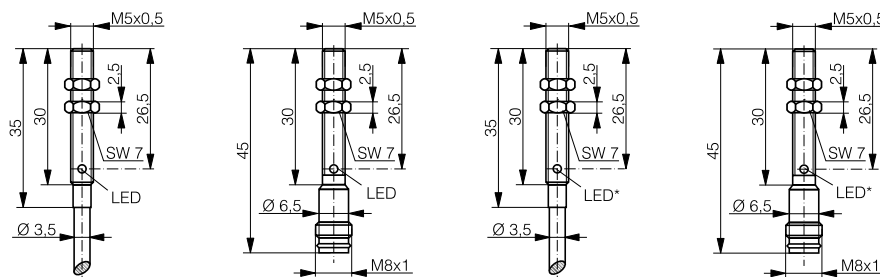


| TECHNICAL DATA                   |                    |                          |
|----------------------------------|--------------------|--------------------------|
| Sensing range                    | 50 mm              | 250 mm                   |
| Standard target                  | 100 x 100 mm white | ---                      |
| No-load supply current           | ≤ 15 mA            | ≤ 5 mA (R) / ≤ 10 mA (E) |
| Emitter                          | IR LED 880 nm      | IR LED 880 nm            |
| Lens material                    | Glass              | Glass                    |
| Approvals                        | CE, UL, RoHS       | CE, UL, RoHS             |
| Weight (cable / connector model) | 35 / 3 g           | 66 / 6 g (R and E)       |

| PART REFERENCES                  |                     |                                              |
|----------------------------------|---------------------|----------------------------------------------|
| ( <b>bold</b> : preferred types) |                     | ( <b>R</b> ) receiver / ( <b>E</b> ) emitter |
| NPN light-ON / cable             | <b>LTK-1040-301</b> | ---                                          |
| NPN dark-ON / cable              | ---                 | <b>LLK-1040-202 (R) / LLK-1040-200 (E)</b>   |
| NPN light-ON / connector S8      | <b>LTS-1040-301</b> | ---                                          |
| NPN dark-ON / connector S8       | ---                 | <b>LLS-1040-202 (R) / LLS-1040-200 (E)</b>   |
| PNP light-ON / cable             | <b>LTK-1040-303</b> | ---                                          |
| PNP dark-ON / cable              | ---                 | <b>LLK-1040-204 (R) / LLK-1040-200 (E)</b>   |
| PNP light-ON / connector S8      | <b>LTS-1040-303</b> | ---                                          |
| PNP dark-ON / connector S8       | ---                 | <b>LLS-1040-204 (R) / LLS-1040-200 (E)</b>   |
| Compatible connectors (page 268) | A, B                | A, B                                         |
| Wiring (pages 198-199)           | Diagram 1           | Diagram 1 (R) / 4 (E)                        |

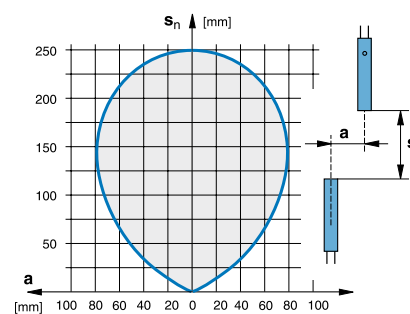
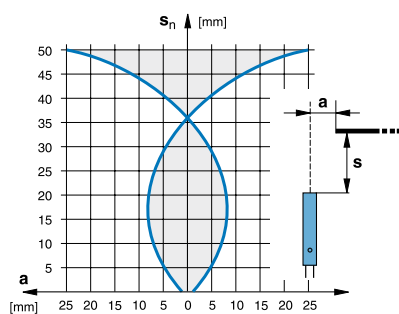
| HOUSING SIZE  | M5                      |                               |
|---------------|-------------------------|-------------------------------|
| SENSING RANGE | DIFFUSE SENSOR<br>50 mm | THROUGH-BEAM SENSOR<br>250 mm |

Dimensions:



\* receiver only

Response curves:

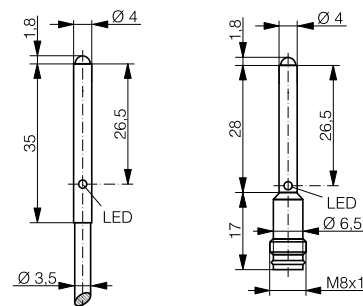
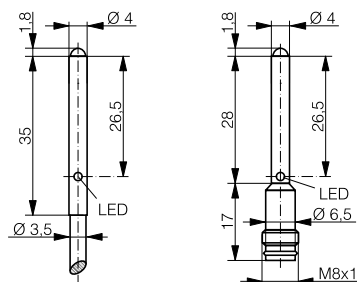


| TECHNICAL DATA                   |                    |                          |
|----------------------------------|--------------------|--------------------------|
| Sensing range                    | 50 mm              | 250 mm                   |
| Standard target                  | 100 x 100 mm white | ---                      |
| No-load supply current           | ≤ 15 mA            | ≤ 5 mA (R) / ≤ 10 mA (E) |
| Emitter                          | IR LED 880 nm      | IR LED 880 nm            |
| Lens material                    | Glass              | Glass                    |
| Approvals                        | CE, UL, RoHS       | CE, UL, RoHS             |
| Weight (cable / connector model) | 35 / 4 g           | 68 / 8 g (R and E)       |

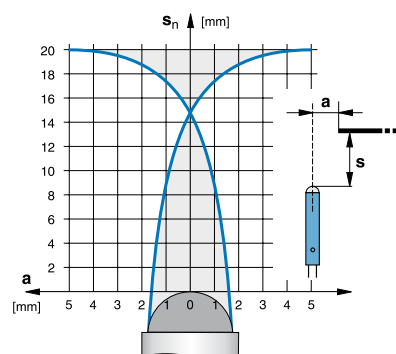
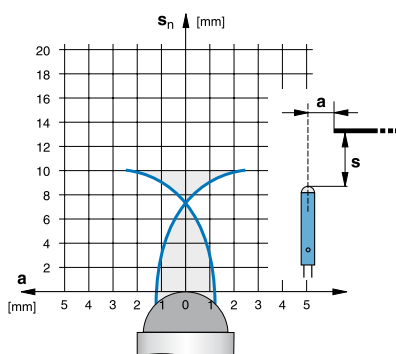
| PART REFERENCES                  |                     |                                            |
|----------------------------------|---------------------|--------------------------------------------|
| <b>(bold: preferred types)</b>   |                     | <b>(R) receiver / (E) emitter</b>          |
| NPN light-ON / cable             | <b>LTK-1050-301</b> | ---                                        |
| NPN dark-ON / cable              | ---                 | <b>LLK-1050-202 (R) / LLK-1050-200 (E)</b> |
| NPN light-ON / connector S8      | <b>LTS-1050-301</b> | ---                                        |
| NPN dark-ON / connector S8       | ---                 | <b>LLS-1050-202 (R) / LLS-1050-200 (E)</b> |
| PNP light-ON / cable             | <b>LTK-1050-303</b> | ---                                        |
| PNP dark-ON / cable              | ---                 | <b>LLK-1050-204 (R) / LLK-1050-200 (E)</b> |
| PNP light-ON / connector S8      | <b>LTS-1050-303</b> | ---                                        |
| PNP dark-ON / connector S8       | ---                 | <b>LLS-1050-204 (R) / LLS-1050-200 (E)</b> |
| Compatible connectors (page 268) | A, B                | A, B                                       |
| Wiring (pages 198-199)           | Diagram 1           | Diagram 1 (R) / 4 (E)                      |

| HOUSING SIZE  | Ø 4 WITH CYLINDRICAL LIGHT BEAM |                         |
|---------------|---------------------------------|-------------------------|
| SENSING RANGE | DIFFUSE SENSOR<br>10 mm         | DIFFUSE SENSOR<br>20 mm |

Dimensions:



Response curves:

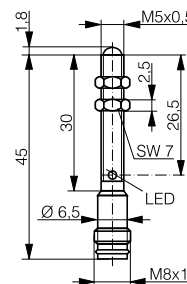
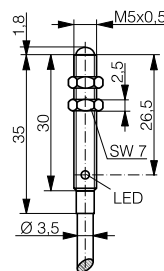
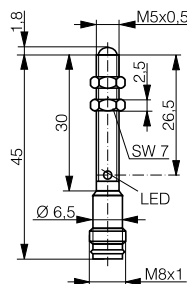
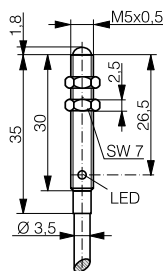


| TECHNICAL DATA                   |                    |                    |
|----------------------------------|--------------------|--------------------|
| Sensing range                    | 10 mm              | 20 mm              |
| Standard target                  | 100 x 100 mm white | 100 x 100 mm white |
| No-load supply current           | ≤ 15 mA            | ≤ 15 mA            |
| Emitter                          | IR LED 880 nm      | IR LED 880 nm      |
| Lens material                    | Sapphire glass     | Sapphire glass     |
| Approvals                        | CE, UL, RoHS       | CE, UL, RoHS       |
| Weight (cable / connector model) | 28 / 3 g           | 28 / 3 g           |

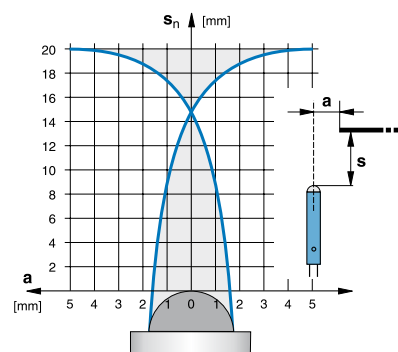
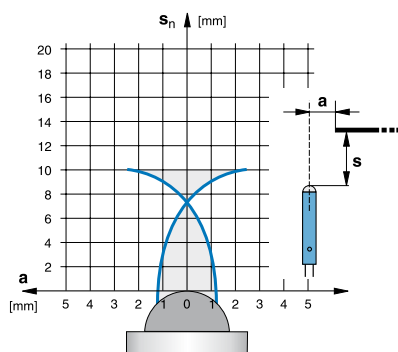
| PART REFERENCES                  |                         |                         |
|----------------------------------|-------------------------|-------------------------|
| <b>(bold: preferred types)</b>   |                         |                         |
| NPN light-ON / cable             | <b>LTK-1040-301-505</b> | <b>LTK-1040-301-506</b> |
| NPN dark-ON / cable              | ---                     | ---                     |
| NPN light-ON / connector S8      | <b>LTS-1040-301-505</b> | <b>LTS-1040-301-506</b> |
| NPN dark-ON / connector S8       | ---                     | ---                     |
| PNP light-ON / cable             | <b>LTK-1040-303-505</b> | <b>LTK-1040-303-506</b> |
| PNP dark-ON / cable              | ---                     | ---                     |
| PNP light-ON / connector S8      | <b>LTS-1040-303-505</b> | <b>LTS-1040-303-506</b> |
| PNP dark-ON / connector S8       | ---                     | ---                     |
| Compatible connectors (page 268) | A, B                    | A, B                    |
| Wiring (pages 198-199)           | Diagram 1               | Diagram 1               |

| HOUSING SIZE  | M5 WITH CYLINDRICAL LIGHT BEAM |                         |
|---------------|--------------------------------|-------------------------|
| SENSING RANGE | DIFFUSE SENSOR<br>10 mm        | DIFFUSE SENSOR<br>20 mm |

Dimensions:



Response curves:

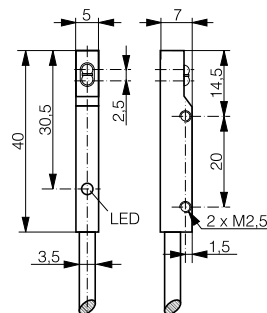
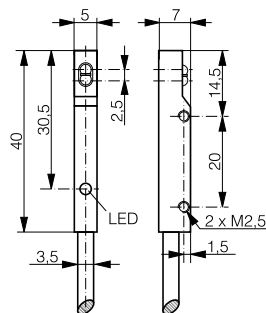
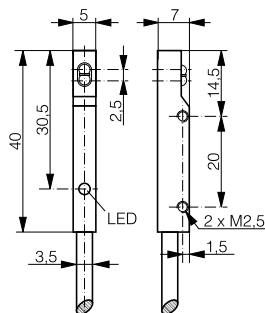


| TECHNICAL DATA                   |                    |                    |
|----------------------------------|--------------------|--------------------|
| Sensing range                    | 10 mm              | 20 mm              |
| Standard target                  | 100 x 100 mm white | 100 x 100 mm white |
| No-load supply current           | ≤ 15 mA            | ≤ 15 mA            |
| Emitter                          | IR LED 880 nm      | IR LED 880 nm      |
| Lens material                    | Sapphire glass     | Sapphire glass     |
| Approvals                        | CE, UL, RoHS       | CE, UL, RoHS       |
| Weight (cable / connector model) | 30 / 5 g           | 30 / 5 g           |

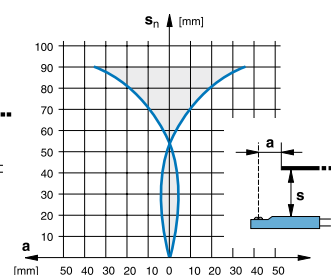
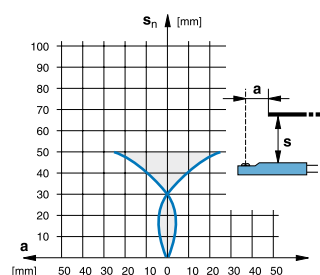
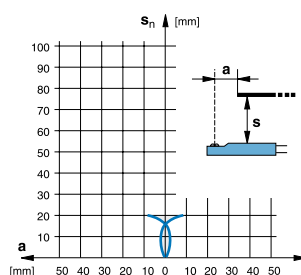
| PART REFERENCES                  |                         |                         |
|----------------------------------|-------------------------|-------------------------|
| <b>(bold: preferred types)</b>   |                         |                         |
| NPN light-ON / cable             | <b>LTK-1050-301-505</b> | <b>LTK-1050-301-506</b> |
| NPN dark-ON / cable              | ---                     | ---                     |
| NPN light-ON / connector S8      | <b>LTS-1050-301-505</b> | <b>LTS-1050-301-506</b> |
| NPN dark-ON / connector S8       | ---                     | ---                     |
| PNP light-ON / cable             | <b>LTK-1050-303-505</b> | <b>LTK-1050-303-506</b> |
| PNP dark-ON / cable              | ---                     | ---                     |
| PNP light-ON / connector S8      | <b>LTS-1050-303-505</b> | <b>LTS-1050-303-506</b> |
| PNP dark-ON / connector S8       | ---                     | ---                     |
| Compatible connectors (page 268) | A, B                    | A, B                    |
| Wiring (pages 198-199)           | Diagram 1               | Diagram 1               |

| HOUSING SIZE  | 5 X 7 X 40 WITH CYLINDRICAL LIGHT BEAM |                         |                         |
|---------------|----------------------------------------|-------------------------|-------------------------|
| SENSING RANGE | DIFFUSE SENSOR<br>20 mm                | DIFFUSE SENSOR<br>50 mm | DIFFUSE SENSOR<br>90 mm |

Dimensions:



Response curves:



| TECHNICAL DATA         |                    |                    |                    |
|------------------------|--------------------|--------------------|--------------------|
| Sensing range          | 20 mm*             | 50 mm              | 90 mm              |
| Standard target        | 100 x 100 mm white | 100 x 100 mm white | 100 x 100 mm white |
| No-load supply current | ≤ 15 mA            | ≤ 15 mA            | ≤ 15 mA            |
| Emitter                | IR LED 880 nm      | IR LED 880 nm      | IR LED 880 nm      |
| Lens material          | Sapphire glass     | Sapphire glass     | Sapphire glass     |
| Approvals              | CE, RoHS           | CE, RoHS           | CE, RoHS           |
| Weight                 | 40 g               | 40 g               | 40 g               |

| PART REFERENCES                  |                         |                     |                         |
|----------------------------------|-------------------------|---------------------|-------------------------|
| <b>(bold: preferred types)</b>   |                         |                     |                         |
| NPN light-ON / cable             | <b>LTK-0507-301-501</b> | <b>LTK-0507-301</b> | <b>LTK-0507-301-502</b> |
| NPN dark-ON / cable              | <b>LTK-0507-302-501</b> | <b>LTK-0507-302</b> | <b>LTK-0507-302-502</b> |
| NPN light-ON / connector S8      | ---                     | ---                 | ---                     |
| NPN dark-ON / connector S8       | ---                     | ---                 | ---                     |
| PNP light-ON / cable             | <b>LTK-0507-303-501</b> | <b>LTK-0507-303</b> | <b>LTK-0507-303-502</b> |
| PNP dark-ON / cable              | <b>LTK-0507-304-501</b> | <b>LTK-0507-304</b> | <b>LTK-0507-304-502</b> |
| PNP light-ON / connector S8      | ---                     | ---                 | ---                     |
| PNP dark-ON / connector S8       | ---                     | ---                 | ---                     |
| Compatible connectors (page 268) | ---                     | ---                 | ---                     |
| Wiring (pages 198-199)           | Diagram 1               | Diagram 1           | Diagram 1               |

\* calibrated between 20 and 25 mm



## PHOTOELECTRIC SENSORS: SERIES 1120



- ✓ M12 **miniature sensor series**
- ✓ Rugged **metal housing**
- ✓ **Accurate & speed-independent target detection**; response time 0.5 msec
- ✓ **Shock & vibration resistant** due to fully vacuum-potted electronics
- ✓ **High system reserves** (excess gain)
- ✓ **Pre-failure warning** (pollution monitoring)
- ✓ **Easy adjustment** (due to visible red light)
- ✓ Accurate **analog sensor** (10 ... 100 mm)

### TECHNICAL DATA

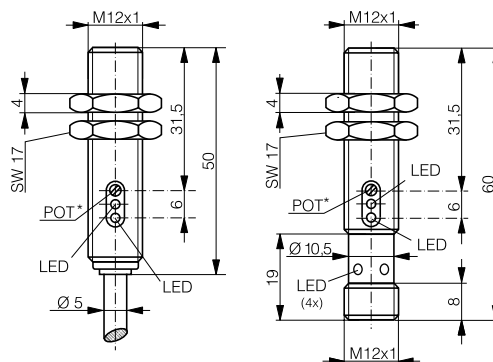
|                                             |                                     |
|---------------------------------------------|-------------------------------------|
| (according to IEC 60947-5-2)                |                                     |
| Housing material                            | Chrome-plated brass                 |
| Hysteresis                                  | 10 % typ. / --- (LA)                |
| Supply voltage range $U_b$                  | 10 ... 36 VDC / 10 ... 30 VDC (LA)  |
| Max. ripple content                         | 20 %                                |
| Output current                              | ≤ 200 mA / --- (LA)                 |
| Output voltage drop                         | ≤ 2.0 V at 200 mA / --- (LA)        |
| Max. switching frequency / Bandwidth (-3dB) | 1,000 Hz / 100 Hz at s = 50 mm (LA) |
| Switching time (↑ and ↓)                    | 0.5 msec / --- (LA)                 |
| Max. ambient light:                         |                                     |
| halogen                                     | 5,000 Lux                           |
| sun                                         | 10,000 Lux                          |
| Ambient temperature range                   | -25 ... +55 °C / 0 ... +55 °C (LA)  |
| Degree of protection                        | IP 67                               |
| EMC protection:                             |                                     |
| IEC 60947-5-2 (7.2.3.1)                     | 1 kV                                |
| IEC 61000-4-2                               | Level 2                             |
| IEC 61000-4-3                               | Level 3 / Level 2 (LA)              |
| IEC 61000-4-4                               | Level 3                             |
| IEC 61000-4-6                               | Level 2 (LA)                        |
| Short-circuit protection                    | Built-in                            |
| Polarity reversal protection                | Built-in                            |
| Power-on reset                              | Built-in / --- (LA)                 |

Rugged M12 miniature sensors in metal housings for accurate and speed-independent target detection. Shock and vibration, scratch and chemically resistant with high system reserves (excess gain). Pollution monitoring (green LED) in case of reduced system reserves prevents downtime caused by pollution. Easy adjustment due to visible red light. Particularly suited for rough industrial environments and where space is limited:

- ✓ **packaging machines**
- ✓ **printing industry**
- ✓ **automation equipment**
- ✓ **handling systems**
- ✓ **conveyor systems**
- ✓ **special machinery**
- ✓ **machine tool industry (in combination with inductive sensors)**
- ✓ **inserters & sorting machines**

| HOUSING SIZE  | M12                      |                                       |
|---------------|--------------------------|---------------------------------------|
| SENSING RANGE | DIFFUSE SENSOR<br>300 mm | REFLEX SENSOR (POLARIZED)<br>1,500 mm |

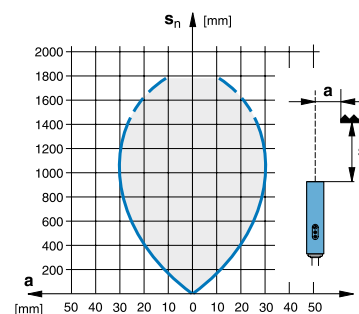
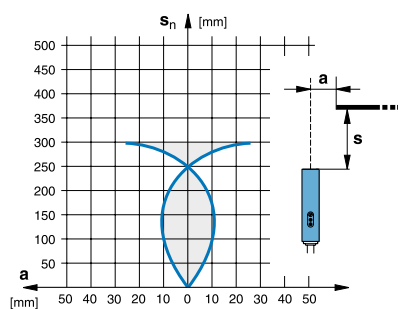
Dimensions:



\* diffuse sensor only



Response curves:

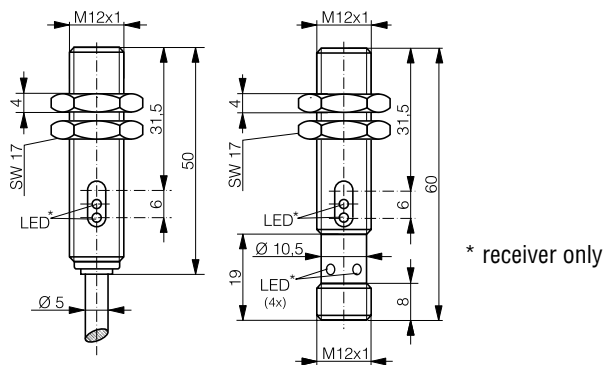


| TECHNICAL DATA                         |                        |                          |
|----------------------------------------|------------------------|--------------------------|
| Sensing range (setting range)          | 300 mm (70 ... 300 mm) | 1,500 mm                 |
| Standard target / reflector (page 197) | 100 x 100 mm white     | Reflector type 3         |
| No-load supply current                 | ≤ 15 mA                | ≤ 15 mA                  |
| Emitter                                | LED red 660 nm         | LED red polarized 660 nm |
| Approvals                              | CE, UL, RoHS           | CE, UL, RoHS             |
| Weight (cable / connector model)       | 100 / 20 g             | 100 / 20 g               |

| PART REFERENCES                  |                     |                     |
|----------------------------------|---------------------|---------------------|
| <b>(bold: preferred types)</b>   |                     |                     |
| NPN light-ON / cable             | <b>LTK-1120-301</b> | ---                 |
| NPN dark-ON / cable              | ---                 | <b>LRK-1120-302</b> |
| NPN light-ON / connector S12     | <b>LTS-1120-301</b> | ---                 |
| NPN dark-ON / connector S12      | ---                 | <b>LRS-1120-302</b> |
| PNP light-ON / cable             | <b>LTK-1120-303</b> | ---                 |
| PNP dark-ON / cable              | ---                 | <b>LRK-1120-304</b> |
| PNP light-ON / connector S12     | <b>LTS-1120-303</b> | ---                 |
| PNP dark-ON / connector S12      | ---                 | <b>LRS-1120-304</b> |
| Compatible connectors (page 268) | G, H                | G, H                |
| Wiring (pages 198-199)           | Diagram 1           | Diagram 1           |

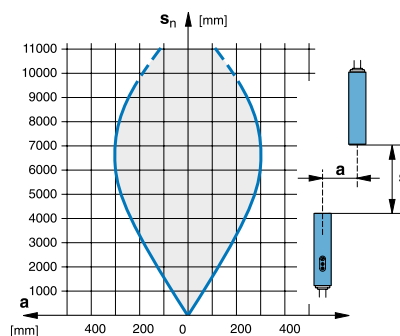
|               |                                  |
|---------------|----------------------------------|
| HOUSING SIZE  | M12                              |
| SENSING RANGE | THROUGH-BEAM SENSOR<br>10,000 mm |

Dimensions:



\* receiver only

Response curve:

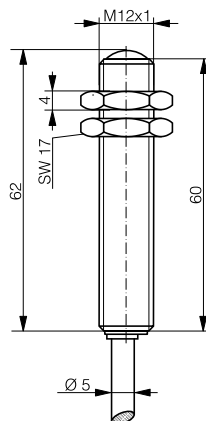


| TECHNICAL DATA                   |                                     |
|----------------------------------|-------------------------------------|
| Sensing range                    | 10,000 mm                           |
| Standard target                  | ---                                 |
| No-load supply current           | $\leq 15$ mA (R) / $\leq 15$ mA (E) |
| Emitter                          | LED red 660 nm                      |
| Approvals                        | CE, UL, RoHS                        |
| Weight (cable / connector model) | 200 / 65 g (R and E)                |

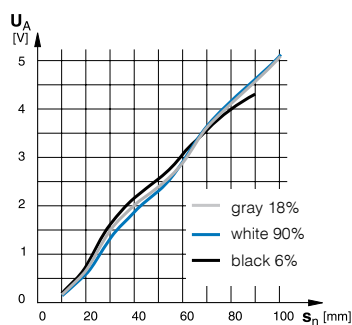
| PART REFERENCES                  |                                                   |
|----------------------------------|---------------------------------------------------|
| ( <b>bold:</b> preferred types)  | ( <b>R</b> ) receiver / ( <b>E</b> ) emitter      |
| NPN light-ON / cable             | LLK-1120-201 (R) / <b>LLK-1120-200 (E)</b>        |
| NPN dark-ON / cable              | <b>LLK-1120-202 (R)</b> / <b>LLK-1120-200 (E)</b> |
| NPN light-ON / connector S12     | LLS-1120-201 (R) / <b>LLS-1120-200 (E)</b>        |
| NPN dark-ON / connector S12      | <b>LLS-1120-202 (R)</b> / <b>LLS-1120-200 (E)</b> |
| PNP light-ON / cable             | LLK-1120-203 (R) / <b>LLK-1120-200 (E)</b>        |
| PNP dark-ON / cable              | <b>LLK-1120-204 (R)</b> / <b>LLK-1120-200 (E)</b> |
| PNP light-ON / connector S12     | LLS-1120-203 (R) / <b>LLS-1120-200 (E)</b>        |
| PNP dark-ON / connector S12      | <b>LLS-1120-204 (R)</b> / <b>LLS-1120-200 (E)</b> |
| Compatible connectors (page 268) | M, N                                              |
| Wiring (pages 198-199)           | Diagram 1 (R) / 4 (E)                             |

|               |                                 |
|---------------|---------------------------------|
| HOUSING SIZE  | M12 WITH ANALOG OUTPUT          |
| SENSING RANGE | DIFFUSE SENSOR<br>10 ... 100 mm |

Dimensions:



Response curve:



| TECHNICAL DATA         |                    |
|------------------------|--------------------|
| Sensing range          | 10 ... 100 mm      |
| Standard target        | 100 x 100 mm white |
| No-load supply current | $\leq 25$ mA       |
| Emitter                | LED red 660 nm     |
| Approvals              | CE, RoHS           |
| Weight                 | 85 g               |

| PART REFERENCES                  |                     |
|----------------------------------|---------------------|
| ( <b>bold:</b> preferred types)  |                     |
| Analog output 0 ... 5 V          | <b>LAK-1120-309</b> |
|                                  |                     |
|                                  |                     |
|                                  |                     |
|                                  |                     |
| Compatible connectors (page 268) | ---                 |
| Wiring (pages 198-199)           | Diagram 8           |



## PHOTOELECTRIC SENSORS: LASER SERIES 1121L



- ✓ M12 **miniature laser sensors**
- ✓ **Accurate detection** of smallest targets
- ✓ **Accurate & speed-independent target detection**; response time 0.1 msec
- ✓ **Sensing range up to 50 m**
- ✓ **Easy adjustment** (due to visible red laser light)
- ✓ **Shock & vibration resistant** due to fully vacuum-potted electronics
- ✓ **Laser protection class 2**

### TECHNICAL DATA

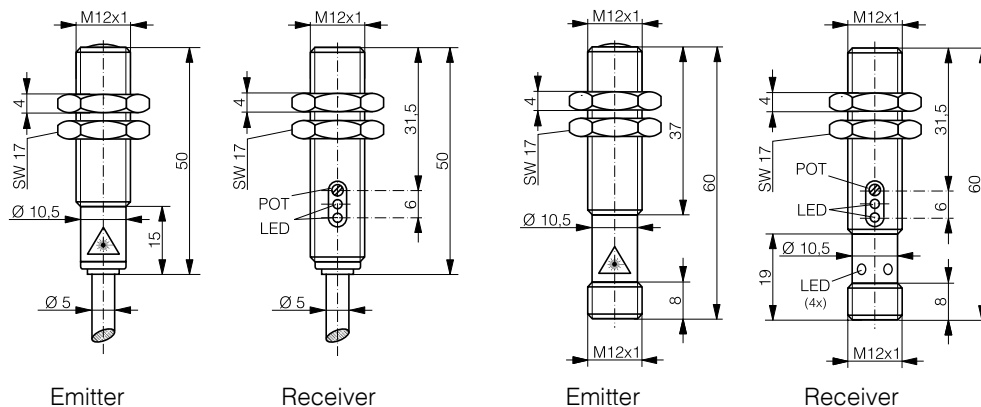
|                                                |                        |
|------------------------------------------------|------------------------|
| (according to IEC 60947-5-2)                   |                        |
| Housing material                               | Stainless steel V2A    |
| Supply voltage range $U_B$                     | 10 ... 36 VDC          |
| Max. ripple content                            | 20 %                   |
| Output current                                 | $\leq 200$ mA          |
| Output voltage drop                            | $\leq 2.0$ V at 200 mA |
| Max. switching frequency                       | 5,000 Hz               |
| Switching time ( $\uparrow$ and $\downarrow$ ) | 0.1 msec               |
| Max. ambient light:                            |                        |
| halogen                                        | 5,000 Lux              |
| sun                                            | 10,000 Lux             |
| Ambient temperature range                      | -10 ... +50 °C         |
| Degree of protection                           | IP 67                  |
| Laser protection class                         | 2                      |
| EMC protection:                                |                        |
| IEC 60947-5-2 (7.2.3.1)                        | 1 kV                   |
| IEC 61000-4-2                                  | Level 2                |
| IEC 61000-4-3                                  | Level 3                |
| IEC 61000-4-4                                  | Level 3                |
| IEC 61000-4-6                                  | Level 2                |
| Short-circuit protection                       | Built-in               |
| Polarity reversal protection                   | Built-in               |
| Power-on reset                                 | Built-in               |

Rugged M12 miniature laser sensors (laser protection class 2) in metal housings with long sensing range of 50 m for accurate and speed-independent detection of smallest targets. Shock and vibration, scratch and chemically resistant with high system reserves (excess gain). Pollution monitoring (green LED) in case of reduced system reserves prevents downtime caused by pollution. Easy adjustment due to visible red laser light. Particularly suited for rough industrial environments and where space is limited:

- ✓ **automation equipment**
- ✓ **special machinery**
- ✓ **handling systems**
- ✓ **machine tool industry**
- ✓ **printing industry**
- ✓ **automotive industry**

|               |                                                                                               |
|---------------|-----------------------------------------------------------------------------------------------|
| HOUSING SIZE  | M12 LASER  |
| SENSING RANGE | THROUGH-BEAM SENSOR<br>50,000 mm                                                              |

Dimensions:



| TECHNICAL DATA                   |                         |
|----------------------------------|-------------------------|
| Sensing range                    | 50,000 mm               |
| Standard target                  | ---                     |
| No-load supply current           | ≤ 10 mA                 |
| Emitter                          | Laser red pulsed 660 nm |
| Approvals                        | CE, UL, RoHS            |
| Weight (cable / connector model) | 180 / 50 g (R and E)    |

| PART REFERENCES                  |                                                     |
|----------------------------------|-----------------------------------------------------|
| <b>(bold: preferred types)</b>   | <b>(R) receiver / (E) emitter</b>                   |
| NPN light-ON / cable             | LLK-1121L-201 (R) / <b>LLK-1121L-200 (E)</b>        |
| NPN dark-ON / cable              | <b>LLK-1121L-202 (R)</b> / <b>LLK-1121L-200 (E)</b> |
| NPN light-ON / connector S12     | LKS-1121L-201 (R) / <b>LKS-1121L-200 (E)</b>        |
| NPN dark-ON / connector S12      | <b>LKS-1121L-202 (R)</b> / <b>LKS-1121L-200 (E)</b> |
| PNP light-ON / cable             | LLK-1121L-203 (R) / <b>LLK-1121L-200 (E)</b>        |
| PNP dark-ON / cable              | <b>LLK-1121L-204 (R)</b> / <b>LLK-1121L-200 (E)</b> |
| PNP light-ON / connector S12     | LKS-1121L-203 (R) / <b>LKS-1121L-200 (E)</b>        |
| PNP dark-ON / connector S12      | <b>LKS-1121L-204 (R)</b> / <b>LKS-1121L-200 (E)</b> |
| Compatible connectors (page 268) | M, N                                                |
| Wiring (pages 198-199)           | Diagram 1 (R) / 4 (E)                               |



## PHOTOELECTRIC SENSORS: SERIES 1180 & 1180W



- ✓ **Compact sensors** M18
- ✓ Models for **lateral sensing**
- ✓ Rugged **metal housing**
- ✓ **Accurate & speed-independent target detection**
- ✓ Diffuse sensors with **background suppression**
- ✓ **Shock & vibration resistant** due to fully vacuum-potted electronics
- ✓ **High system reserves** (excess gain)
- ✓ **Pre-failure warning** (pollution monitoring)
- ✓ **Easy adjustment** (due to visible red light)

### TECHNICAL DATA

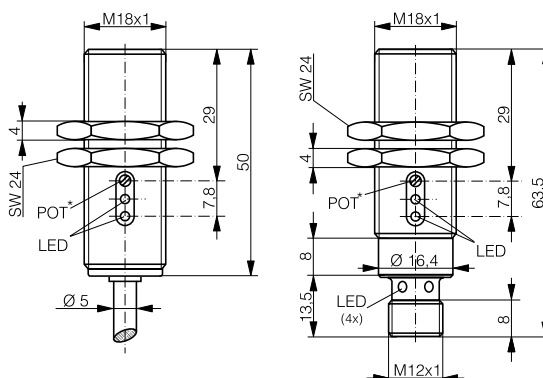
|                                                |                        |
|------------------------------------------------|------------------------|
| (according to IEC 60947-5-2)                   |                        |
| Housing material                               | Chrome-plated brass    |
| Hysteresis                                     | 10 % typ.              |
| Supply voltage range $U_B$                     | 10 ... 36 VDC          |
| Max. ripple content                            | 20 %                   |
| Output current                                 | $\leq 200$ mA          |
| Output voltage drop                            | $\leq 2.0$ V at 200 mA |
| Max. switching frequency                       | 1,000 Hz / 500 Hz (LH) |
| Switching time ( $\uparrow$ and $\downarrow$ ) | 0.5 msec / 1 msec (LH) |
| Max. ambient light:                            |                        |
| halogen                                        | 5,000 Lux              |
| sun                                            | 10,000 Lux             |
| Ambient temperature range                      | -25 ... +55 °C         |
| Degree of protection                           | IP 67                  |
| EMC protection:                                |                        |
| IEC 60947-5-2 (7.2.3.1)                        | 1 kV                   |
| IEC 61000-4-2                                  | Level 2                |
| IEC 61000-4-3                                  | Level 3                |
| IEC 61000-4-4                                  | Level 3                |
| Short-circuit protection                       | Built-in               |
| Polarity reversal protection                   | Built-in               |
| Power-on reset                                 | Built-in               |

Rugged compact M18 sensors in metal housings for axial or lateral sensing and accurate as well as speed-independent target detection. Diffuse sensors with background suppression. Shock and vibration, scratch and chemically resistant with high system reserves (excess gain). Pollution monitoring (green LED) in case of reduced system reserves prevents downtime caused by pollution. Easy adjustment due to visible red light. Particularly suited for rough industrial environments and where space is limited (1180W):

- ✓ **automation equipment**
- ✓ **stock & conveyor systems**
- ✓ **special machinery**
- ✓ **machine tool industry**
- ✓ **filling systems**
- ✓ **packaging machines**
- ✓ **woodworking machines**
- ✓ **logistics automation**
- ✓ **cigarette manufacturing**
- ✓ **palletizer & wrapping machines**
- ✓ **automotive industry**

| HOUSING SIZE  | M18                                                     |                                          |
|---------------|---------------------------------------------------------|------------------------------------------|
| SENSING RANGE | DIFFUSE SENSOR WITH<br>BACKGROUND SUPPRESSION<br>120 mm | REFLEX SENSOR<br>(POLARIZED)<br>2,000 mm |

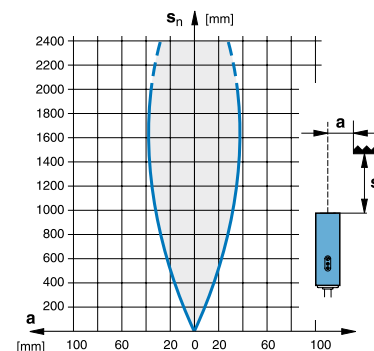
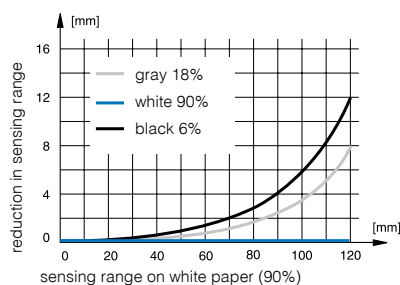
Dimensions:



\*diffuse sensor with background suppression only



Response curves:

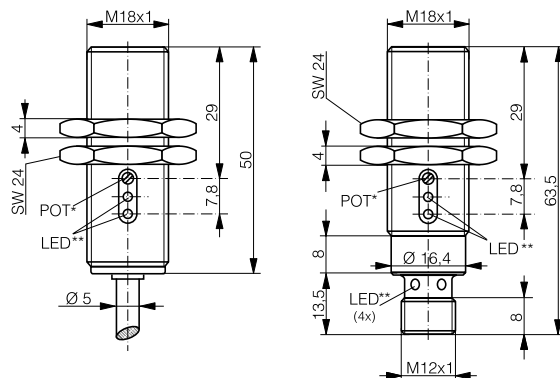


| TECHNICAL DATA                         |                        |                          |
|----------------------------------------|------------------------|--------------------------|
| Sensing range (setting range)          | 120 mm (10 ... 120 mm) | 2,000 mm                 |
| Standard target / reflector (page 197) | 100 x 100 mm white     | Reflector type 3         |
| No-load supply current                 | ≤ 25 mA                | ≤ 15 mA                  |
| Emitter                                | LED red 660 nm         | LED red polarized 660 nm |
| Approvals                              | CE, UL, RoHS           | CE, UL, RoHS             |
| Weight (cable / connector model)       | 121 / 53 g             | 121 / 53 g               |

| PART REFERENCES                  |                     |                     |
|----------------------------------|---------------------|---------------------|
| <b>(bold: preferred types)</b>   |                     |                     |
| NPN light-ON / cable             | <b>LHK-1180-301</b> | ---                 |
| NPN dark-ON / cable              | ---                 | <b>LRK-1180-302</b> |
| NPN light-ON / connector S12     | <b>LHS-1180-301</b> | ---                 |
| NPN dark-ON / connector S12      | ---                 | <b>LRS-1180-302</b> |
| PNP light-ON / cable             | <b>LHK-1180-303</b> | ---                 |
| PNP dark-ON / cable              | ---                 | <b>LRK-1180-304</b> |
| PNP light-ON / connector S12     | <b>LHS-1180-303</b> | ---                 |
| PNP dark-ON / connector S12      | ---                 | <b>LRS-1180-304</b> |
| Compatible connectors (page 268) | G, H                | G, H                |
| Wiring (pages 198-199)           | Diagram 1           | Diagram 1           |

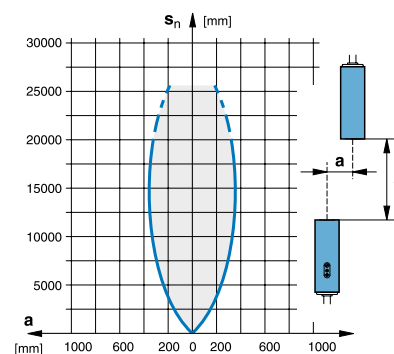
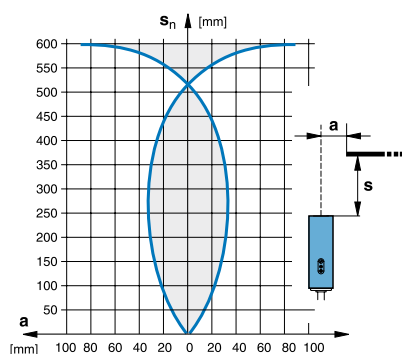
| HOUSING SIZE  | M18                      |                                  |
|---------------|--------------------------|----------------------------------|
| SENSING RANGE | DIFFUSE SENSOR<br>600 mm | THROUGH-BEAM SENSOR<br>20,000 mm |

Dimensions:



\* diffuse sensor only  
\*\* receiver only

Response curves:

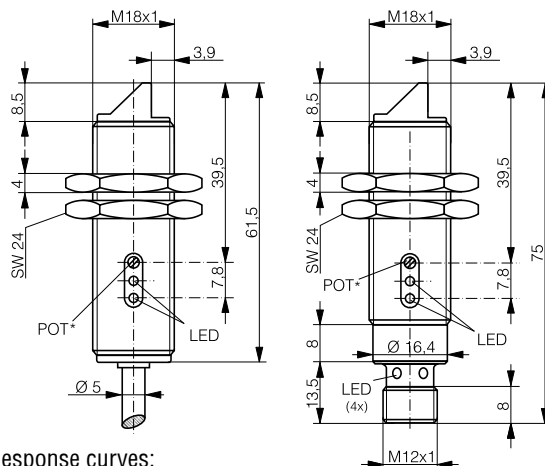


| TECHNICAL DATA                   |                        |                           |
|----------------------------------|------------------------|---------------------------|
| Sensing range (setting range)    | 600 mm (40 ... 600 mm) | 20,000 mm                 |
| Standard target                  | 200 x 200 mm white     | ---                       |
| No-load supply current           | ≤ 20 mA                | ≤ 10 mA (R) / ≤ 15 mA (E) |
| Emitter                          | LED red 660 nm         | LED red 660 nm            |
| Approvals                        | CE, UL, RoHS           | CE, UL, RoHS              |
| Weight (cable / connector model) | 121 / 53 g             | 230 / 80 g (R and E)      |

| PART REFERENCES                    |                     |                                            |
|------------------------------------|---------------------|--------------------------------------------|
| <b>(bold: preferred types)</b>     |                     | <b>(R) receiver / (E) emitter</b>          |
| NPN changeover outputs / cable     | <b>LTK-1180-101</b> | <b>LLK-1180-001 (R) / LLK-1180-000 (E)</b> |
| NPN light-ON + excess gain / cable | LTK-1180-102        | LLK-1180-002 (R) / LLK-1180-000 (E)        |
| NPN changeover outputs / S12       | <b>LTS-1180-101</b> | <b>LLS-1180-001 (R) / LLS-1180-000 (E)</b> |
| NPN light-ON + excess gain / S12   | LTS-1180-102        | LLS-1180-002 (R) / LLS-1180-000 (E)        |
| PNP changeover outputs / cable     | <b>LTK-1180-103</b> | <b>LLK-1180-003 (R) / LLK-1180-000 (E)</b> |
| PNP light-ON + excess gain / cable | LTK-1180-104        | LLK-1180-004 (R) / LLK-1180-000 (E)        |
| PNP changeover outputs / S12       | <b>LTS-1180-103</b> | <b>LLS-1180-003 (R) / LLS-1180-000 (E)</b> |
| PNP light-ON + excess gain / S12   | LTS-1180-104        | LLS-1180-004 (R) / LLS-1180-000 (E)        |
| Compatible connectors (page 268)   | M, N                | M, N                                       |
| Wiring (pages 198-199)             | Diagram 2           | Diagram 2 (R) / 4 (E)                      |

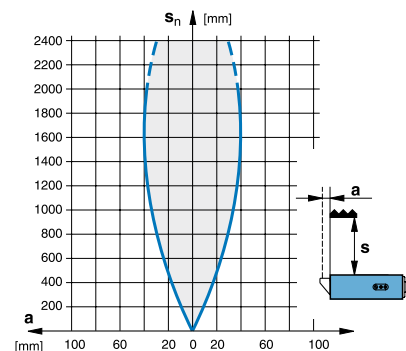
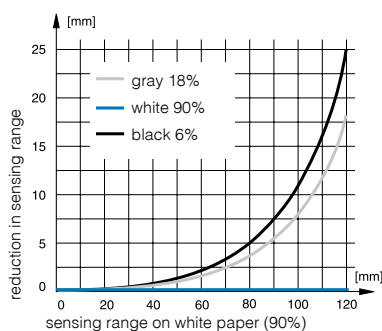
| HOUSING SIZE  | M18W                                                    |                                          |
|---------------|---------------------------------------------------------|------------------------------------------|
| SENSING RANGE | DIFFUSE SENSOR WITH<br>BACKGROUND SUPPRESSION<br>120 mm | REFLEX SENSOR<br>(POLARIZED)<br>2,000 mm |

Dimensions:



\*diffuse sensor with background suppression only

Response curves:

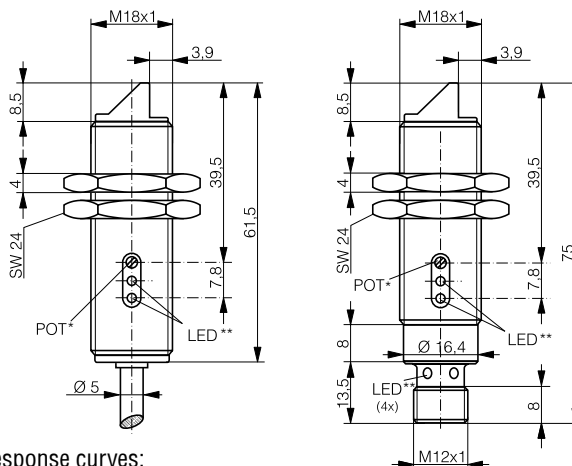


| TECHNISCHE DATEN                       |                        |                          |
|----------------------------------------|------------------------|--------------------------|
| Sensing range (setting range)          | 120 mm (10 ... 120 mm) | 2,000 mm                 |
| Standard target / reflector (page 197) | 100 x 100 mm white     | Reflector type 3         |
| No-load supply current                 | ≤ 25 mA                | ≤ 15 mA                  |
| Emitter                                | LED red 660 nm         | LED red polarized 660 nm |
| Approvals                              | CE, UL, RoHS           | CE, UL, RoHS             |
| Weight (cable / connector model)       | 124 / 57 g             | 125 / 56 g               |

| PART REFERENCES                  |                      |                      |
|----------------------------------|----------------------|----------------------|
| <b>(bold: preferred types)</b>   |                      |                      |
| NPN light-ON / cable             | <b>LHK-1180W-301</b> | ---                  |
| NPN dark-ON / cable              | ---                  | <b>LRK-1180W-302</b> |
| NPN light-ON / connector S12     | <b>LHS-1180W-301</b> | ---                  |
| NPN dark-ON / connector S12      | ---                  | <b>LRS-1180W-302</b> |
| PNP light-ON / cable             | <b>LHK-1180W-303</b> | ---                  |
| PNP dark-ON / cable              | ---                  | <b>LRK-1180W-304</b> |
| PNP light-ON / connector S12     | <b>LHS-1180W-303</b> | ---                  |
| PNP dark-ON / connector S12      | ---                  | <b>LRS-1180W-304</b> |
| Compatible connectors (page 268) | G, H                 | G, H                 |
| Wiring (pages 198-199)           | Diagram 1            | Diagram 1            |

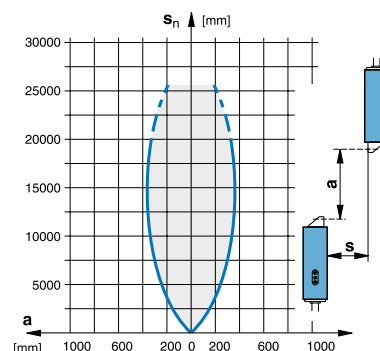
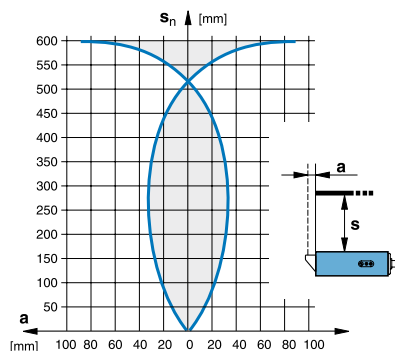
| HOUSING SIZE  | M18W                     |                                  |
|---------------|--------------------------|----------------------------------|
| SENSING RANGE | DIFFUSE SENSOR<br>600 mm | THROUGH-BEAM SENSOR<br>20,000 mm |

Dimensions:



\* diffuse sensor only  
\*\* receiver only

Response curves:



| TECHNICAL DATA                   |                        |                           |
|----------------------------------|------------------------|---------------------------|
| Sensing range (setting range)    | 600 mm (40 ... 600 mm) | 20,000 mm                 |
| Standard target                  | 200 x 200 mm white     | ---                       |
| No-load supply current           | ≤ 20 mA                | ≤ 10 mA (R) / ≤ 15 mA (E) |
| Emitter                          | LED red 660 nm         | LED red 660 nm            |
| Approvals                        | CE, UL, RoHS           | CE, UL, RoHS              |
| Weight (cable / connector model) | 123 / 56 g             | 248 / 114 g (R and E)     |

| PART REFERENCES                    |                      |                                              |
|------------------------------------|----------------------|----------------------------------------------|
| <b>(bold: preferred types)</b>     |                      | <b>(R) receiver / (E) emitter</b>            |
| NPN changeover outputs / cable     | <b>LTK-1180W-101</b> | <b>LLK-1180W-001 (R) / LLK-1180W-000 (E)</b> |
| NPN light-ON + excess gain / cable | LTK-1180W-102        | LLK-1180W-002 (R) / LLK-1180W-000 (E)        |
| NPN changeover outputs / S12       | <b>LTS-1180W-101</b> | <b>LLS-1180W-001 (R) / LLS-1180W-000 (E)</b> |
| NPN light-ON + excess gain / S12   | LTS-1180W-102        | LLS-1180W-002 (R) / LLS-1180W-000 (E)        |
| PNP changeover outputs / cable     | <b>LTK-1180W-103</b> | <b>LLK-1180W-003 (R) / LLK-1180W-000 (E)</b> |
| PNP light-ON + excess gain / cable | LTK-1180W-104        | LLK-1180W-004 (R) / LLK-1180W-000 (E)        |
| PNP changeover outputs / S12       | <b>LTS-1180W-103</b> | <b>LLS-1180W-003 (R) / LLS-1180W-000 (E)</b> |
| PNP light-ON + excess gain / S12   | LTS-1180W-104        | LLS-1180W-004 (R) / LLS-1180W-000 (E)        |
| Compatible connectors (page 268)   | M, N                 | M, N                                         |
| Wiring (pages 198-199)             | Diagram 2            | Diagram 2 (R) / 4 (E)                        |





## PHOTOELECTRIC SENSORS: LASER SERIES 1180 / 1181L



- ✓ **Compact laser sensors** M18
- ✓ **Accurate detection** of smallest targets ( $\geq 0.1$  mm)
- ✓ **Accurate & speed-independent target detection**
- ✓ Rugged **metal housing**
- ✓ **Sensing range up to 50 m**
- ✓ **Easy adjustment** (due to visible red laser light)
- ✓ **Shock & vibration resistant** due to fully vacuum-potted electronics
- ✓ **Laser protection class 2**

### TECHNICAL DATA

|                                                |                        |
|------------------------------------------------|------------------------|
| (according to IEC 60947-5-2)                   |                        |
| Housing material                               | Stainless steel V2A    |
| Supply voltage range $U_B$                     | 10 ... 36 VDC          |
| Max. ripple content                            | 20 %                   |
| Output current (total of both outputs)         | $\leq 200$ mA          |
| Output voltage drop                            | $\leq 2.0$ V at 200 mA |
| Max. switching frequency                       | 5,000 Hz* / 1,000 Hz   |
| Switching time ( $\uparrow$ and $\downarrow$ ) | 0.1 msec* / 0.5 msec   |
| Max. ambient light:                            |                        |
| halogen                                        | 5,000 Lux              |
| sun                                            | 10,000 Lux             |
| Ambient temperature range                      | -10 ... +50 °C         |
| Degree of protection                           | IP 67                  |
| Laser protection class                         | 2                      |
| EMC protection:                                |                        |
| IEC 60947-5-2 (7.2.3.1)                        | 1 kV                   |
| IEC 61000-4-2                                  | Level 2                |
| IEC 61000-4-3                                  | Level 3                |
| IEC 61000-4-4                                  | Level 3                |
| IEC 61000-4-6                                  | Level 2                |
| Short-circuit protection                       | Built-in               |
| Polarity reversal protection                   | Built-in               |
| Power-on reset                                 | Built-in               |

\* Version -516 + through-beam sensors

Rugged compact laser sensors M18 (laser protection class 2) in metal housings with long sensing range of 50 m for accurate and speed-independent detection of smallest targets. Shock and vibration, scratch and chemically resistant with high system reserves (excess gain). Pollution monitoring (green LED) in case of reduces system reserves prevents downtime caused by pollution. Easy adjustment due to visible red laser light. Particularly suited for rough industrial environments and where space is limited:

- ✓ **automation equipment**
- ✓ **special machinery**
- ✓ fine positioning of **storage and retrieval systems**
- ✓ **waver detection** in semiconductor industry
- ✓ **edge detection**
- ✓ **cap monitoring** in packaging industry
- ✓ **printed circuit board adjustment**
- ✓ **component positioning**
- ✓ **automotive industry**

| HOUSING SIZE  | M18 LASER  |                          |                          |
|---------------|-----------------------------------------------------------------------------------------------|--------------------------|--------------------------|
| SENSING RANGE | THROUGH-BEAM SENSOR<br>50,000 mm                                                              | DIFFUSE SENSOR<br>250 mm | DIFFUSE SENSOR<br>600 mm |

Inductive

Photoelectric

Optical fibers

Ultrasonic

Capacitive

Cables &amp; connectors

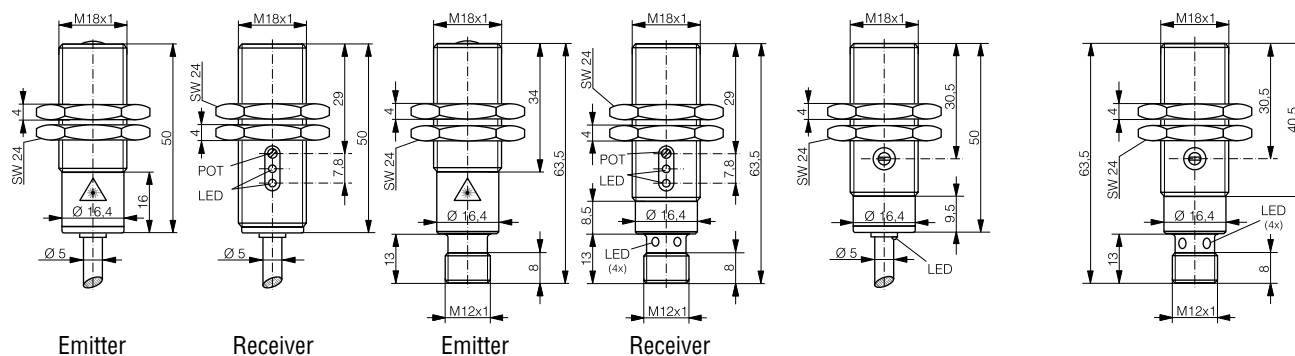
Accessories

Glossary

Index



Dimensions:



| TECHNICAL DATA                   |                         |                         |                         |
|----------------------------------|-------------------------|-------------------------|-------------------------|
| Sensing range (setting range)    | 50,000 mm               | 250 mm (40 ... 250 mm)  | 600 mm (60 ... 600 mm)  |
| Standard target                  | ---                     | 100 x 100 mm white      | 100 x 100 mm white      |
| No-load supply current           | ≤ 10 mA                 | ≤ 20 mA                 | ≤ 20 mA                 |
| Emitter                          | Laser red pulsed 660 nm | Laser red pulsed 660 nm | Laser red pulsed 660 nm |
| Approvals                        | CE, UL, RoHS            | CE, UL, RoHS            | CE, UL, RoHS            |
| Weight (cable / connector model) | 215 / 85 g (R and E)    | 96 / 63 g               | 96 / 63 g               |

| PART REFERENCES                    |                                              |                          |                      |
|------------------------------------|----------------------------------------------|--------------------------|----------------------|
| ( <b>bold:</b> preferred types)    | ( <b>R</b> ) receiver / ( <b>E</b> ) emitter |                          |                      |
| NPN changeover outputs / cable     | <b>LLK-1181L-001 (R) / LLK-1181L-000 (E)</b> | <b>LTK-1180L-101-516</b> | <b>LTK-1180L-101</b> |
| NPN light-ON + excess gain / cable | LLK-1181L-002 (R) / <b>LLK-1181L-000 (E)</b> | LTK-1180L-102-516        | LTK-1180L-102        |
| NPN changeover outputs / S12       | <b>LLS-1181L-001 (R) / LLS-1181L-000 (E)</b> | <b>LTS-1180L-101-516</b> | <b>LTS-1180L-101</b> |
| NPN light-ON + excess gain / S12   | LLS-1181L-002 (R) / <b>LLS-1181L-000 (E)</b> | LTS-1180L-102-516        | LTS-1180L-102        |
| PNP changeover outputs / cable     | <b>LLK-1181L-003 (R) / LLK-1181L-000 (E)</b> | <b>LTK-1180L-103-516</b> | <b>LTK-1180L-103</b> |
| PNP light-ON + excess gain / cable | LLK-1181L-004 (R) / <b>LLK-1181L-000 (E)</b> | LTK-1180L-104-516        | LTK-1180L-104        |
| PNP changeover outputs / S12       | <b>LLS-1181L-003 (R) / LLS-1181L-000 (E)</b> | <b>LTS-1180L-103-516</b> | <b>LTS-1180L-103</b> |
| PNP light-ON + excess gain / S12   | LLS-1181L-004 (R) / <b>LLS-1181L-000 (E)</b> | LTS-1180L-104-516        | LTS-1180L-104        |
| Compatible connectors (page 268)   | M, N                                         | M, N                     | M, N                 |
| Wiring (pages 198-199)             | Diagram 2 (R) / 4 (E)                        | Diagram 2                | Diagram 2            |



## PHOTOELECTRIC SENSORS: SERIES 3#30 & 3#31



- ✓ Complete **miniature sensor series**  $\nabla$  30 x 30 x 15 mm in rugged Crastin housings
- ✓ **Shock & vibration resistant** due to fully vacuum-potted electronics
- ✓ Diffuse sensors with **precise background suppression**
- ✓ **Polarizing filter** (reflex sensors)
- ✓ **High system reserves** (excess gain)
- ✓ **Pre-failure warning** (pollution monitoring)
- ✓ **Changeover outputs**
- ✓ **Analog outputs**

### TECHNICAL DATA

|                                                |                                           |
|------------------------------------------------|-------------------------------------------|
| (according to IEC 60947-5-2)                   |                                           |
| Housing material                               | Glass-fiber reinforced PBTP (Crastin)     |
| Hysteresis                                     | 10 % typ. / 15% typ. (LA#-3130-119)       |
| Supply voltage range $U_B$                     | 10...36 VDC/15...36 VDC (LA#-3130-119)    |
| Max. ripple content                            | $\leq 20$ %                               |
| Output current (total of both outputs)         | $\leq 200$ mA / --- (LA)                  |
| Output voltage drop                            | $\leq 2.0$ V at 200 mA / --- (LA)         |
| Max. switching frequency // Bandwidth (-3 dB)  | 1,000 Hz/500 Hz (LH)/500 Hz @ s=50mm (LA) |
| Switching time ( $\uparrow$ and $\downarrow$ ) | 0.5 msec / 1 msec (LH) / --- (LA)         |
| Max. ambient light:                            |                                           |
| halogen                                        | 5,000 Lux                                 |
| sun                                            | 10,000 Lux                                |
| Ambient temperature range                      | -25 ... +55 °C                            |
| Degree of protection                           | IP 67 / IP 65 (3031)                      |
| EMC protection:                                |                                           |
| IEC 60947-5-2 (7.2.3.1)                        | 5 kV                                      |
| IEC 61000-4-2                                  | Level 2 / Level 3 (3#31 + LA)             |
| IEC 61000-4-3                                  | Level 3                                   |
| IEC 61000-4-4                                  | Level 3                                   |
| IEC 61000-4-6                                  | Level 2 (3131 + LA)                       |
| Short-circuit protection                       | Built-in                                  |
| Polarity reversal protection                   | Built-in                                  |
| Power-on reset                                 | Built-in / --- (LA)                       |

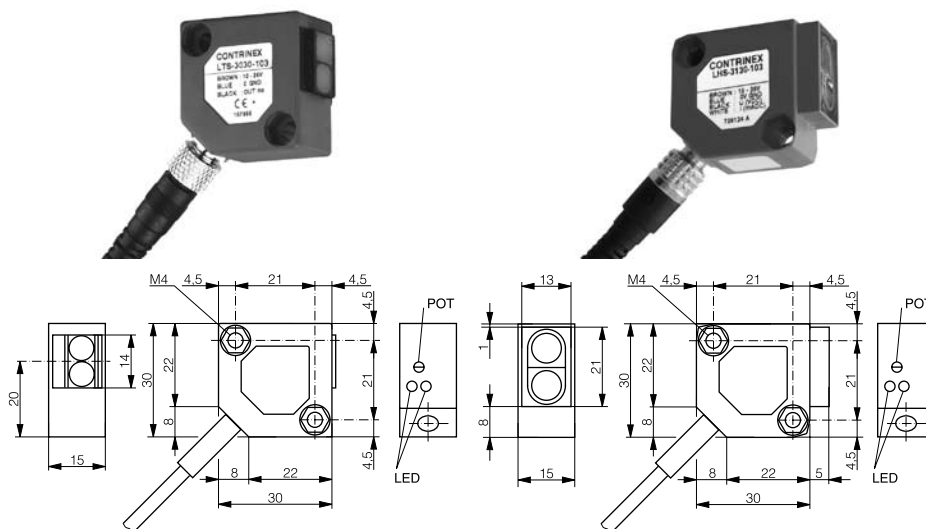
Complete miniature sensor series in rugged Crastin housings  $\nabla$  30 x 30 x 15 mm. Shock and vibration resistant with high system reserves (excess gain) and change-over outputs. Diffuse sensors with precise background suppression or analog output as well as polarized reflex sensors. Pollution monitoring (green LED) in case of reduced system reserves (excess gain) prevents downtime caused by pollution. Particularly suited for:

- ✓ **handling systems**
- ✓ **printing industry**
- ✓ **wrapping machines**
- ✓ **vending machines**
- ✓ **semiconductor industry**
- ✓ **electronics industry**
- ✓ **conveyor systems**
- ✓ **assembly machines**
- ✓ **inserters & sorting machines**

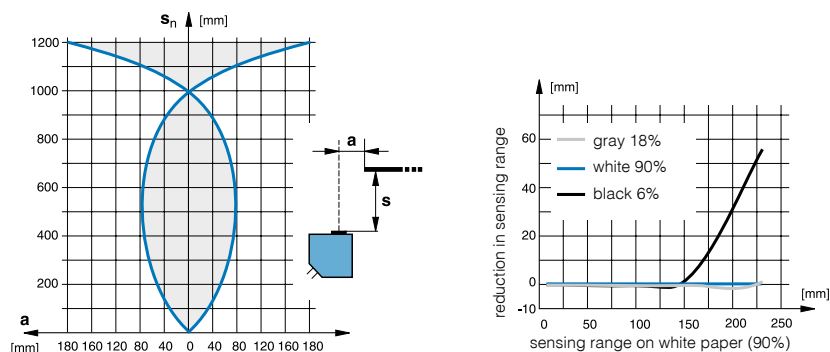
|               |                                                                                                |                                                         |
|---------------|------------------------------------------------------------------------------------------------|---------------------------------------------------------|
| HOUSING SIZE  |  30 X 30 X 15 |                                                         |
| SENSING RANGE | DIFFUSE SENSOR<br>1,200 mm                                                                     | DIFFUSE SENSOR WITH<br>BACKGROUND SUPPRESSION<br>200 mm |



Dimensions:



Response curves:



| TECHNICAL DATA                   |                    |                        |
|----------------------------------|--------------------|------------------------|
| Sensing range (setting range)    | 1,200 mm           | 200 mm (15 ... 200 mm) |
| Standard target                  | 200 x 200 mm white | 100 x 100 mm white     |
| No-load supply current           | ≤ 20 mA            | ≤ 25 mA                |
| Emitter                          | IR LED 880 nm      | LED red 660 nm         |
| Approvals                        | CE, UL, RoHS       | CE, RoHS               |
| Weight (cable / connector model) | 75 / 17 g          | 75 / 17 g              |

| PART REFERENCES                     |                     |                     |
|-------------------------------------|---------------------|---------------------|
| <b>(bold: preferred types)</b>      |                     |                     |
| NPN changeover outputs / cable      | <b>LTK-3030-101</b> | <b>LHK-3130-101</b> |
| NPN light-ON + excess gain* / cable | LTK-3030-102        | LHK-3130-102        |
| NPN changeover outputs / S8         | <b>LTS-3030-101</b> | <b>LHS-3130-101</b> |
| NPN light-ON + excess gain* / S8    | LTS-3030-102        | LHS-3130-102        |
| PNP changeover outputs / cable      | <b>LTK-3030-103</b> | <b>LHK-3130-103</b> |
| PNP light-ON + excess gain* / cable | LTK-3030-104        | LHK-3130-104        |
| PNP changeover outputs / S8         | <b>LTS-3030-103</b> | <b>LHS-3130-103</b> |
| PNP light-ON + excess gain* / S8    | LTS-3030-104        | LHS-3130-104        |
| Compatible connectors (page 268)    | E, F                | E, F                |
| Wiring (pages 198-199)              | Diagram 2           | Diagram 2           |

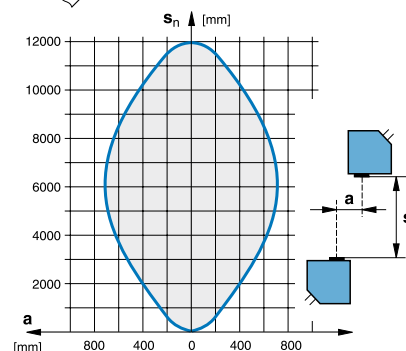
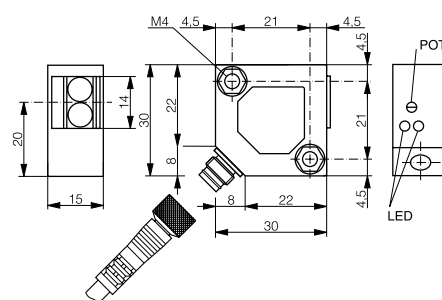
\* reception indication (for LH)

|               |                                                                                                |                                  |
|---------------|------------------------------------------------------------------------------------------------|----------------------------------|
| HOUSING SIZE  |  30 X 30 X 15 |                                  |
| SENSING RANGE | REFLEX SENSOR (POLARIZED)<br>4,000 mm                                                          | THROUGH-BEAM SENSOR<br>12,000 mm |



Dimensions:

Response curves:



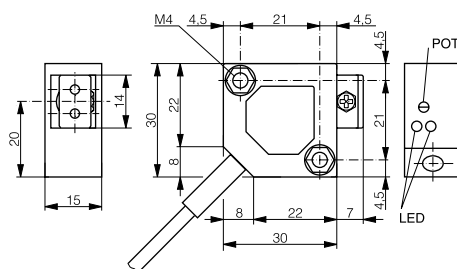
## TECHNICAL DATA

## PART REFERENCES

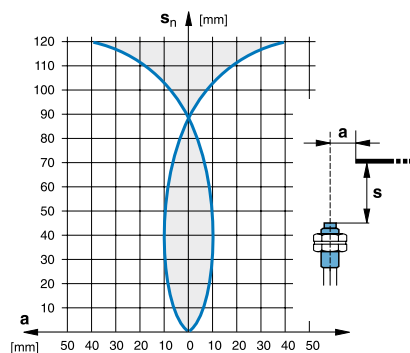
|               |                                                                                                |  |
|---------------|------------------------------------------------------------------------------------------------|--|
| HOUSING SIZE  |  30 X 30 X 15 |  |
| SENSING RANGE | FIBER-OPTIC AMPLIFIER *<br>120 mm                                                              |  |



Dimensions:



Response curve:



| TECHNICAL DATA                   |                            |  |
|----------------------------------|----------------------------|--|
| Sensing range                    | 120 mm (with LFP-1002-020) |  |
| Standard target                  | 100 x 100 mm white         |  |
| No-load supply current           | $\leq 20$ mA               |  |
| Emitter                          | LED red 660 nm             |  |
| Approvals                        | CE, UL, RoHS               |  |
| Weight (cable / connector model) | 78 / 18 g                  |  |

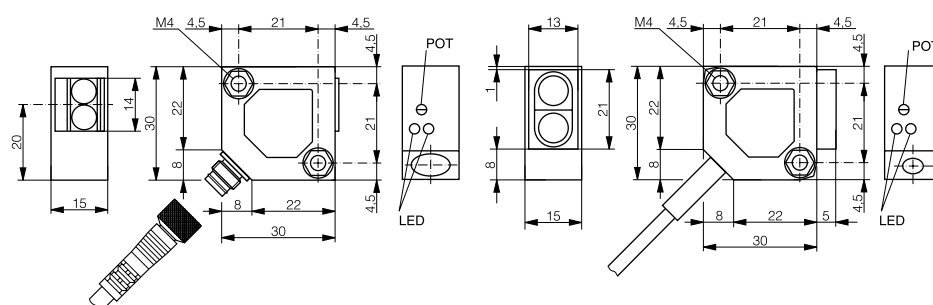
| PART REFERENCES                    |                     |  |
|------------------------------------|---------------------|--|
| <b>(bold: preferred types)</b>     |                     |  |
| NPN changeover outputs / cable     | <b>LFK-3030-101</b> |  |
| NPN light-ON + excess gain / cable | LFK-3030-102        |  |
| NPN changeover outputs / S8        | <b>LFS-3030-101</b> |  |
| NPN light-ON + excess gain / S8    | LFS-3030-102        |  |
| PNP changeover outputs / cable     | <b>LFK-3030-103</b> |  |
| PNP light-ON + excess gain / cable | LFK-3030-104        |  |
| PNP changeover outputs / S8        | <b>LFS-3030-103</b> |  |
| PNP light-ON + excess gain / S8    | LFS-3030-104        |  |
| Compatible connectors (page 268)   | E, F                |  |
| Wiring (pages 198-199)             | Diagram 2           |  |

\* Optical fibers (pages 200 - 219)

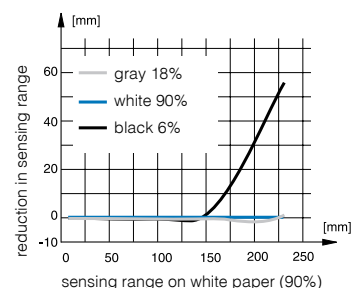
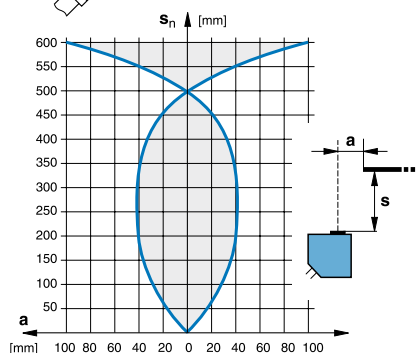
|               |                                                                                                |                                                         |
|---------------|------------------------------------------------------------------------------------------------|---------------------------------------------------------|
| HOUSING SIZE  |  30 X 30 X 15 |                                                         |
| SENSING RANGE | DIFFUSE SENSOR<br>600 mm                                                                       | DIFFUSE SENSOR WITH<br>BACKGROUND SUPPRESSION<br>200 mm |



Dimensions:



Response curves:



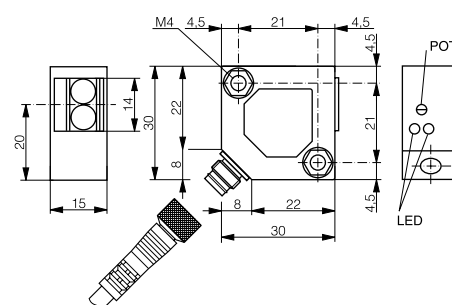
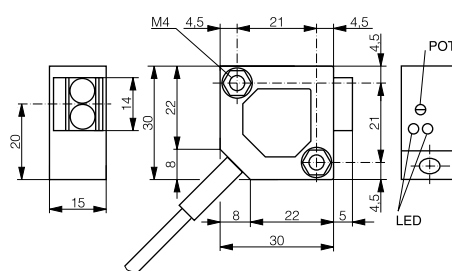
| TECHNICAL DATA                   |                    |                        |
|----------------------------------|--------------------|------------------------|
| Sensing range (setting range)    | 600 mm             | 200 mm (15 ... 200 mm) |
| Standard target                  | 200 x 200 mm white | 100 x 100 mm white     |
| No-load supply current           | ≤ 15 mA            | ≤ 25 mA                |
| Emitter                          | IR LED 880 nm      | LED red 660 nm         |
| Approvals                        | CE, UL, RoHS       | CE, RoHS               |
| Weight (cable / connector model) | 75 / 17 g          | 75 / 17 g              |

| PART REFERENCES                  |                     |                     |
|----------------------------------|---------------------|---------------------|
| ( <b>bold</b> : preferred types) |                     |                     |
| NPN light-ON / cable             | <b>LTK-3031-301</b> | <b>LHK-3131-301</b> |
| NPN dark-ON / cable              | ---                 | ---                 |
| NPN light-ON / connector S8      | <b>LTS-3031-301</b> | <b>LHS-3131-301</b> |
| NPN dark-ON / connector S8       | ---                 | ---                 |
| PNP light-ON / cable             | <b>LTK-3031-303</b> | <b>LHK-3131-303</b> |
| PNP dark-ON / cable              | ---                 | ---                 |
| PNP light-ON / connector S8      | <b>LTS-3031-303</b> | <b>LHS-3131-303</b> |
| PNP dark-ON / connector S8       | ---                 | ---                 |
| Compatible connectors (page 268) | A, B                | A, B                |
| Wiring (pages 198-199)           | Diagram 1           | Diagram 1           |

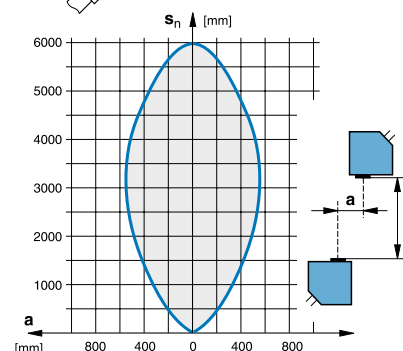
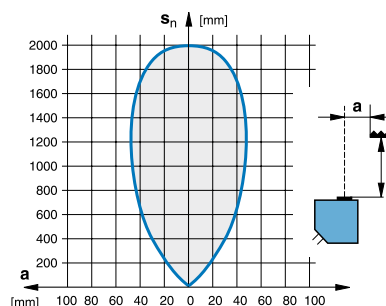
|               |                                       |                                 |
|---------------|---------------------------------------|---------------------------------|
| HOUSING SIZE  | 30 X 30 X 15                          |                                 |
| SENSING RANGE | REFLEX SENSOR (POLARIZED)<br>2,000 mm | THROUGH-BEAM SENSOR<br>6,000 mm |



Dimensions:



Response curves:



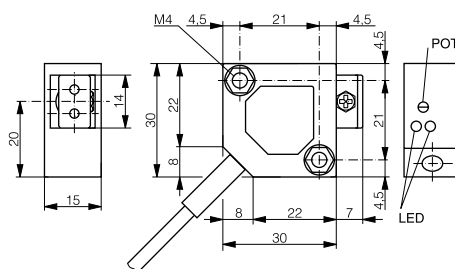
| TECHNICAL DATA                   |                          |                           |
|----------------------------------|--------------------------|---------------------------|
| Sensing range                    | 2,000 mm                 | 6,000 mm                  |
| Reflector (page 197)             | Reflector type 3         | ---                       |
| No-load supply current           | ≤ 15 mA                  | ≤ 10 mA (R) / ≤ 15 mA (E) |
| Emitter                          | LED red polarized 660 nm | IR LED 880 nm             |
| Approvals                        | CE, UL, RoHS             | CE, UL, RoHS              |
| Weight (cable / connector model) | 80 / 18 g                | 150 / 34 g (R and E)      |

| PART REFERENCES                  |                     |                                              |
|----------------------------------|---------------------|----------------------------------------------|
| ( <b>bold</b> : preferred types) |                     | ( <b>R</b> ) receiver / ( <b>E</b> ) emitter |
| NPN light-ON / cable             | ---                 | ---                                          |
| NPN dark-ON / cable              | <b>LRK-3031-302</b> | <b>LLK-3031-202 (R) / LLK-3031-200 (E)</b>   |
| NPN light-ON / connector S8      | ---                 | ---                                          |
| NPN dark-ON / connector S8       | <b>LRS-3031-302</b> | <b>LLS-3031-202 (R) / LLS-3031-200 (E)</b>   |
| PNP light-ON / cable             | ---                 | ---                                          |
| PNP dark-ON / cable              | <b>LRK-3031-304</b> | <b>LLK-3031-204 (R) / LLK-3031-200 (E)</b>   |
| PNP light-ON / connector S8      | ---                 | ---                                          |
| PNP dark-ON / connector S8       | <b>LRS-3031-304</b> | <b>LLS-3031-204 (R) / LLS-3031-200 (E)</b>   |
| Compatible connectors (page 268) | A, B                | A, B                                         |
| Wiring (pages 198-199)           | Diagram 1           | Diagram 1 (R) / 4 (E)                        |

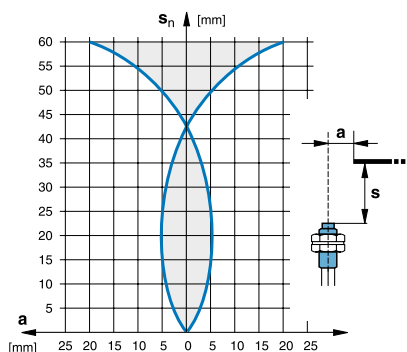
|               |                                                                                                |  |
|---------------|------------------------------------------------------------------------------------------------|--|
| HOUSING SIZE  |  30 X 30 X 15 |  |
| SENSING RANGE | FIBER-OPTIC AMPLIFIER *<br>60 mm                                                               |  |



Dimensions:



Response curve:



| TECHNICAL DATA                   |                           |  |
|----------------------------------|---------------------------|--|
| Sensing range                    | 60 mm (with LFP-1002-020) |  |
| Standard target                  | 100 x 100 mm white        |  |
| No-load supply current           | $\leq 15$ mA              |  |
| Emitter                          | LED red 660 nm            |  |
| Approvals                        | CE, UL, RoHS              |  |
| Weight (cable / connector model) | 78 / 17 g                 |  |

| PART REFERENCES                  |                     |  |
|----------------------------------|---------------------|--|
| <b>(bold: preferred types)</b>   |                     |  |
| NPN light-ON / cable             | <b>LFK-3031-301</b> |  |
| NPN dark-ON / cable              | <b>LFK-3031-302</b> |  |
| NPN light-ON / connector S8      | <b>LFS-3031-301</b> |  |
| NPN dark-ON / connector S8       | <b>LFS-3031-302</b> |  |
| PNP light-ON / cable             | <b>LFK-3031-303</b> |  |
| PNP dark-ON / cable              | <b>LFK-3031-304</b> |  |
| PNP light-ON / connector S8      | <b>LFS-3031-303</b> |  |
| PNP dark-ON / connector S8       | <b>LFS-3031-304</b> |  |
| Compatible connectors (page 268) | A, B                |  |
| Wiring (pages 198-199)           | Diagram 1           |  |

\* Optical fibers (pages 200 - 219)

## HOUSING SIZE

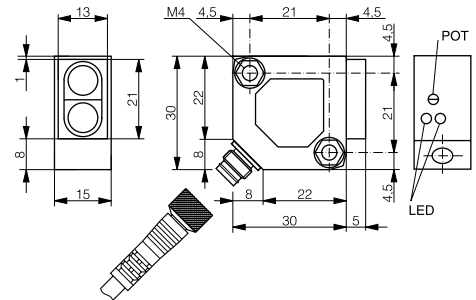
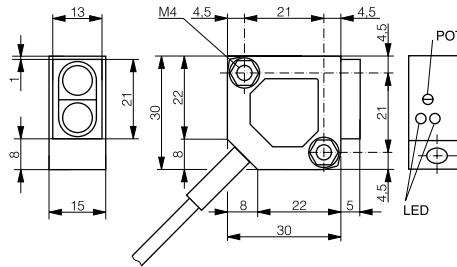
## 30 X 30 X 15 WITH ANALOG OUTPUT

## SENSING RANGE

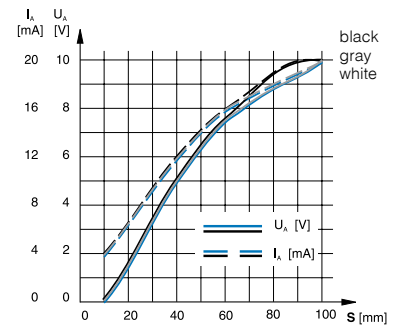
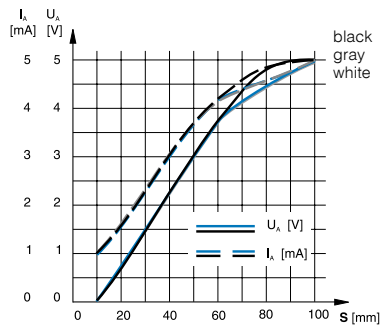
**DIFFUSE SENSOR**  
10 ... 100 mm

**DIFFUSE SENSOR**  
10 ... 100 mm

Dimensions:



Response curves:



## TECHNICAL DATA

|                                  |                    |                    |
|----------------------------------|--------------------|--------------------|
| Sensing range                    | 10 ... 100 mm      | 10 ... 100 mm      |
| Standard target                  | 100 x 100 mm white | 100 x 100 mm white |
| No-load supply current           | ≤ 25 mA            | ≤ 25 mA            |
| Emitter                          | LED red 660 nm     | LED red 660 nm     |
| Voltage output                   | 0 ... 5 V          | 0 ... 10 V         |
| Current output                   | 1 ... 5 mA         | 4 ... 20 mA        |
| Approvals                        | CE, RoHS           | CE, RoHS           |
| Weight (cable / connector model) | 75 / 17 g          | 75 / 17 g          |

## PART REFERENCES

|                                     |                     |                     |
|-------------------------------------|---------------------|---------------------|
| <b>(bold: preferred types)</b>      |                     |                     |
| Voltage and current outputs / cable | <b>LAK-3130-109</b> | <b>LAK-3130-119</b> |
| Voltage and current outputs / S8    | <b>LAS-3130-109</b> | <b>LAS-3130-119</b> |
| Compatible connectors (page 268)    | E, F                | E, F                |
| Wiring (pages 198-199)              | Diagram 9           | Diagram 9           |



## PHOTOELECTRIC SENSORS: SERIES 4040



- ✓ **Compact sensor series**  $\nabla$  40 x 40 x 19 mm in rugged Crastin housings
- ✓ **Shock & vibration resistant** due to fully vacuum-potted electronics
- ✓ **Polarizing filter** (reflex sensors)
- ✓ **High system reserves** (excess gain)
- ✓ **Pre-failure warning** (pollution monitoring)
- ✓ **Changeover outputs**
- ✓ **Glass-fiber optic amplifier** (temperatures up to +250 °C)

### TECHNICAL DATA

|                                                |                                       |
|------------------------------------------------|---------------------------------------|
| (according to IEC 60947-5-2)                   |                                       |
| Housing material                               | Glass-fiber reinforced PBTP (Crastin) |
| Hysteresis                                     | 10 % typ.                             |
| Supply voltage range $U_B$                     | 10 ... 36 VDC                         |
| Max. ripple content                            | $\leq 20$ %                           |
| Output current (total of both outputs)         | $\leq 200$ mA                         |
| Output voltage drop                            | $\leq 2.0$ V at 200 mA                |
| Max. switching frequency                       | 1,000 Hz                              |
| Switching time ( $\uparrow$ and $\downarrow$ ) | 0.5 msec                              |
| Max. ambient light:                            |                                       |
| halogen                                        | 5,000 Lux                             |
| sun                                            | 10,000 Lux                            |
| Ambient temperature range                      | -25 ... +55 °C                        |
| Degree of protection                           | IP 67                                 |
| EMC protection:                                |                                       |
| IEC 60947-5-2 (7.2.3.1)                        | 5 kV                                  |
| IEC 61000-4-2                                  | Level 2                               |
| IEC 61000-4-3                                  | Level 3                               |
| IEC 61000-4-4                                  | Level 3                               |
| Short-circuit protection                       | Built-in                              |
| Polarity reversal protection                   | Built-in                              |
| Power-on reset                                 | Built-in                              |

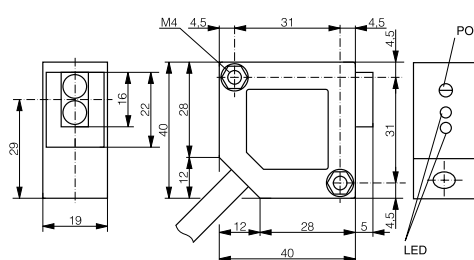
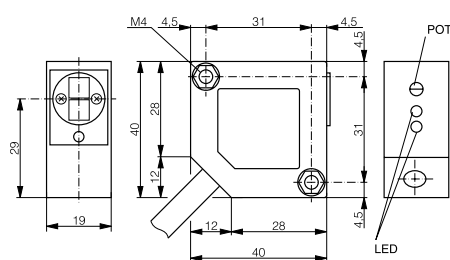
Compact sensor series in rugged Crastin housings  $\nabla$  40 x 40 x 19 mm. Shock and vibration resistant with high system reserves (excess gain) and changeover outputs. Glass-fiber optic amplifier for ambient temperatures up to +250 °C as well as polarized reflex sensors. Pollution monitoring (green LED) in case of reduced system reserves (excess gain) prevents downtime caused by pollution. Particularly suited for

- ✓ **wrapping machines**
- ✓ **machine tool industry**
- ✓ **filling systems**
- ✓ **elevator industry**
- ✓ **stock & conveyor systems**

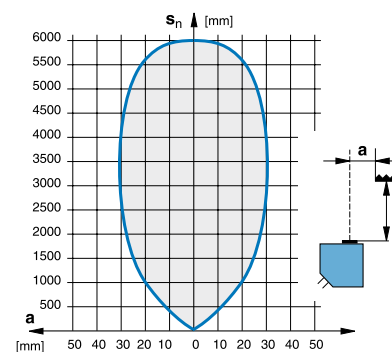
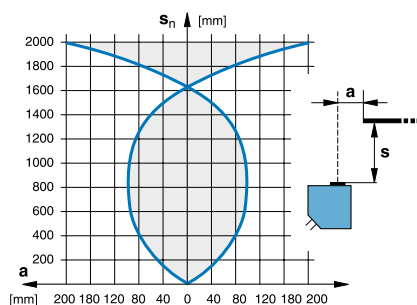
|               |                            |                                       |
|---------------|----------------------------|---------------------------------------|
| HOUSING SIZE  | 40 X 40 X 19               |                                       |
| SENSING RANGE | DIFFUSE SENSOR<br>2,000 mm | REFLEX SENSOR (POLARIZED)<br>6,000 mm |



Dimensions:



Response curves:



| TECHNICAL DATA                         |                    |                          |
|----------------------------------------|--------------------|--------------------------|
| Sensing range                          | 2,000 mm           | 6,000 mm                 |
| Standard target / reflector (page 197) | 400 x 400 mm white | Reflector type 3         |
| No-load supply current                 | ≤ 25 mA            | ≤ 20 mA                  |
| Emitter                                | IR LED 880 nm      | LED red polarized 660 nm |
| Approvals                              | CE, UL, RoHS       | CE, UL, RoHS             |
| Weight (cable / connector model)       | 90 / 35 g          | 90 / 35 g                |

| PART REFERENCES                    |                     |                     |
|------------------------------------|---------------------|---------------------|
| <b>(bold: preferred types)</b>     |                     |                     |
| NPN changeover outputs / cable     | <b>LTK-4040-101</b> | <b>LRK-4040-101</b> |
| NPN light-ON + excess gain / cable | LTK-4040-102        | LRK-4040-102        |
| NPN changeover outputs / S8        | <b>LTS-4040-101</b> | <b>LRS-4040-101</b> |
| NPN light-ON + excess gain / S8    | LTS-4040-102        | LRS-4040-102        |
| PNP changeover outputs / cable     | <b>LTK-4040-103</b> | <b>LRK-4040-103</b> |
| PNP light-ON + excess gain / cable | LTK-4040-104        | LRK-4040-104        |
| PNP changeover outputs / S8        | <b>LTS-4040-103</b> | <b>LRS-4040-103</b> |
| PNP light-ON + excess gain / S8    | LTS-4040-104        | LRS-4040-104        |
| Compatible connectors (page 268)   | E, F                | E, F                |
| Wiring (pages 198-199)             | Diagram 2           | Diagram 2           |







## PHOTOELECTRIC SENSORS: SERIES 4050



- ✓ Complete **compact sensor series**  $\varnothing$  40 x 50 x 15 mm for peak performance
- ✓ Diffuse sensors with **precise background suppression**
- ✓ **High system reserves** (excess gain)
- ✓ **Pre-failure warning** (pollution monitoring)
- ✓ **Easy adjustment** (due to visible red light)
- ✓ **Adjustable connector**
- ✓ **Sensing face of glass or coated plastic**
- ✓ **Insensitive to ambient light**

### TECHNICAL DATA

|                                                |                             |
|------------------------------------------------|-----------------------------|
| (according to IEC 60947-5-2)                   |                             |
| Housing material                               | Glass-fiber reinforced PBTP |
| Hysteresis                                     | $\leq 10 \% s_n$            |
| Supply voltage range $U_B$                     | 10 ... 36 VDC               |
| Max. ripple content                            | $\leq 20 \%$                |
| Output current                                 | $\leq 200$ mA               |
| Output voltage drop                            | $\leq 2.0$ V at 200 mA      |
| Max. switching frequency                       | 1,500 Hz / 500 Hz (LH)      |
| Switching time ( $\uparrow$ and $\downarrow$ ) | 0.5 msec / 1 msec (LH)      |
| Max. ambient light:                            |                             |
| halogen                                        | 5,000 Lux                   |
| sun                                            | 10,000 Lux                  |
| Ambient temperature range                      | -5 ... +55 °C               |
| Degree of protection                           | IP 67                       |
| EMC protection:                                |                             |
| IEC 60947-5-2 (7.2.3.1)                        | 5 kV                        |
| IEC 61000-4-2                                  | Level 2                     |
| IEC 61000-4-3                                  | Level 3                     |
| IEC 61000-4-4                                  | Level 3                     |
| IEC 61000-4-6                                  | Level 2                     |
| Short-circuit protection                       | Built-in                    |
| Polarity reversal protection                   | Built-in                    |
| Power-on reset                                 | Built-in                    |

Complete compact sensor series for peak performance in standard housings  $\varnothing$  40 x 50 x 15 mm with adjustable connector and sensing face made of glass or coated plastic. Diffuse sensors with precise background suppression as well as polarized and non-polarized reflex sensors. High system reserves (excess gain) and insensitive to ambient light. Pollution monitoring (green LED) in case of reduced system reserves (excess gain) prevents downtime caused by pollution. Particularly suited for

- ✓ **wrapping machines**
- ✓ **food & tobacco industry**
- ✓ **filling systems**
- ✓ **special machinery**
- ✓ **automation equipment**
- ✓ **machine tool industry**
- ✓ **woodworking & processing industry**

HOUSING SIZE

40 X 50 X 15

SENSING RANGE

DIFFUSE SENSOR

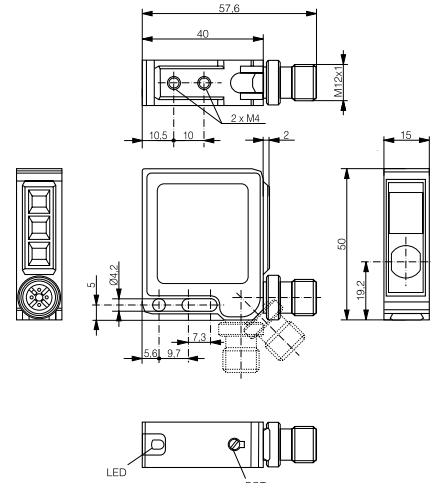
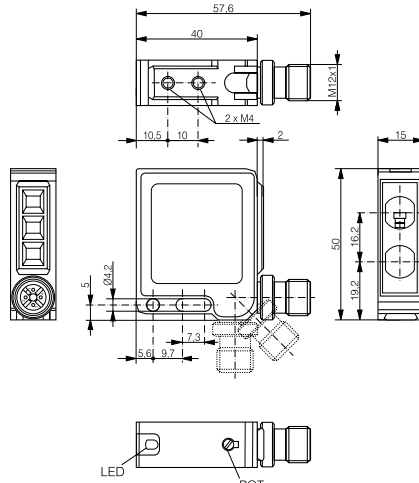
1,200 mm

DIFFUSE SENSOR WITH  
BACKGROUND SUPPRESSION

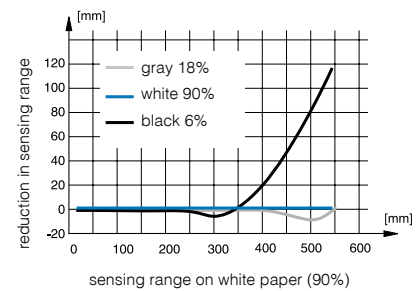
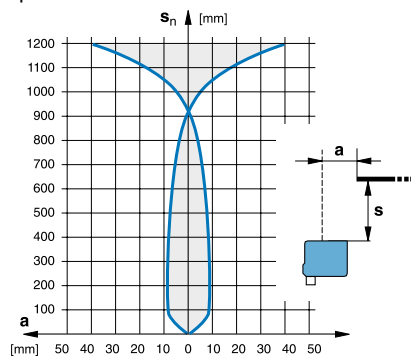
500 mm



Dimensions:



Response curves:



## TECHNICAL DATA

|                               |                            |                        |
|-------------------------------|----------------------------|------------------------|
| Sensing range (setting range) | 1,200 mm (30 ... 1,200 mm) | 500 mm (30 ... 500 mm) |
| Standard target               | 200 x 200 mm white         | 100 x 100 mm white     |
| No-load supply current        | ≤ 25 mA                    | ≤ 30 mA                |
| Emitter                       | LED red 640 nm             | LED red 660 nm         |
| Approvals                     | CE, RoHS                   | CE, RoHS               |
| Weight                        | 17 g                       | 17 g                   |

## PART REFERENCES

| Sensing face                        | Glass               | Coated plastic      | Glass               | Coated plastic      |
|-------------------------------------|---------------------|---------------------|---------------------|---------------------|
| NPN changeover outputs / cable      |                     |                     |                     |                     |
| NPN light-ON + excess gain* / cable |                     |                     |                     |                     |
| NPN changeover outputs / S12        | <b>LTS-4050-101</b> | <b>LTS-4150-101</b> | <b>LHS-4050-101</b> | <b>LHS-4150-101</b> |
| NPN light-ON + excess gain* / S12   | LTS-4050-102        | LTS-4150-102        | LHS-4050-102        | LHS-4150-102        |
| PNP changeover outputs / cable      |                     |                     |                     |                     |
| PNP light-ON + excess gain* / cable |                     |                     |                     |                     |
| PNP changeover outputs / S12        | <b>LTS-4050-103</b> | <b>LTS-4150-103</b> | <b>LHS-4050-103</b> | <b>LHS-4150-103</b> |
| PNP light-ON + excess gain* / S12   | LTS-4050-104        | LTS-4150-104        | LHS-4050-104        | LHS-4150-104        |
| Compatible connectors (page 268)    | M, N                | M, N                | M, N                | M, N                |
| Wiring (pages 198-199)              | Diagram 2           | Diagram 2           | Diagram 2           | Diagram 2           |

(bold: preferred types)

\* Reception indication (for LH)

## HOUSING SIZE

40 X 50 X 15

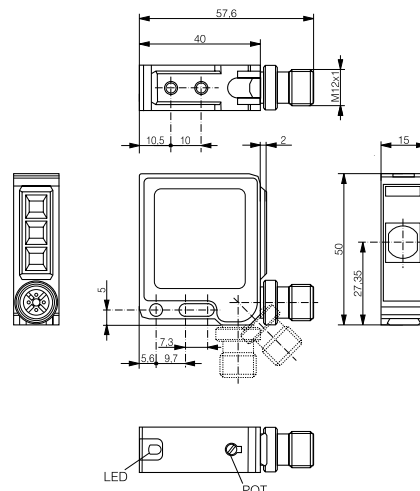
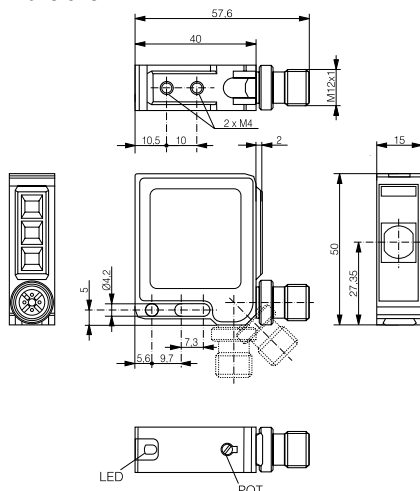
## SENSING RANGE

REFLEX SENSOR (POLARIZED)  
4,000 mm

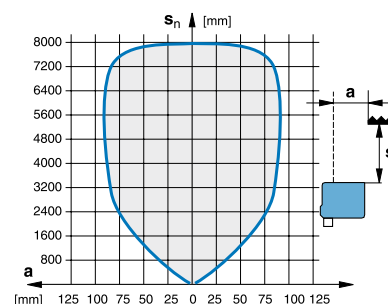
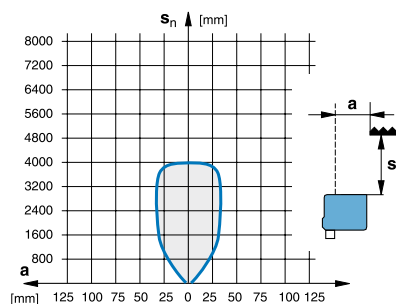
REFLEX SENSOR (NON-POLARIZED)  
8,000 mm



Dimensions:



Response curves::



## TECHNICAL DATA

|                        |                          |                  |
|------------------------|--------------------------|------------------|
| Sensing range          | 4,000 mm                 | 8,000 mm         |
| Reflector (page 197)   | Reflector type 3         | Reflector type 3 |
| No-load supply current | ≤ 20 mA                  | ≤ 25 mA          |
| Emitter                | LED red polarized 680 nm | LED red 680 nm   |
| Approvals              | CE, RoHS                 | CE, RoHS         |
| Weight                 | 17 g                     | 17 g             |

## PART REFERENCES

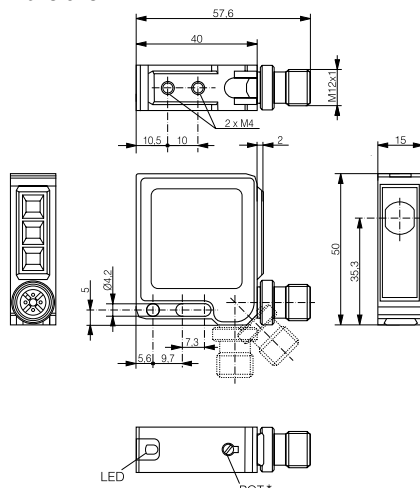
| Sensing face                       | Glass               | Coated plastic      | Glass                   | Coated plastic          |
|------------------------------------|---------------------|---------------------|-------------------------|-------------------------|
| NPN changeover outputs / cable     |                     |                     |                         |                         |
| NPN light-ON + excess gain / cable |                     |                     |                         |                         |
| NPN changeover outputs / S12       | <b>LRS-4050-101</b> | <b>LRS-4150-101</b> | <b>LRS-4050-101-501</b> | <b>LRS-4150-101-501</b> |
| NPN light-ON + excess gain / S12   | LRS-4050-102        | LRS-4150-102        | LRS-4050-102-501        | LRS-4150-102-501        |
| PNP changeover outputs / cable     |                     |                     |                         |                         |
| PNP light-ON + excess gain / cable |                     |                     |                         |                         |
| PNP changeover outputs / S12       | <b>LRS-4050-103</b> | <b>LRS-4150-103</b> | <b>LRS-4050-103-501</b> | <b>LRS-4150-103-501</b> |
| PNP light-ON + excess gain / S12   | LRS-4050-104        | LRS-4150-104        | LRS-4050-104-501        | LRS-4150-104-501        |
| Compatible connectors (page 268)   | M, N                | M, N                | M, N                    | M, N                    |
| Wiring (pages 198-199)             | Diagram 2           | Diagram 2           | Diagram 2               | Diagram 2               |

(bold: preferred types)

|               |                                  |                                  |
|---------------|----------------------------------|----------------------------------|
| HOUSING SIZE  | 40 X 50 X 15                     |                                  |
| SENSING RANGE | THROUGH-BEAM SENSOR<br>50,000 mm | THROUGH-BEAM SENSOR<br>50,000 mm |

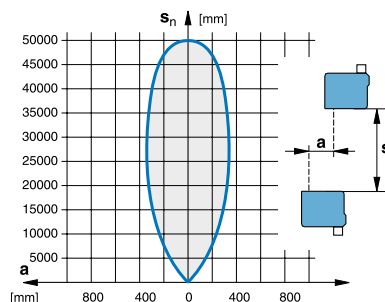


Dimensions:



\* receiver only

Response curves::



| TECHNICAL DATA         |                                                   |                                                   |
|------------------------|---------------------------------------------------|---------------------------------------------------|
| Sensing range          | 50,000 mm                                         | 50,000 mm                                         |
| Standard target        | ---                                               | ---                                               |
| No-load supply current | $\leq 15 \text{ mA (R)} / \leq 15 \text{ mA (E)}$ | $\leq 15 \text{ mA (R)} / \leq 15 \text{ mA (E)}$ |
| Emitter                | LED red 640 nm                                    | LED red 640 nm                                    |
| Approvals              | CE, RoHS                                          | CE, RoHS                                          |
| Weight                 | 34 g (R and E)                                    | 34 g (R and E)                                    |

| PART REFERENCES                    |                                            |                                            |
|------------------------------------|--------------------------------------------|--------------------------------------------|
| Sensing face                       | Glass                                      | Coated plastic                             |
| NPN changeover outputs / cable     |                                            |                                            |
| NPN light-ON + excess gain / cable |                                            |                                            |
| NPN changeover outputs / S12       | <b>LLS-4050-001 (R) / LLS-4050-000 (E)</b> | <b>LLS-4150-001 (R) / LLS-4150-000 (E)</b> |
| NPN light-ON + excess gain / S12   | LLS-4050-002 (R) / LLS-4050-000 (E)        | LLS-4150-002 (R) / LLS-4150-000 (E)        |
| PNP changeover outputs / cable     |                                            |                                            |
| PNP light-ON + excess gain / cable |                                            |                                            |
| PNP changeover outputs / S12       | <b>LLS-4050-003 (R) / LLS-4050-000 (E)</b> | <b>LLS-4150-003 (R) / LLS-4150-000 (E)</b> |
| PNP light-ON + excess gain / S12   | LLS-4050-004 (R) / LLS-4050-000 (E)        | LLS-4150-004 (R) / LLS-4150-000 (E)        |
| Compatible connectors (page 268)   | M, N                                       | M, N                                       |
| Wiring (pages 198-199)             | Diagram 2 (R) / 4 (E)                      | Diagram 2 (R) / 4 (E)                      |

(bold: preferred types)

(R) Receiver / (E) Emitter



## PHOTOELECTRIC SENSORS: COLOR SENSOR SERIES 4050



- ✓ **Compact color sensor**  $\varnothing$  40 x 50 x 15 mm
- ✓ Recognition of **3 different teachable shades of color**
- ✓ **Tolerance selection** for recognition of desired **color variation**
- ✓ **Distance-independent color recognition**
- ✓ **Speed-independent color recognition**
- ✓ **Adjustable connector**
- ✓ **Sensing face of glass or coated plastic**
- ✓ **Insensitive to ambient light**

### TECHNICAL DATA

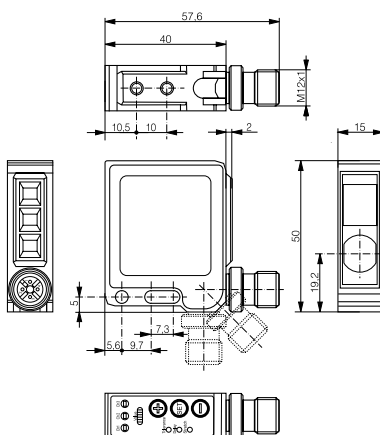
|                                                |                                                          |
|------------------------------------------------|----------------------------------------------------------|
| (according to IEC 60947-5-2)                   |                                                          |
| Housing material                               | Glass-fiber reinforced PBTP                              |
| Average positioning tolerance (tol. 3)         | $\pm 5$ mm                                               |
| Beam diameter at 35 mm                         | 4 mm                                                     |
| Supply voltage range $U_B$                     | 10 ... 30 VDC                                            |
| Max. ripple content                            | $\leq 20$ %                                              |
| Output current                                 | $\leq 200$ mA                                            |
| Output voltage drop                            | $\leq 2.0$ V at 200 mA                                   |
| Max. switching frequency                       | 4 kHz (tol. 3, 4, 5) / 1.25 kHz (tol. 1, 2)              |
| Switching time ( $\uparrow$ and $\downarrow$ ) | 200 $\mu$ sec (tol. 3, 4, 5) / 400 $\mu$ sec (tol. 1, 2) |
| Max. ambient light:                            |                                                          |
| halogen                                        | 5,000 Lux                                                |
| sun                                            | 10,000 Lux                                               |
| Ambient temperature range                      | -5 ... +55 °C                                            |
| Degree of protection                           | IP 67                                                    |
| EMC protection:                                |                                                          |
| IEC 60947-5-2 (7.2.3.1)                        | 5 kV                                                     |
| IEC 61000-4-2                                  | Level 2                                                  |
| IEC 61000-4-3                                  | Level 3                                                  |
| IEC 61000-4-4                                  | Level 3                                                  |
| IEC 61000-4-6                                  | Level 2                                                  |
| Short-circuit protection                       | Built-in                                                 |
| Polarity reversal protection                   | Built-in                                                 |
| Power-on reset                                 | Built-in                                                 |

Compact color sensor for the recognition and selection of 3 different teachable shades of color in standard housing  $\varnothing$  40 x 50 x 15 mm with adjustable connector and sensing face made of glass or coated plastic. Recognizes or ignores smallest color differences depending on requirements, due to 5 tolerance levels for each shade of color. Color recognition independent of distance and speed. Particularly suited for

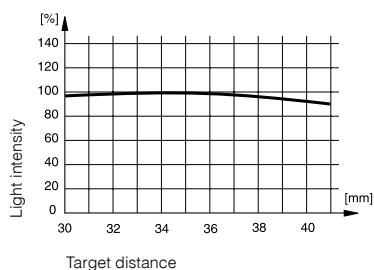
- ✓ **packaging industry**
- ✓ **printing industry**
- ✓ **quality control** of manufacturing processes
- ✓ **sorting processes** in manufacturing industry
- ✓ **food & tobacco industry**
- ✓ **wood processing machines** (furniture industry)

|                 |                                        |                                        |
|-----------------|----------------------------------------|----------------------------------------|
| HOUSING SIZE    | 40 X 50 X 15                           |                                        |
| OPERATING RANGE | COLOR SENSOR (DIFFUSE)<br>30 ... 40 mm | COLOR SENSOR (DIFFUSE)<br>30 ... 40 mm |

Dimensions:



Response curve:



| TECHNICAL DATA                   |              |              |
|----------------------------------|--------------|--------------|
| Operating range                  | 30 ... 40 mm | 30 ... 40 mm |
| No-load supply current (at 24 V) | ≤ 35 mA      | ≤ 35 mA      |
| Emitter                          | LED white    | LED white    |
| Approvals                        | CE, RoHS     | CE, RoHS     |
| Weight                           | 35 g         | 35 g         |

| PART REFERENCES                   |                     |                     |
|-----------------------------------|---------------------|---------------------|
| Sensing face                      | Glass               | Coated plastic      |
| 3 x NPN light-ON / teach-in / S12 | <b>FTS-4055-301</b> | <b>FTS-4155-301</b> |
| 3 x PNP light-ON / teach-in / S12 | <b>FTS-4055-303</b> | <b>FTS-4155-303</b> |
| Compatible connectors (page 268)  | O, P                | O, P                |
| Wiring (pages 198-199)            | Diagram 10          | Diagram 10          |

(**bold**: preferred types)



## PHOTOELECTRIC SENSORS: SERIES 5050



- ✓ Sensor series in **standard housings**  $\varnothing$  50 x 50 x 18 mm
- ✓ **Designed to cost**
- ✓ **Sensing face of PMMA**
- ✓ **Polarizing filter** (reflex sensors)
- ✓ **High system reserves** (excess gain)
- ✓ **Pre-failure warning** (pollution monitoring)
- ✓ **Changeover outputs**
- ✓ **AC/DC models**

### TECHNICAL DATA

|                                                |                                 |
|------------------------------------------------|---------------------------------|
| (according to IEC 60947-5-2)                   |                                 |
| Housing material                               | ABS                             |
| Hysteresis                                     | 10 % typ.                       |
| Supply voltage range $U_B$ (DC)                | 10 ... 36 VDC                   |
| Supply voltage range $U_B$ (AC/DC)             | 20 ... 250 VAC / 20 ... 300 VDC |
| Max. ripple content (DC)                       | $\leq 20$ %                     |
| Output current (total of both outputs/DC)      | $\leq 200$ mA                   |
| Output voltage drop (DC)                       | $\leq 2.0$ V at 200 mA          |
| Max. switching frequency                       | 1,000 Hz (DC) / 50 Hz (AC/DC)   |
| Switching time ( $\uparrow$ and $\downarrow$ ) | 0.5 msec (DC) / 10 msec (AC/DC) |
| Max. ambient light:                            |                                 |
| halogen                                        | 5,000 Lux                       |
| sun                                            | 10,000 Lux                      |
| Ambient temperature range                      | -5 ... +55 °C                   |
| Degree of protection                           | IP 65                           |
| EMC protection:                                |                                 |
| IEC 60947-5-2 (7.2.3.1)                        | 5 kV                            |
| IEC 61000-4-2                                  | Level 2                         |
| IEC 61000-4-3                                  | Level 3                         |
| IEC 61000-4-4                                  | Level 3                         |
| IEC 61000-4-6                                  | Level 2                         |
| Short-circuit protection                       | Built-in (DC)                   |
| Polarity reversal protection                   | Built-in (DC)                   |
| Power-on reset                                 | Built-in (DC)                   |

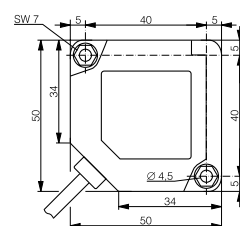
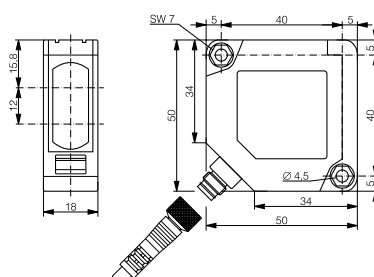
Sensor series in standard housings  $\varnothing$  50 x 50 x 18 mm. High system reserves (excess gain), changeover outputs, AC/DC models and polarized reflex sensors. Pollution monitoring (green LED) in case of reduced system reserves prevents downtime caused by pollution. Particularly suited for

- ✓ **packaging machines**
- ✓ **machine tool industry**
- ✓ **filling systems**
- ✓ **elevator industry**
- ✓ **stock & conveyor systems**

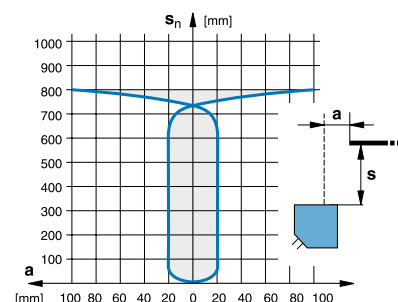
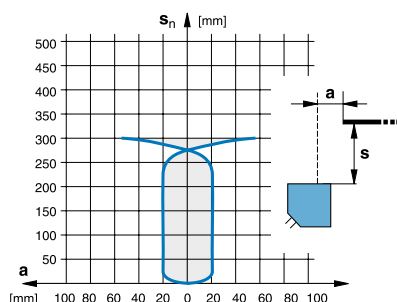
|               |                          |                          |
|---------------|--------------------------|--------------------------|
| HOUSING SIZE  | 50 X 50 X 18             |                          |
| SENSING RANGE | DIFFUSE SENSOR<br>300 mm | DIFFUSE SENSOR<br>800 mm |



Dimensions:



Response curves:



| TECHNICAL DATA                   |                    |                    |
|----------------------------------|--------------------|--------------------|
| Sensing range                    | 300 mm             | 800 mm             |
| Standard target                  | 100 x 100 mm white | 200 x 200 mm white |
| No-load supply current (DC)      | ≤ 15 mA            | ≤ 15 mA            |
| Emitter                          | LED red 648 nm     | LED red 648 nm     |
| Approvals                        | CE, RoHS           | CE, RoHS           |
| Weight (cable / connector model) | 95 / 30 g          | 95 / 30 g          |

| PART REFERENCES                     |                                    |                                    |
|-------------------------------------|------------------------------------|------------------------------------|
| <b>(bold: preferred types)</b>      |                                    |                                    |
| DC NPN changeover outputs / cable   | <b>LTK-5050-101-501</b>            | <b>LTK-5050-101</b>                |
| DC NPN light-ON + excess gain/cable | LTK-5050-102-501                   | LTK-5050-102                       |
| DC NPN changeover outputs / S8      | <b>LTS-5050-101-501</b>            | <b>LTS-5050-101</b>                |
| DC NPN light-ON + excess gain / S8  | LTS-5050-102-501                   | LTS-5050-102                       |
| DC PNP changeover outputs / cable   | <b>LTK-5050-103-501</b>            | <b>LTK-5050-103</b>                |
| DC PNP light-ON + excess gain/cable | LTK-5050-104-501                   | LTK-5050-104                       |
| DC PNP changeover outputs / S8      | <b>LTS-5050-103-501</b>            | <b>LTS-5050-103</b>                |
| DC PNP light-ON + excess gain / S8  | LTS-5050-104-501                   | LTS-5050-104                       |
| AC/DC relay light-ON / cable        | <b>LTK-5050-115-501</b>            | <b>LTK-5050-115</b>                |
| Compatible connectors (page 268)    | E, F                               | E, F                               |
| Wiring (pages 198-199)              | Diagram 2 (DC) / Diagram 5 (AC/DC) | Diagram 2 (DC) / Diagram 5 (AC/DC) |

HOUSING SIZE

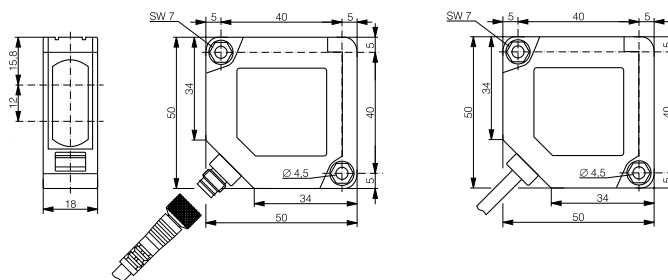
50 X 50 X 18

SENSING RANGE

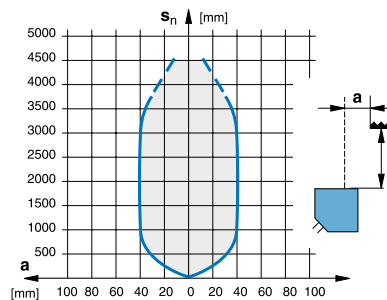
REFLEX SENSOR (POLARIZED)  
4,000 mm



Dimensions:



Response curve:



## TECHNICAL DATA

|                                  |                          |  |
|----------------------------------|--------------------------|--|
| Sensing range                    | 4,000 mm                 |  |
| Reflector (page 197)             | Reflector type 3*        |  |
| No-load supply current (DC)      | ≤ 15 mA                  |  |
| Emitter                          | LED red polarized 660 nm |  |
| Approvals                        | CE, RoHS                 |  |
| Weight (cable / connector model) | 90 / 35 g                |  |

## PART REFERENCES

|                                     |                                    |  |
|-------------------------------------|------------------------------------|--|
| <b>(bold: preferred types)</b>      |                                    |  |
| DC NPN changeover outputs / cable   | <b>LRK-5050-101</b>                |  |
| DC NPN light-ON + excess gain/cable | LRK-5050-102                       |  |
| DC NPN changeover outputs / S8      | <b>LRS-5050-101</b>                |  |
| DC NPN light-ON + excess gain / S8  | LRS-5050-102                       |  |
| DC PNP changeover outputs / cable   | <b>LRK-5050-103</b>                |  |
| DC PNP light-ON + excess gain/cable | LRK-5050-104                       |  |
| DC PNP changeover outputs / S8      | <b>LRS-5050-103</b>                |  |
| DC PNP light-ON + excess gain / S8  | LRS-5050-104                       |  |
| AC/DC relay light-ON / cable        | <b>LRK-5050-115</b>                |  |
| Compatible connectors (page 268)    | E, F                               |  |
| Wiring (pages 198-199)              | Diagram 2 (DC) / Diagram 5 (AC/DC) |  |

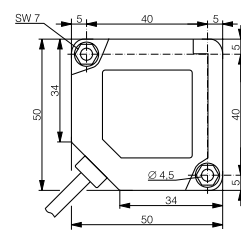
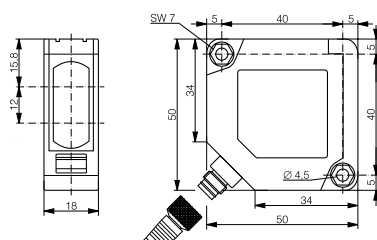
\* 3,000 mm sensing range with reflector type 15

Detailed data sheets for these products can be found on the Contrinex website:

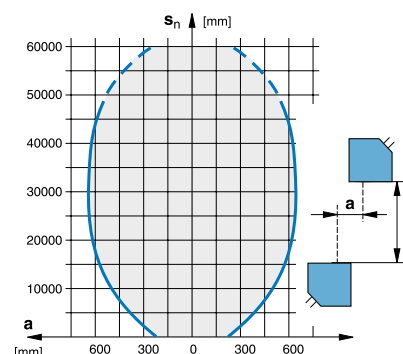
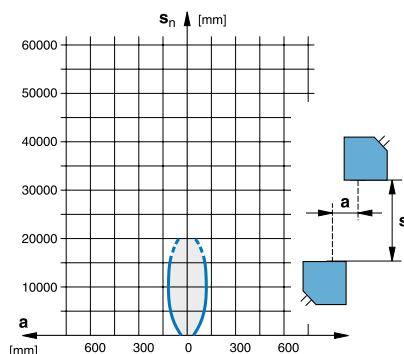
|               |                                                                                                |                                  |
|---------------|------------------------------------------------------------------------------------------------|----------------------------------|
| HOUSING SIZE  |  50 X 50 X 18 |                                  |
| SENSING RANGE | THROUGH-BEAM SENSOR<br>15,000 mm                                                               | THROUGH-BEAM SENSOR<br>50,000 mm |



Dimensions:



Response curves:



| TECHNICAL DATA                   |                           |                           |
|----------------------------------|---------------------------|---------------------------|
| Sensing range                    | 15,000 mm                 | 50,000 mm                 |
| Standard target                  | ---                       | ---                       |
| No-load supply current (DC)      | ≤ 10 mA (R) / ≤ 10 mA (E) | ≤ 10 mA (R) / ≤ 10 mA (E) |
| Emitter                          | LED red 660 nm            | IR LED 880 nm             |
| Approvals                        | CE, RoHS                  | CE, RoHS                  |
| Weight (cable / connector model) | 190 / 60 g (R and E)      | 190 / 60 g (R and E)      |

| PART REFERENCES                     |                                                   |                                                    |
|-------------------------------------|---------------------------------------------------|----------------------------------------------------|
| (bold: preferred types)             | (R) receiver / (E) emitter                        | (R) receiver / (E) emitter                         |
| DC NPN changeover outputs / cable   | <b>LLK-5050-001 (R) / LLK-5050-000 (E)</b>        | <b>LLK-5050-001-502 (R) / LLK-5050-000-502 (E)</b> |
| DC NPN light-ON + excess gain/cable | LLK-5050-002 (R) / <b>LLK-5050-000 (E)</b>        | LLK-5050-002-502 (R) / <b>LLK-5050-000-502 (E)</b> |
| DC NPN changeover outputs / S8      | <b>LSS-5050-001 (R) / LSS-5050-000 (E)</b>        | <b>LSS-5050-001-502 (R) / LSS-5050-000-502 (E)</b> |
| DC NPN light-ON + excess gain / S8  | LSS-5050-002 (R) / <b>LSS-5050-000 (E)</b>        | LSS-5050-002-502 (R) / <b>LSS-5050-000-502 (E)</b> |
| DC PNP changeover outputs / cable   | <b>LLK-5050-003 (R) / LLK-5050-000 (E)</b>        | <b>LLK-5050-003-502 (R) / LLK-5050-000-502 (E)</b> |
| DC PNP light-ON + excess gain/cable | LLK-5050-004 (R) / <b>LLK-5050-000 (E)</b>        | LLK-5050-004-502 (R) / <b>LLK-5050-000-502 (E)</b> |
| DC PNP changeover outputs / S8      | <b>LSS-5050-003 (R) / LSS-5050-000 (E)</b>        | <b>LSS-5050-003-502 (R) / LSS-5050-000-502 (E)</b> |
| DC PNP light-ON + excess gain / S8  | LSS-5050-004 (R) / <b>LSS-5050-000 (E)</b>        | LSS-5050-004-502 (R) / <b>LSS-5050-000-502 (E)</b> |
| AC/DC relay light-ON / cable        | <b>LLK-5050-015 (R) / LLK-5050-010 (E)</b>        | <b>LLK-5050-015-502 (R) / LLK-5050-010-502 (E)</b> |
| Compatible connectors (page 268)    | E, F                                              | E, F                                               |
| Wiring (pages 198-199)              | Diagram 2 (R; DC) / 4 (E; DC) / Diagram 5 (AC/DC) | Diagram 2 (R; DC) / 4 (E; DC) / Diagram 5 (AC/DC)  |



## PHOTOELECTRIC SENSORS: FIBER-OPTIC AMPLIFIERS SERIES 3#6#



- ✓ Complete series of fiber-optic amplifiers for **DIN-rail mounting** (TS35)
- ✓ **Small housings**  $\varnothing$  31 x 60 x 10 mm
- ✓ Sensing range: **0 ... 200 mm**
- ✓ **Operator-guided setting**
- ✓ **IO-Link**
- ✓ For application environments from **-55 °C to +105 °C**
- ✓ **Blue light** for glass detection

### TECHNICAL DATA

|                                                |                                                |
|------------------------------------------------|------------------------------------------------|
| (according to IEC 60947-5-2)                   |                                                |
| Housing material                               | Glass-fiber reinforced PBTP (Crastin)          |
| Hysteresis                                     | 10 % typ. / $\leq$ 5 % (3066)                  |
| Supply voltage range $U_B$                     | 10 ... 30 VDC                                  |
| Max. ripple content                            | $\leq$ 20 %                                    |
| Output current                                 | $\leq$ 200 mA                                  |
| Output voltage drop                            | $\leq$ 2.0 V at 200 mA                         |
| Max. switching frequency                       | 1,500 Hz / 5,000 Hz (high frequency)           |
|                                                | 4,000 Hz (3066)                                |
| Switching time ( $\uparrow$ and $\downarrow$ ) | 330 $\mu$ sec / 100 $\mu$ sec (high frequency) |
|                                                | $\geq$ 80 $\mu$ sec (3066)                     |
| Max. ambient light:                            |                                                |
| halogen                                        | 5,000 Lux                                      |
| sun                                            | 10,000 Lux                                     |
| Ambient temperature range                      | -25 ... +55 °C / -5 ... +55 °C (3066)          |
| Degree of protection                           | IP 64                                          |
| EMC protection:                                |                                                |
| IEC 60947-5-2 (7.2.3.1)                        | 5 kV                                           |
| IEC 61000-4-2                                  | Level 2                                        |
| IEC 61000-4-3                                  | Level 3                                        |
| IEC 61000-4-4                                  | Level 2                                        |
| IEC 61000-4-6                                  | Level 2 (3066)                                 |
| Short-circuit protection                       | Built-in                                       |
| Polarity reversal protection                   | Built-in                                       |
| Power-on reset                                 | Built-in                                       |

Complete series of fiber-optic amplifiers in small housings  $\varnothing$  31 x 60 x 10 mm for DIN-rail mounting (TS35) with large sensing range of 0 ... 200 mm. For application environments from -55 °C to +105 °C. IO-Link as well as blue-light models for glass detection. For a large selection of optical fibers, please refer to pages 200 - 219 of this catalog.

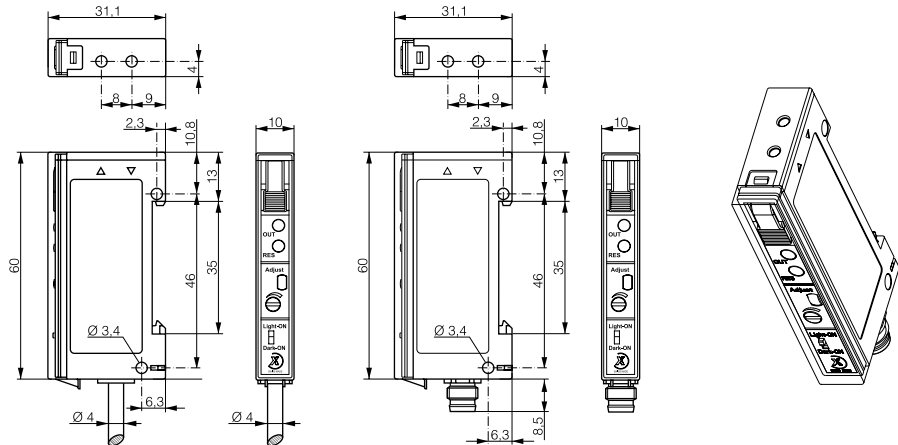
Fiber-optic solutions are particularly suited for

- ✓ **precision engineering**
- ✓ **robot gripping arms**
- ✓ **handling systems**
- ✓ **automation equipment**
- ✓ **special machinery**
- ✓ **electronics industry**
- ✓ **printed circuit board production**

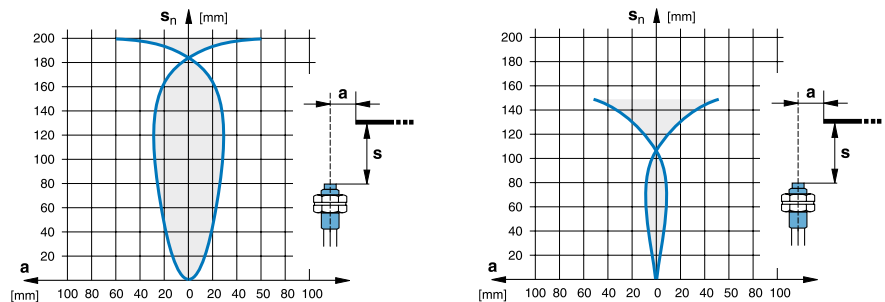
|               |                                        |                                                               |
|---------------|----------------------------------------|---------------------------------------------------------------|
| HOUSING SIZE  | <b>31 X 60 X 10 WITH POTENTIOMETER</b> |                                                               |
| SENSING RANGE | FIBER-OPTIC AMPLIFIER *<br>200 mm      | FIBER-OPTIC AMPLIFIER *<br>HIGH SWITCHING FREQUENCY<br>140 mm |



Dimensions:



Response curves:



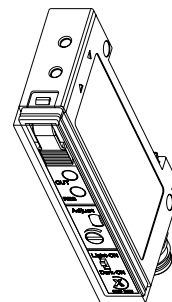
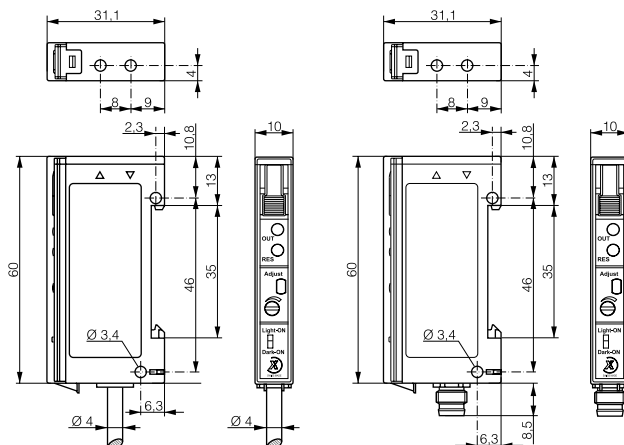
| TECHNICAL DATA                           |                            |                            |
|------------------------------------------|----------------------------|----------------------------|
| Sensing range                            | 200 mm (with LFP-1002-020) | 140 mm (with LFP-1002-020) |
| Standard target                          | 100 x 100 mm white         | 100 x 100 mm white         |
| No-load supply current (at $U_B = 24V$ ) | 15 mA (typ.)               | 15 mA (typ.)               |
| Emitter                                  | LED red 680 nm             | LED red 680 nm             |
| Approvals                                | CE, UL, RoHS               | CE, RoHS                   |
| Weight (cable / connector model)         | 69 / 18 g                  | 69 / 18 g                  |

| PART REFERENCES                   |                     |                     |
|-----------------------------------|---------------------|---------------------|
| <b>(bold: preferred types)</b>    |                     |                     |
| NPN light-ON / dark-ON switchable | <b>LFK-3060-101</b> | <b>LFK-3260-101</b> |
| + excess gain / cable             |                     |                     |
| NPN light-ON / dark-ON switchable | <b>LFS-3060-101</b> | <b>LFS-3260-101</b> |
| + excess gain / connector S8      |                     |                     |
| PNP light-ON / dark-ON switchable | <b>LFK-3060-103</b> | <b>LFK-3260-103</b> |
| + excess gain / cable             |                     |                     |
| PNP light-ON / dark-ON switchable | <b>LFS-3060-103</b> | <b>LFS-3260-103</b> |
| + excess gain / connector S8      |                     |                     |
| Compatible connectors (page 268)  | E, F                | E, F                |
| Wiring (pages 198-199)            | Diagram 2           | Diagram 2           |

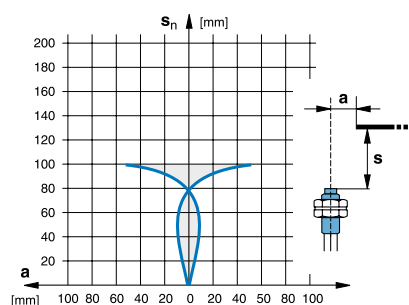
\* Optical fibers (pages 200 - 219)

|               |                                                                                                                          |  |
|---------------|--------------------------------------------------------------------------------------------------------------------------|--|
| HOUSING SIZE  |  <b>31 X 60 X 10 WITH POTENTIOMETER</b> |  |
| SENSING RANGE | FIBER-OPTIC AMPLIFIER *<br>BLUE-LIGHT<br>100 mm                                                                          |  |

Dimensions:



Response curve:



| TECHNICAL DATA                           |                            |  |
|------------------------------------------|----------------------------|--|
| Sensing range                            | 100 mm (with LFP-1002-020) |  |
| Standard target                          | 100 x 100 mm white         |  |
| No-load supply current (at $U_B = 24V$ ) | 15 mA (typ.)               |  |
| Emitter                                  | LED blue 465 nm            |  |
| Approvals                                | CE, RoHS                   |  |
| Weight (cable / connector model)         | 69 / 18 g                  |  |

| PART REFERENCES                   |                     |  |
|-----------------------------------|---------------------|--|
| <b>(bold: preferred types)</b>    |                     |  |
| NPN light-ON / dark-ON switchable | <b>LFK-3360-101</b> |  |
| + excess gain / cable             |                     |  |
| NPN light-ON / dark-ON switchable | <b>LFS-3360-101</b> |  |
| + excess gain / connector S8      |                     |  |
| PNP light-ON / dark-ON switchable | <b>LFK-3360-103</b> |  |
| + excess gain / cable             |                     |  |
| PNP light-ON / dark-ON switchable | <b>LFS-3360-103</b> |  |
| + excess gain / connector S8      |                     |  |
| Compatible connectors (page 268)  | E, F                |  |
| Wiring (pages 198-199)            | Diagram 2           |  |

\* Optical fibers (pages 200 - 219)



## HOUSING SIZE

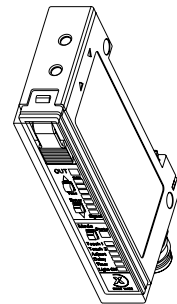
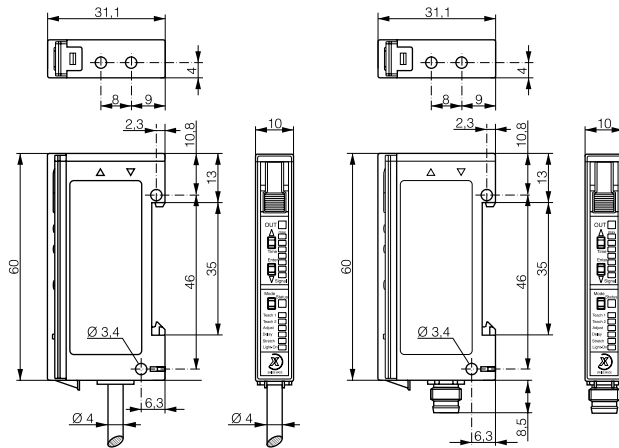
**31 X 60 X 10 WITH TEACH-IN**

## SENSING RANGE

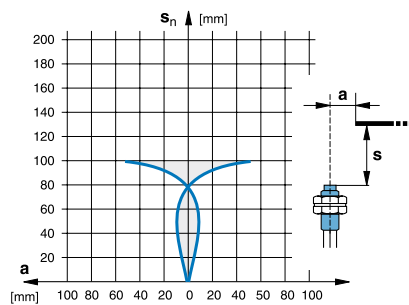
**FIBER-OPTIC AMPLIFIER \***  
**BLUE-LIGHT**  
**100 mm**



Dimensions:



Response curve:



## TECHNICAL DATA

|                                          |                            |  |
|------------------------------------------|----------------------------|--|
| Sensing range                            | 100 mm (with LFP-1002-020) |  |
| Standard target                          | 100 x 100 mm white         |  |
| No-load supply current (at $U_B = 24V$ ) | 25 mA (typ.)               |  |
| Emitter                                  | LED blue 465 nm            |  |
| Approvals                                | CE, RoHS                   |  |
| Weight (cable / connector model)         | 68 / 17 g                  |  |

## PART REFERENCES

|                                   |                     |  |
|-----------------------------------|---------------------|--|
| <b>(bold: preferred types)</b>    |                     |  |
| NPN light-ON / dark-ON switchable | <b>LFK-3365-101</b> |  |
| + excess gain / cable             |                     |  |
| NPN light-ON / dark-ON switchable | <b>LFS-3365-101</b> |  |
| + excess gain / connector S8      |                     |  |
| PNP light-ON / dark-ON switchable | <b>LFK-3365-103</b> |  |
| + excess gain / cable             |                     |  |
| PNP light-ON / dark-ON switchable | <b>LFS-3365-103</b> |  |
| + excess gain / connector S8      |                     |  |
| Compatible connectors (page 268)  | E, F                |  |
| Wiring (pages 198-199)            | Diagram 6           |  |

\* Optical fibers (pages 200 - 219)

## HOUSING SIZE

**31 X 60 X 10 WITH TEACH-IN & DIGITAL DISPLAY**

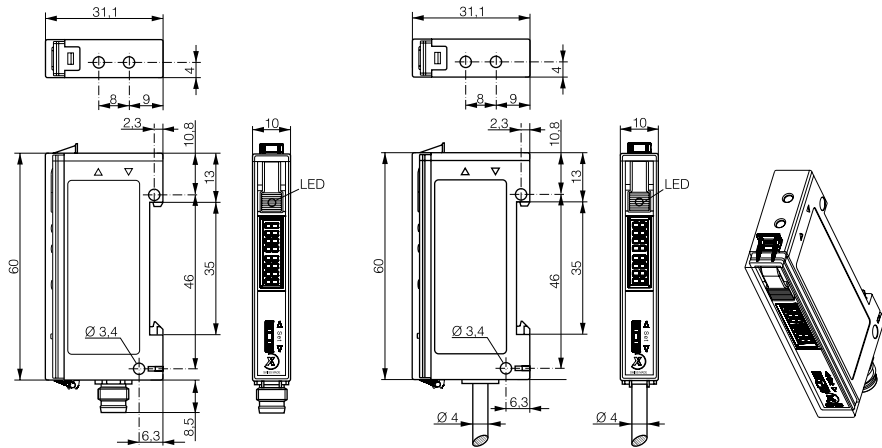
## SENSING RANGE

**FIBER-OPTIC AMPLIFIER \***  
**200 mm**

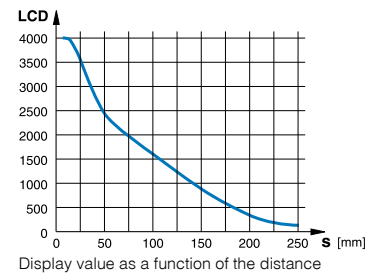
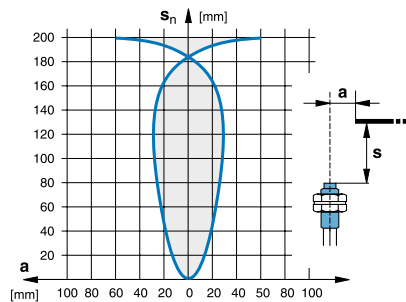


**IO-Link**

Dimensions:



Response curves:



## TECHNICAL DATA

|                                          |                            |  |
|------------------------------------------|----------------------------|--|
| Sensing range                            | 200 mm (with LFP-1002-020) |  |
| Standard target                          | 100 x 100 mm white         |  |
| No-load supply current (at $U_B = 24V$ ) | 30 mA (typ.)               |  |
| Emitter                                  | LED red 680 nm             |  |
| Approvals                                | CE, RoHS                   |  |
| Weight (cable / connector model)         | 68 / 17 g                  |  |

## PART REFERENCES

|                                      |                     |  |
|--------------------------------------|---------------------|--|
| <b>(bold: preferred types)</b>       |                     |  |
| NPN light/dark-ON switchable / cable | <b>LFK-3066-101</b> |  |
| NPN light/dark-ON switchable / S8    | <b>LFS-3066-101</b> |  |
| PNP light/dark-ON switchable / cable | <b>LFK-3066-103</b> |  |
| PNP light/dark-ON switchable / S8    | <b>LFS-3066-103</b> |  |
| PNP light/dark-ON switchable         | <b>LFK-3066-403</b> |  |
| + IO-Link / cable                    |                     |  |
| PNP light/dark-ON switchable         | <b>LFS-3066-403</b> |  |
| + IO-Link / connector S8             |                     |  |
| Compatible connectors (page 268)     | E, F                |  |
| Wiring (pages 198-199)               | Diagram 6           |  |

\* Optical fibers (pages 200 - 219)



## PHOTOELECTRIC SENSORS: SERIES 6080



- ✓ **Universal sensor series**  $\varnothing$  65 x 83 x 25 mm for **rough industrial applications**
- ✓ **Autocollimation principle** (reflex sensors)
- ✓ **Pre-failure warning** (pollution monitoring)
- ✓ **AC/DC models**

### TECHNICAL DATA

|                                                 |                                       |
|-------------------------------------------------|---------------------------------------|
| (according to IEC 60947-5-2)                    |                                       |
| Housing material                                | Glass-fiber reinforced PBTP (Crastin) |
| Hysteresis                                      | 10 % typ.                             |
| Supply voltage range $U_B$ (DC)                 | 10 ... 36 VDC                         |
| Supply voltage range $U_B$ (AC/DC)              | 20 ... 265 VAC / 20 ... 320 VDC       |
| Max. ripple content*                            | $\leq 20$ %                           |
| Output current*                                 | $\leq 200$ mA                         |
| Output voltage drop*                            | $\leq 2.0$ V at 200 mA                |
| Max. switching frequency*                       | 1,000 Hz / 250 Hz (LH)                |
| Switching time ( $\uparrow$ and $\downarrow$ )* | 0.5 msec / 2 msec (LH)                |
| Max. ambient light:                             |                                       |
| halogen                                         | 5,000 Lux                             |
| sun                                             | 10,000 Lux                            |
| Ambient temperature range                       | -5 ... +55 °C                         |
| Degree of protection                            | IP 67                                 |
| EMC protection:                                 |                                       |
| IEC 60947-5-2 (7.2.3.1)                         | 1 kV                                  |
| IEC 61000-4-2                                   | Level 3                               |
| IEC 61000-4-3                                   | Level 3                               |
| IEC 61000-4-4                                   | Level 3                               |
| Short-circuit protection                        | Built-in                              |
| Polarity reversal protection                    | Built-in                              |
| Power-on reset                                  | Built-in                              |

\* DC models (AC/DC see data sheet)

Universal sensor series  $\varnothing$  65 x 83 x 25 mm for rough industrial applications. Reflex sensors with autocollimation principle. Pollution monitoring (green LED) in case of reduced system reserves (excess gain) prevents downtime caused by pollution. Particularly suited for

- ✓ **crane installations**
- ✓ **paper machines**
- ✓ **doors & gates**
- ✓ **woodworking machines**
- ✓ **palletizers**
- ✓ **steel industry**
- ✓ **heavy duty conveyor systems**
- ✓ **chemical industry**
- ✓ **automotive industry**

## HOUSING SIZE

65 X 83 X 25

## SENSING RANGE

### DIFFUSE SENSOR

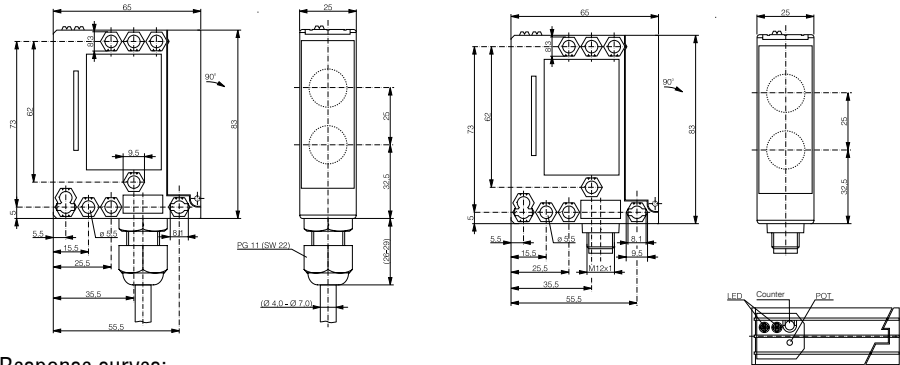
2,000 mm

### DIFFUSE SENSOR WITH BACKGROUND SUPPRESSION

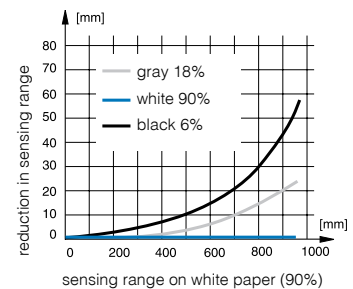
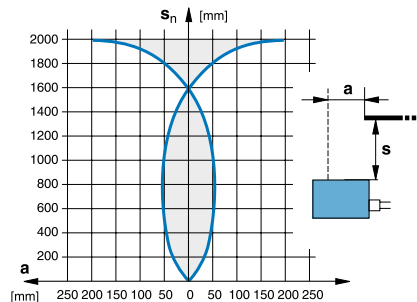
50 ... 1,000 mm



### Dimensions:



### Response curves:



## TECHNICAL DATA

|                                             |                    |                            |
|---------------------------------------------|--------------------|----------------------------|
| Sensing range (setting range)               | 2,000 mm           | 1,000 mm (50 ... 1,000 mm) |
| Standard target                             | 400 x 400 mm white | 200 x 200 mm white         |
| No-load supply current (DC)/voltage (AC/DC) | ≤ 20 mA / < 2 VA   | ≤ 50 mA / < 2 VA           |
| Emitter                                     | IR LED 880 nm      | IR LED 880 nm              |
| Approvals                                   | CE, UL, RoHS       | CE, UL, RoHS               |
| Weight                                      | 100 g              | 100 g                      |

## PART REFERENCES

|                                       |                              |                              |
|---------------------------------------|------------------------------|------------------------------|
| <b>(bold: preferred types)</b>        |                              |                              |
| DC NPN / connector S12                | <b>LTS-6080-101*</b>         | <b>LHS-6080-101*</b>         |
| DC NPN / screw terminal               | <b>LTT-6080-101</b>          | <b>LHT-6080-101</b>          |
| DC NPN timer*** / connector S12       | <b>LTS-6080-151**</b>        | <b>LHS-6080-151**</b>        |
| DC NPN timer*** / screw terminal      | <b>LTT-6080-151</b>          | <b>LHT-6080-151</b>          |
| DC PNP / connector S12                | <b>LTS-6080-103*</b>         | <b>LHS-6080-103*</b>         |
| DC PNP / screw terminal               | <b>LTT-6080-103</b>          | <b>LHT-6080-103</b>          |
| DC PNP timer*** / connector S12       | <b>LTS-6080-153**</b>        | <b>LHS-6080-153**</b>        |
| DC PNP timer*** / screw terminal      | <b>LTT-6080-153</b>          | <b>LHT-6080-153</b>          |
| AC/DC relay / connector S12           | <b>LTS-6080-115**</b>        | <b>LHS-6080-115**</b>        |
| AC/DC relay / screw terminal          | <b>LTT-6080-115</b>          | <b>LHT-6080-115</b>          |
| AC/DC relay/timer*** / connector S12  | LTS-6080-165**               | LHS-6080-165**               |
| AC/DC relay/timer*** / screw terminal | LTT-6080-165                 | LHT-6080-165                 |
| Compatible connectors (page 268)      | M, N (**O, P)                | M, N (**O, P)                |
| Wiring (pages 198-199)                | 2 (DC*) / 3 (DC) / 5 (AC/DC) | 2 (DC*) / 3 (DC) / 5 (AC/DC) |

\*\*\* light-ON / dark-ON switchable

## HOUSING SIZE

65 X 83 X 25

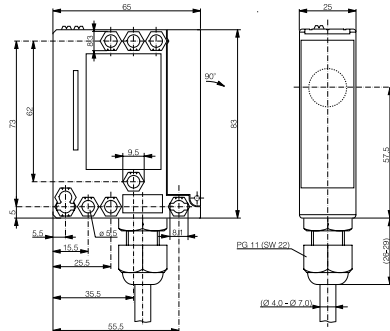
## SENSING RANGE

REFLEX SENSOR (POLARIZED)  
6,000 mm

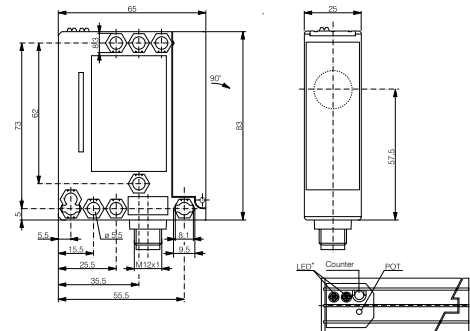
THROUGH-BEAM SENSOR  
50,000 mm



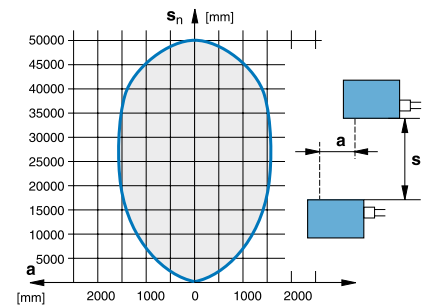
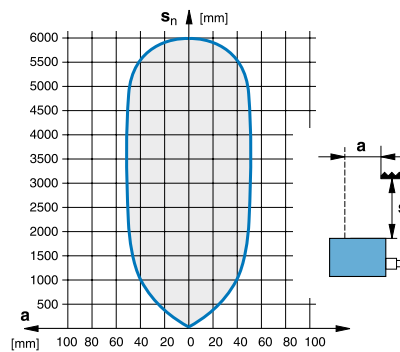
Dimensions:



\* receiver only



Response curves:



## TECHNICAL DATA

|                                             |                          |                                     |
|---------------------------------------------|--------------------------|-------------------------------------|
| Sensing range                               | 6,000 mm                 | 50,000 mm                           |
| Reflector (page 197)                        | Reflector type 3         | ---                                 |
| No-load supply current (DC)/voltage (AC/DC) | ≤ 30 mA / < 2 VA         | ≤ 15 mA (R) / ≤ 15 mA (E) // < 2 VA |
| Emitter                                     | LED red polarized 660 nm | IR LED 880 nm                       |
| Approvals                                   | CE, UL, RoHS             | CE, UL, RoHS                        |
| Weight                                      | 100 g                    | 200 g (R and E)                     |

## PART REFERENCES

| (bold: preferred types)               |                              | (R) receiver / (E) emitter                  |
|---------------------------------------|------------------------------|---------------------------------------------|
| DC NPN / connector S12                | <b>LRS-6080-102*</b>         | <b>LLS-6080-002 (R) / LLS-6080-000 (E)</b>  |
| DC NPN / screw terminal               | <b>LRT-6080-102</b>          | <b>LLT-6080-002 (R) / LLT-6080-000 (E)</b>  |
| DC NPN timer*** / connector S12       | <b>LRS-6080-152**</b>        | <b>LLS-6080-052 (R) / LLS-6080-000 (E)</b>  |
| DC NPN timer*** / screw terminal      | <b>LRT-6080-152</b>          | <b>LLT-6080-052 (R) / LLT-6080-000 (E)</b>  |
| DC PNP / connector S12                | <b>LRS-6080-104*</b>         | <b>LLS-6080-004 (R) / LLS-6080-000 (E)</b>  |
| DC PNP / screw terminal               | <b>LRT-6080-104</b>          | <b>LLT-6080-004 (R) / LLT-6080-000 (E)</b>  |
| DC PNP timer*** / connector S12       | <b>LRS-6080-154**</b>        | <b>LLS-6080-054 (R) / LLS-6080-000 (E)</b>  |
| DC PNP timer*** / screw terminal      | <b>LRT-6080-154</b>          | <b>LLT-6080-054 (R) / LLT-6080-000 (E)</b>  |
| AC/DC relay / connector S12           | <b>LRS-6080-115**</b>        | <b>LLS-6080-015 (R)* / LLS-6080-010 (E)</b> |
| AC/DC relay / screw terminal          | <b>LRT-6080-115</b>          | <b>LLT-6080-015 (R) / LLT-6080-010 (E)</b>  |
| AC/DC relay/timer*** / connector S12  | LRS-6080-165**               | LLS-6080-065 (R)* / <b>LLS-6080-010 (E)</b> |
| AC/DC relay/timer*** / screw terminal | LRT-6080-165                 | LLT-6080-065 (R) / <b>LLT-6080-010 (E)</b>  |
| Compatible connectors (page 268)      | M, N (**O, P)                | M, N (*O, P)                                |
| Wiring (pages 198-199)                | 2 (DC*) / 3 (DC) / 5 (AC/DC) | 2 (R; DC) / 4 (E; DC) / 5 (AC/DC)           |

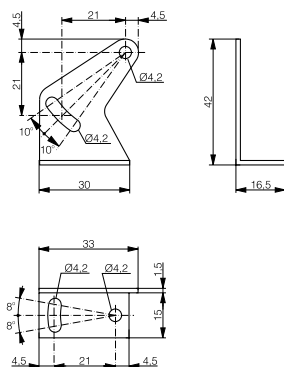
\*\*\* light-ON / dark-ON switchable



# PHOTOELECTRIC ACCESSORIES

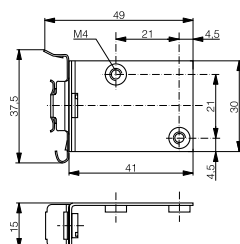
## UNIVERSAL MOUNTING BRACKET

For 3#30 / 3#31 series  
Material: stainless steel V2A  
Part reference: **LXW-3030-000**



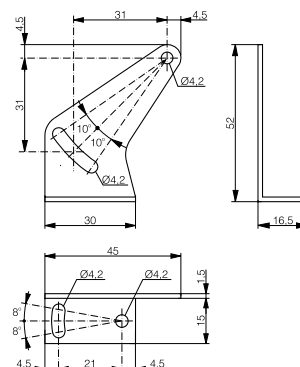
## DIN-RAIL MOUNTING BRACKET

(TS35) for 3#30 / 3#31 series  
Material: stainless steel V2A  
Part reference: **LXW-3030-001**



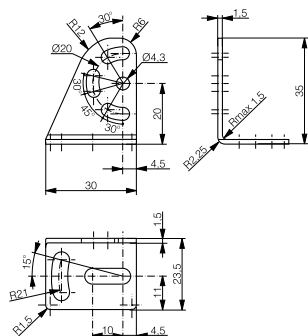
## UNIVERSAL MOUNTING BRACKET

For 4040 series  
Material: stainless steel V2A  
Part reference: **LXW-4040-000**



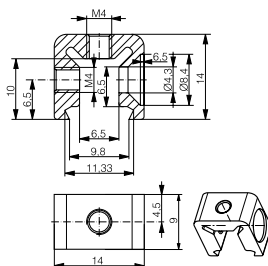
## UNIVERSAL MOUNTING BRACKET

For 4050 series  
Material: stainless steel V2A  
Part reference: **LXW-4050-000**



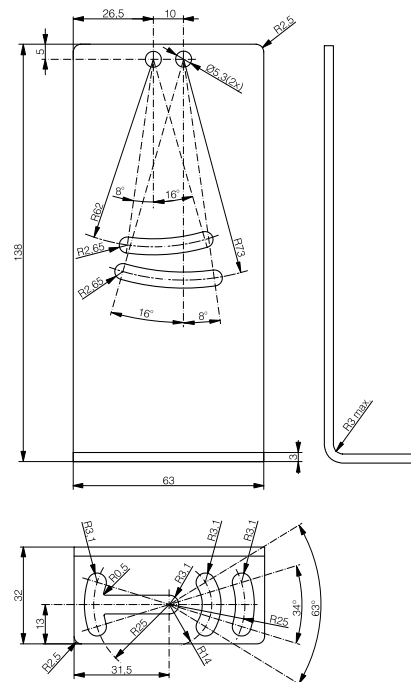
## CLAMP BRACKET

For 4050 series  
Material: aluminum  
Part reference: **LXW-4050-002**



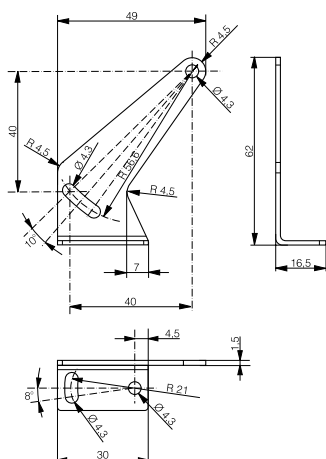
## UNIVERSAL MOUNTING BRACKET

For 6080 series  
Material: stainless steel V2A  
Part reference: **LXW-6080-000**



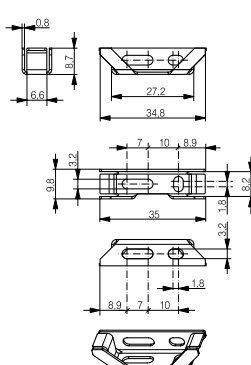
## UNIVERSAL MOUNTING BRACKET

For 5050 series  
Material: stainless steel V2A  
Part reference: **LXW-5050-000**



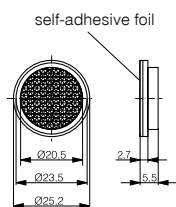
## UNIVERSAL MOUNTING BRACKET

For 3#6# series  
Material: stainless steel V2A  
Part reference: **LXW-3060-000**



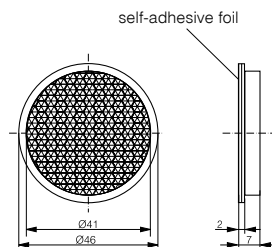
## REFLECTOR TYPE 1

Range 50% of type 3  
Part reference: **LXR-0000-025**



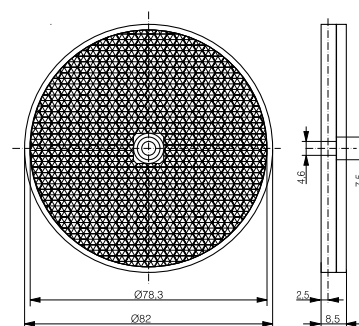
## REFLECTOR TYPE 2

Range 60% of type 3  
Part reference: **LXR-0000-046**



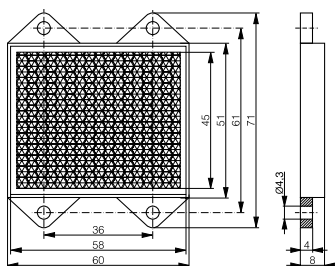
## REFLECTOR TYPE 3

Reference reflector for all reflex sensors  
Part reference: **LXR-0000-084**



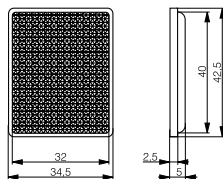
## REFLECTOR TYPE 12

Range 80% of type 3  
Part reference: **LXR-0000-012**



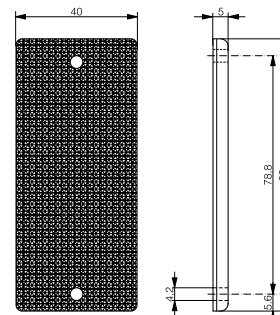
## REFLECTOR TYPE 13

Range 40% of type 3  
Part reference: **LXR-0000-013**



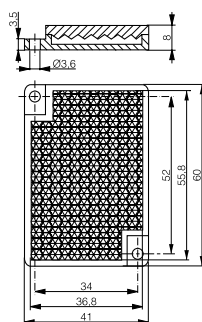
## REFLECTOR TYPE 14

Range 50% of type 3  
Part reference: **LXR-0000-014**



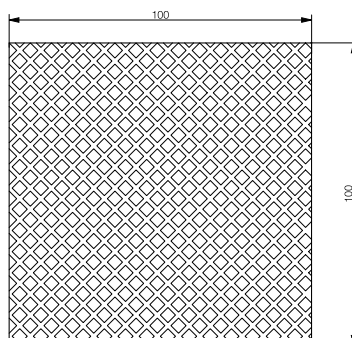
## REFLECTOR TYPE 15

Range 100% of type 3  
Part reference: **LXR-0000-015**



## REFLECTIVE FOIL (SELF-ADHESIVE)

For all reflex sensors (IMOS IRF 6000)  
Part reference: **LXR-0000-000**



Inductive

Photoelectric

Optical fibers

Ultrasonic

Capacitive

Cables & connectors

Accessories

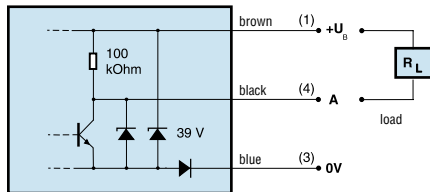
Glossary

Index

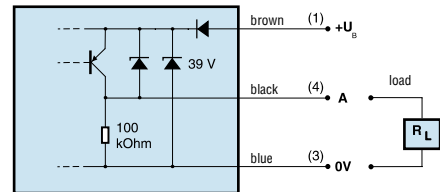
# WIRING DIAGRAMS

NPN light-ON / dark-ON output

Diagram 1

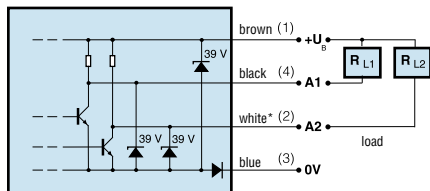


PNP light-ON / dark-ON output



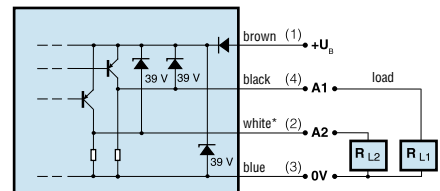
NPN changeover outputs  
NPN light-ON (/dark-ON) + excess-gain outputs

Diagram 2



\* pink for LFK-3#60-10#

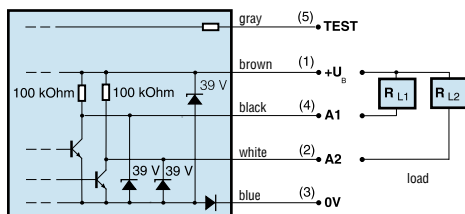
PNP changeover outputs  
PNP light-ON (/dark-ON) + excess-gain outputs



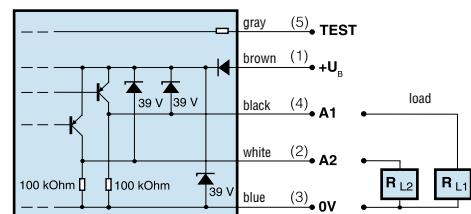
\* pink for LFK-3#60-10#

NPN with test input

Diagram 3

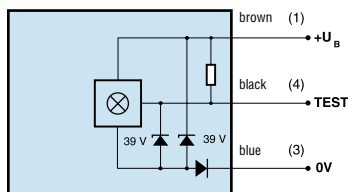


PNP with test input



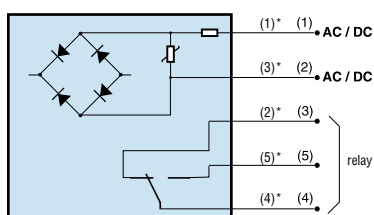
Emitter of through-beam sensor

Diagram 4



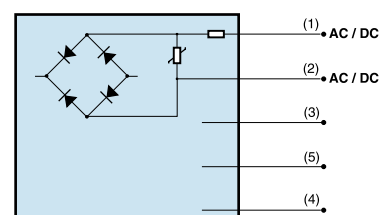
AC/DC with relay output

Diagram 5

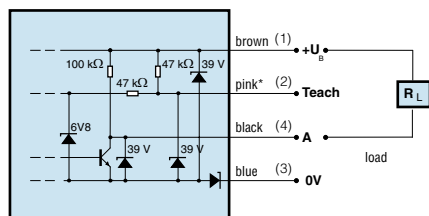


\* for connector models

AC/DC with relay output/emitter of through-beam sensor

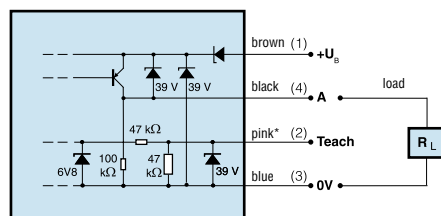


NPN light-ON / dark-ON output with teach-in (3#65)



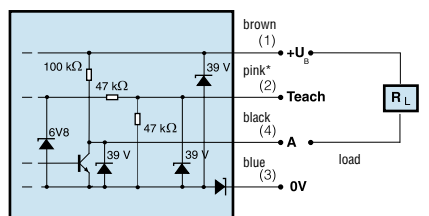
\* white for LFS-3#65-10#

PNP light-ON / dark-ON output with teach-in



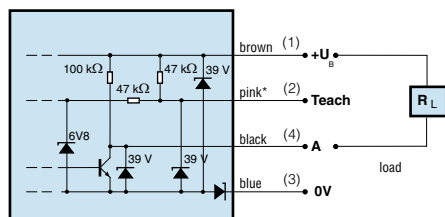
\* white for LFS-3#65-10# / LFS-3066-#0#

NPN light-ON / dark-ON output with teach-in (3066)



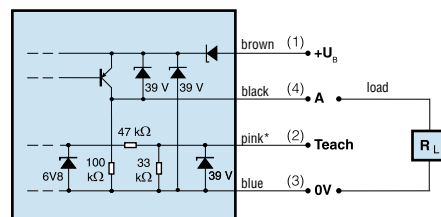
\* white for LFS-3066-10#

NPN light-ON / dark-ON output with teach-in



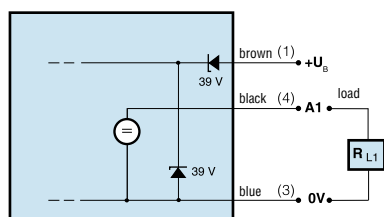
\* white for LFS-3265-10#

PNP light-ON / dark-ON output with teach-in

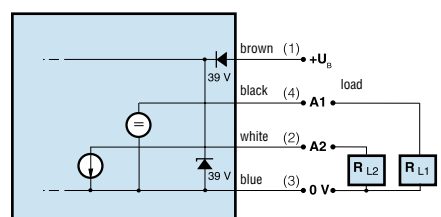


\* white for LFS-3265-10#

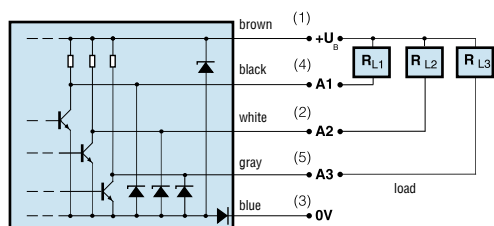
Analog output



Analog output



3 x NPN light-ON with teach-in



3 x PNP light-ON with teach-in

