LD30 - Time of Flight photoelectric laser sensors
LD30 Time of Flight (ToF) series of photoelectric laser sensors from Carlo Gavazzi in a compact housing feature long accurate sensing distance on a variety of objects. By means of the integrated IO-Link communication, the sensors can be easily customized to the application needs.

LD30 is available in two housing styles, an AISI316L stainless steel version with IP69K and ECOLAB approvals designed for use in harsh or hygienic environments and an ABS plastic version with IP 67 approval.

LD30 can reliably detect objects of various colors, materials or surfaces at a distance up to 1000 mm due to the ToF detection principle. The long sensing range sets the standard of what to achieve in such a compact sensor, and Carlo Gavazzi have increased the distance four times compared to our previous Background suppression sensors. The compact sensor design is ideally suited to confined spaces.

Data availability down to the field level
Using IO-Link, the sensors can deliver their data directly into the control system very efficiently.

Device identification
Each IO-Link sensor has an IODD (IO Device Description), which describes the sensor, its capabilities and parameters, process data, diagnosis data and user interface configuration. Furthermore, each sensor is equipped with an internal ID.

Automatic parameter settings
Initial setup of a new sensor is smooth and easy using previously stored parameters. Once a sensor has been replaced, the IO-Link master simply transmits parameters stored from the old sensor.
Universal, smart and easy

Centralised configuration and data management
IO-Link enables fast configuration and dynamic change of the sensor parameters on the fly, which considerably reduces downtime in case of product changeover and increases flexibility and diversity of the installation.

Simplified installation
An IO-Link system requires just standard, unshielded 3-wire cables, and a standardised uniform interface for sensors and actuators drastically reduce the complexity of the installation process. In addition, the automated parameter reassignment simplifies sensor replacement in case of defects and prevents incorrect settings. The IO-Link-enabled sensor acts as a standard sensor when installed in a non-IO-Link system, so the same sensor can be stocked for both standard I/O (SIO) applications and IO-Link applications.

IO-Link

What is IO-Link?
IO-Link is a universal, open communication standard protocol that allows IO-Link-enabled devices to exchange, collect and analyse data and convert it into actionable information.

IO-Link is recognised worldwide as an international standard (IEC 61131-9), and it is today considered as the “USB interface” for sensors and actuators in the industrial automation environment.

Plug and play
When the IO-Link sensor is connected to an IO-Link port, the IO-Link master sends a wake-up request to the sensor, which automatically switches to IO-Link mode, and a point-to-point bidirectional communication automatically starts between the master and the sensor.

Operating modes
The IO-Link-capable sensor can operate in two different modes; SIO mode (standard I/O) or IO-Link mode.

- SIO mode: the sensor works as a traditional sensor, and pin 4 acts as an ordinary digital output. SIO mode ensures backwards compatibility with standard sensor systems.

- IO-Link mode: exchange of data between sensor and IO-Link master takes place, and pin 4 is used for the transmission of IO-Link-related data.
IO-Link photoelectric laser sensors

Fully configurable

IO-Link provides the first globally standardised interface for communication with the sensor. Once you have connected the sensor to the IO-Link port, you can access a multitude of configuration parameters and advanced functionalities. This way, the sensor can be tailored to meet your individual needs and requirements at a given time. The settings can also be stored in the master and can always be changed if the need occurs, or they can be smoothly transferred to a new sensor in case of sensor replacement.

1. Outputs/inputs
   The sensor has two I/O terminals.

2. NPN, PNP, Push-pull, External input
   The I/O terminals can be configured as: NPN, PNP, push-pull or external input (only output 2).

3. Normally open (N.O.)
   Normally closed (N.C.)
   The output can be configured to normally open or normally closed.

4. Timer function
   It is possible to activate different timer functions: ON delay, OFF delay, ON and OFF delay or one shot (leading edge or trailing edge).

5. Find my sensor
   The LEDs can be set to flashing alternating with 2Hz with 50% duty cycle in order to easily locate the sensor.

Additional logging functions

The Carlo Gavazzi capacitive IO-Link sensors offer additional logging functions for advanced diagnostics mechanisms making both real-time and historic data available.

6. Power cycles
   Counts and store how many times the sensor has been powered up since its creation.

7. Operation hours
   Counts and store number of hours of power connected since its creation.

8. Operation cycle
   Number of sensor detections (SSC1) since its creation.

9. Temperature measuring
   Two different specifics are measured: The lowest temperature the sensor has been exposed to since 1. its creation (stored in sensor) 2. since last power-up.

10. Temperature Logging
    Two different specifics are logged: The highest temperature the sensor has been exposed to since 1. its creation (stored in sensor) 2. since last power-up.
### Selectable output/input functions

11. Filter scaler
It is a stabilising filter that increases
the immunity of the variation of the
sensor’s measurements and media.
The detection filter can be set to
measure the average value of
additional 1 to 255 measurements.

12. External input
The external input can be controlled by
outputs from sensors or PLC’s.

13. Temperature alarm
The sensor can be configured to give
an alarm if the temperature exceeds or
drops below a preset value (Tmax or
Tmin).

14. SSC1
The Switching Signal Channel 1
(SSC1) output can be configured to the
following four detection modes: Single-
point mode, two-point mode, windows
mode and adjustable hysteresis.
Two individual setpoints and hysteresis
can be set.

15. SSC2
The Switching Signal Channel 2
(SSC2) output can be configured to the
same modes as SSC1.
Two individual setpoints and hysteresis
can be set.

16. Switch point mode
SSC1 and SSC2 can be configured to
single-point mode, two-point mode,
windows mode, adjustable hysteresis.

17. Logic functions
In the logic function block the selected
signals from the input selector can be
added a logic function directly without
using a PLC – making decentral
decisions possible.
The logic functions available are:
AND, OR, XOR and Gated SR-FF.

18. Analogue output
16 bit Analogue Output by IO-Link
representing the Dielectric value
measured by the sensor.

19. Quality of run
The quality of run value informs about
the actual sensing performance
compared to the set-points of the
sensor, the higher the value the
better quality of detection.

19. Quality of teach
The quality if teach value informs about
how well the actually teach procedure
was done, meaning the margin
between the actual setpoints and the
environmental influence of the sensor.

### The advantages of the LD30 series in stainless steel

- Highest degree of protection

  The IP69K rating is for applications where
  high pressure and high temperature wash-
down is used to sanitize equipment.

  The LD30 Stainless steel housing with-
  stands high-pressure cleaning processes
  with chemicals, and the sensor’s object
detection is continuous and reliable even
in the harshest conditions. Certified by
Ecolab.
**IO-Link photoelectric laser sensors**

**Time of Flight principle**

*Time of Flight (ToF) principle*

In the ToF detection principle, the sensing distance is calculated from the time the light is emitted from the sensor, until the reflected light beam is received by the sensor.

*Why ToF detection principle is so stable?*

As the distance measured is based upon the time elapsed, the detection is not affected by the object colour. The sensor can detect white objects or black objects such as black car tiers. The sensing distance hardly influences by the strength of the light detected.

**Features and functions**

**LD30 series in plastic**

- **LED**
  - TPU

- **Sensing window**
  - PMMA

- **Laser inscription**
  - Permanent readability

- **Housing**
  - ABS

**Features**

- Potentiometer on the back side.
- 4-pin M8 plug or 4-wire PVC cable, 2 m.

**LD30 series in stainless steel**

- **LED**
  - PES

- **Sensing window**
  - PPSU

- **Laser inscription**
  - Permanent readability

- **Housing**
  - Stainless steel AISI316L

**Features**

- High-pressure cleaning.
- Resistant to aggressive cleaning agents.
- ECOLAB® certification for the food industry.
- 4-pin M8 plug or 4-wire PVC cable, 2 m.

**Materials**

- ABS = Acrylnitril-Butadien-Styrol
- PMMA = Polymethylmethacrylat
- POM = Polyoxymethylen
- TPU = Thermoplastisches Polyurethan
- PEEK = Polyetheretherketon
- PES = Polyethersulfon
- PPSU = Polyphenylensulfon

All versions are available as cable or M12 plug versions.
The Time of Flight photoelectric laser IO-Link sensor family

<table>
<thead>
<tr>
<th>Housing</th>
<th>Plastic (ABS)</th>
<th>Stainless steel (AISI316L)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Connection</td>
<td>Plug</td>
<td>Cable</td>
</tr>
<tr>
<td>Code</td>
<td>LD30CNB110BPM5IO</td>
<td>LD30CNB110BPA2IO</td>
</tr>
<tr>
<td>Sensing distance</td>
<td>0-1000 mm</td>
<td></td>
</tr>
<tr>
<td>Adjustable distance</td>
<td>50-1000 mm</td>
<td></td>
</tr>
<tr>
<td>IO-Link</td>
<td>Transmission type: COM2 [38.4 k baud], Revision: 1.1, SDCl standard: IEC 61131-3, Profiles: Smart sensor [Process Data Variable, Device Identification], SIO mode: Yes, Required master port type: A, Min. process cycle time [ms]: 5</td>
<td></td>
</tr>
<tr>
<td>Selectable function output 1</td>
<td>NPN, PNP or Push-Pull</td>
<td></td>
</tr>
<tr>
<td>Selectable function output 2</td>
<td>NPN, PNP, Push-Pull, External input or External teach</td>
<td></td>
</tr>
<tr>
<td>Diagnostic</td>
<td>Operation hours, Power cycles, Detection cycles max. and min. Temperatures, Short-circuit, No of Parameter change.</td>
<td></td>
</tr>
<tr>
<td>Logic functions</td>
<td>AND, OR, XOR, Gated SR-FF</td>
<td></td>
</tr>
<tr>
<td>Timer functions</td>
<td>ON Delay, OFF delay, ON+OFF delay and One shot</td>
<td></td>
</tr>
<tr>
<td>Sensitivity control</td>
<td>Trimmer input, teach by wire or by IO-Link</td>
<td></td>
</tr>
<tr>
<td>Rated operational voltage (U_B)</td>
<td>10 to 30 V DC (ripple included)</td>
<td></td>
</tr>
<tr>
<td>No load supply current (I_L)</td>
<td>≤ 25 mA @ U_B, min, ≤ 12 mA @ U_B max</td>
<td></td>
</tr>
<tr>
<td>Minimum operational current (I_m)</td>
<td>≥ 0.5 mA</td>
<td></td>
</tr>
<tr>
<td>Off-State current (I_OS)</td>
<td>≤ 100 mA</td>
<td></td>
</tr>
<tr>
<td>Voltage drop, digital (U_d)</td>
<td>≤ 1.0 V DC @ 100 mA DC</td>
<td></td>
</tr>
<tr>
<td>Capacitive load</td>
<td>100 nF @ 100 mA</td>
<td></td>
</tr>
<tr>
<td>Frequency of operating cycles (f)</td>
<td>5 Hz</td>
<td></td>
</tr>
<tr>
<td>Response time t_ON or t_OFF</td>
<td>100 ms</td>
<td></td>
</tr>
<tr>
<td>Power on delay (t_v)</td>
<td>≤ 300 ms</td>
<td></td>
</tr>
<tr>
<td>Hysteresis (adjustable by IO-Link)</td>
<td>Manual: 5-2000 mm (default 50 mm)</td>
<td></td>
</tr>
<tr>
<td>Led indications</td>
<td>Yellow LED steady: Output ON and signal stability.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Yellow LED flashing: Output short-circuit, timer indication and teach.</td>
<td></td>
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<tr>
<td></td>
<td>Green LED steady: Power ON and signal stability.</td>
<td></td>
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<tr>
<td></td>
<td>Green LED flashing: IO-Link mode.</td>
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<tr>
<td></td>
<td>Yellow LED and green LED flashing: Find my sensor</td>
<td></td>
</tr>
<tr>
<td>Sensor protection</td>
<td>Short circuit [A], reverse polarity [B] and transients [C]</td>
<td></td>
</tr>
<tr>
<td>Electrostatic discharge</td>
<td>Contact discharge: ±4 kV. Air discharge: ±8 kV [IEC 61000-4-2]</td>
<td></td>
</tr>
<tr>
<td>Electrical fast transients/burst</td>
<td>±2kV/5kHz using the capacitive coupling clamp [IEC 61000-4-4]</td>
<td></td>
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<tr>
<td>Surge</td>
<td>1kV (with 500Ω)</td>
<td></td>
</tr>
<tr>
<td>Wire conducted disturbances</td>
<td>10 Vrms [IEC 61000-4-6]</td>
<td></td>
</tr>
<tr>
<td>Power - frequency magnetic fields</td>
<td>30 A/m, 38 µT (IEC 61000-4-8)</td>
<td></td>
</tr>
<tr>
<td>Radiated RF electromagnetic fields</td>
<td>10 V/m [IEC 60664-4-3]</td>
<td></td>
</tr>
<tr>
<td>Vibration</td>
<td>10 to 150 Hz, 1 mm/15G in X,Y and Z direction (EN 60666-2-6)</td>
<td></td>
</tr>
<tr>
<td>Shock</td>
<td>30G/11 ms, 6 positive and 6 negative in X,Y and Z direction (EN 60666-2-27)</td>
<td></td>
</tr>
<tr>
<td>Drop test</td>
<td>2 times from 1m, 100 times from 0.5m (EN 60666-2-31)</td>
<td></td>
</tr>
<tr>
<td>Degree of protection</td>
<td>IP67 [IEC60529; EN60529-1]; IP68, IP69K [IEC60529; EN60529-1; DIN40050-9]</td>
<td></td>
</tr>
<tr>
<td>NEMA type</td>
<td>1 (NEMA 250); 2, 4, 4X, 5, 6, 6P (NEMA 250)</td>
<td></td>
</tr>
<tr>
<td>Ambient temperature</td>
<td>Operating: -25 to +50°C [13 to +122°F]; Storage: -40 to +70°C (-40 to +158°F)</td>
<td></td>
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<tr>
<td>CE marking</td>
<td>According to EN 60947-5-2</td>
<td></td>
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<tr>
<td>Approvals</td>
<td>cULus (UL508 + C22.2), Class 1 laser (IEC60825-1:2014), ECOLAB</td>
<td></td>
</tr>
<tr>
<td>Overvoltage category</td>
<td>III [IEC60664; EN 60947-1]; Class 1 laser (IEC60825-1:2014), ECOLAB</td>
<td></td>
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<tr>
<td>Pollution degree</td>
<td>3 (EN60947-1)</td>
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</tr>
<tr>
<td>MTTF</td>
<td>132.2 years @ 40°C (104°F)</td>
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<tr>
<td></td>
<td>132.3 years @ 40°C (104°F)</td>
<td></td>
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<tr>
<td>Cable</td>
<td>PCV, black, 2 m, Ø=3.3 mm</td>
<td></td>
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<tr>
<td>Connector</td>
<td>M8, 4-pin, male</td>
<td></td>
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<tr>
<td>Dimensions</td>
<td>Cable and Plug: 10.8 x 30 x 20 mm</td>
<td></td>
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<tr>
<td></td>
<td>Cable and Plug: 11 x 31.5 x 21 mm</td>
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</tr>
<tr>
<td>Weight incl. packaging</td>
<td>Cable version ≤ 50 g, Plug version ≤ 20 g</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Cable version ≤ 100 g, Plug version ≤ 65 g</td>
<td></td>
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<tr>
<td>Accessories, additional</td>
<td>Connectors: CO..54NF-...-series</td>
<td></td>
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<tr>
<td></td>
<td>Mounting brackets: APD30MB2</td>
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</table>