Inductive Linear Positioning Sensors

# LPD Series

INSTRUCTION MANUAL

TCD230053AG

Autonics

Thank you for choosing our Autonics product.
**Read and understand the instruction manual and manual thoroughly before using the product.**
**For your safety, read and follow the below safety considerations before using.**
**For your safety, read and follow the considerations written in the instruction manual, other manuals and Autonics website.**
Keep this instruction manual in a place where you can find easily.
The specifications, dimensions, etc. are subject to change without notice for product improvement. Some models may be discontinued without notice.
Follow Autonics website for the latest information.

## Safety Considerations

- Observe all 'Safety Considerations' for safe and proper operation to avoid hazards.
- ⚠ symbol indicates caution due to special circumstances in which hazards may occur.

**⚠ Warning** Failure to follow instructions may result in serious injury or death.

**01. Fail-safe device must be installed when using the unit with machinery that may cause serious injury or substantial economic loss.(e.g. nuclear power control, medical equipment, ships, vehicles, railways, aircraft, combustion apparatus, safety equipment, crime/disaster prevention devices, etc.)**
Failure to follow this instruction may result in personal injury, economic loss or fire.
**02. Do not use or store the unit in the place where flammable/explosive/ corrosive gas, high humidity, direct sunlight, radiant heat, vibration, impact or salinity may be present.**
Failure to follow this instruction may result in explosion or fire.
**03. Do not disassemble or modify the unit.**
Failure to follow this instruction may result in fire.
**04. Do not connect, repair, or inspect the unit while connected to a power source.**
Failure to follow this instruction may result in fire.
**05. Check 'Connections' before wiring.**
Failure to follow this instruction may result in fire.

**⚠ Caution** Failure to follow instructions may result in injury or product damage.

**01. Use the unit within the rated specifications.**
Failure to follow this instruction may result in fire or product damage.
**02. Use a dry cloth to clean the unit, and do not use water or organic solvent.**
Failure to follow this instruction may result in fire.

## Cautions during Use

- Follow instructions in 'Cautions during Use'. Otherwise, it may cause unexpected accidents.
- Power supply should be insulated and limited voltage/current or Class 2, SELV power supply device.
- Use the product, after about 15 min of supplying power. Temperature compensation stabilizes the device. If device stabilization is not completed, sensing performance deteriorate.
- When teaching, the [Teach-in] button axis must be pressed correctly for operation. Do not press the button with a sharp object. If the button is damaged, there may be operational or functional problems.
- Wire as short as possible and keep away from high voltage lines or power lines, to prevent surge and inductive noise.
  Do not use near the equipment which generates strong magnetic force or high frequency noise (transceiver, etc.).
  In case installing the product near the equipment which generates strong surge (motor, welding machine, etc.), use diode or varistor to remove surge.
- This unit may be used in the following environments.
  - Indoors (UL Type 1 Enclosure)
  - Altitude max. 2,000 m
  - Pollution degree 3
  - Installation category II

## Cautions for Installation

### ■ Environment

- Install the unit correctly with the usage environment, location, and the designated specifications.
- Install no objects other than the sensing target in the detection width area. For the area, refer to the product manual.

### ■ Wire

- Do NOT impact with a hard object or excessive bending of the wire lead-out. It may cause damage the water resistance.
- In case of IO-Link mode, the cable length between the unit and the IO-Link Master should be under 20 m.
- Fasten the connector not to shown the thread.
- Fasten the vibration part with PTFE tape.

### ■ Tightening torque

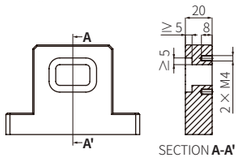
- Connector - M8: ≤ 0.2 N m
  M12: 0.39 to 0.49 N m
- M4 × 14 bolt (LPD-14-□-□): 0.5 N m
  (LPD-103-□-□): 3 N m

### ■ Influence by surrounding metals

When devices are mounted on metallic panel, it must be prevented devices from being affected by any metallic object except target.
To prevent malfunction due to surrounding metal, install as follows.

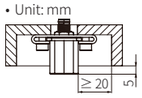
**• LPD-14-□-□**

Maintain a metal-free area of approximately 5 mm along all sides of the aspect of the product.
If the detection object is not a steel for general structure (SS275, SM45C, etc.), attach the target (TG-LPD-T8, sold separately) to the detection object and use it.
• Unit: mm




**• LPD-103-□-□**

Maintain a metal-free area of approximately 20 mm along all sides of the aspect of the product.
• Unit: mm




## Ordering Information

This is only for reference, the actual product does not support all combinations.
For selecting the specified model, follow the Autonics website.

LPD - ❶ - ❷ - ❸

**❶ Detection range**
14: 14 mm
103: 103 mm

**❷ Output**
No mark: Voltage + Current
V: Voltage
C: Current
IL2: IO-Link COM2

**❸ Connection type**
No mark: Cable type
W8: Cable M8 connector type
W12: Cable M12 connector type
CM8: M8 connector type
CM12: M12 connector type

## Product Components

| Model | LPD-14-□-□ | LPD-103-□-□ |
|---|---|---|
| Product components | Product, Instruction manual | |
| M4 × 14 bolt | × 2 | × 4 |
| Bracket | - | × 2 |

## Sold Separately

- M8 Connector cable: CID□408-□, CLD□408-□, C□D4-□EB, C□DH4-□EB
- M12 Connector cable: C□D4-□, C□DH4-□
- Target: TG-LPD-T8

## Software

Download the installation file and the manuals from the Autonics website.

### ■ atIOLink

atIOLink with purposes for setting, diagnosis, and maintenance of IO-Link device via IODD file is provided as the Port and Device Configuration Tool (PDCT).

- IODD (IO Device Description)

This file contains information such as manufacturer information, process data, diagnostic data, and parameter setting of a device using IO-Link communication.
By uploading the IODD file to PDCT Software, you can check the setting and communication data according to the user interface.
Download the IODD file from the Autonics website.

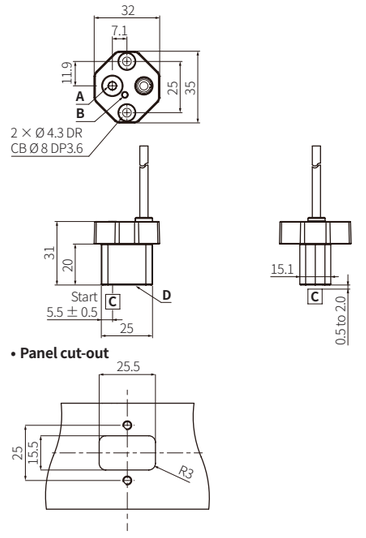
## Dimensions

- Unit: mm, For the detailed, follow the Autonics website.

| | |
|---|---|
| A 01) | Teach-in button |
| B | Indicator (green / red LED) |
| C | Detection object |
| D | Sensing part |

01) For Voltage + current / Voltage / Current output model

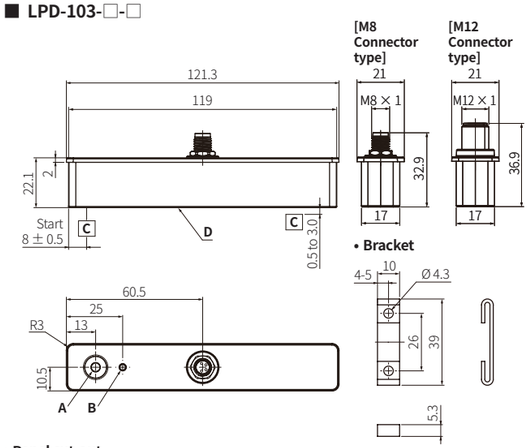
### ■ LPD-14-□-□



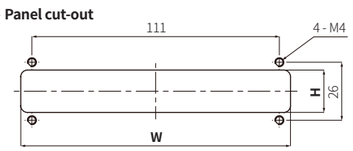

**• Panel cut-out**




### ■ LPD-103-□-□



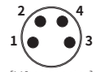

**• Panel cut-out**




| | M8 | M12 |
|---|---|---|
| H | ≥ 19 | |
| W | ≥ 121 | |

## Connections

| Pin | Color | Voltage / Current output | Voltage + Current output | IO-Link output |
|---|---|---|---|---|
| 1 | Brown | VCC | | |
| 2 | White | N.C | I OUT | N.C |
| 3 | Blue | GND | | |
| 4 | Black | V OUT / I OUT | V OUT | C/Q |

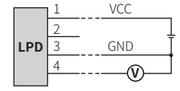


[M8 connector]

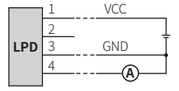
[M12 connector]

## Wiring Diagram

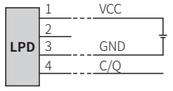
### ■ LPD-14-V-□



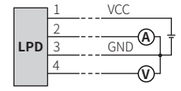

### ■ LPD-14-C-□



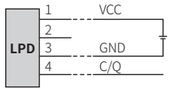

### ■ LPD-14-IL2-□




### ■ LPD-103-□

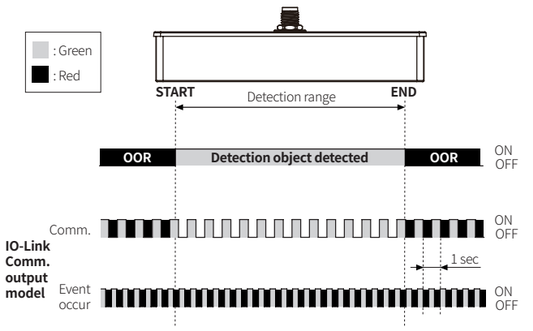



### ■ LPD-103-IL2-□



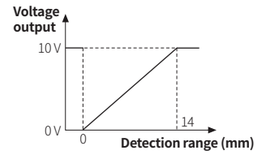

## Indicator

**• START**, **END** points are based on the center of the detection object.

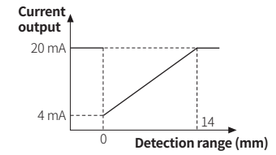



## Analog Output Feature Data

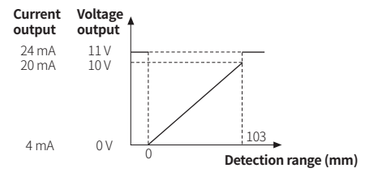
### ■ LPD-14-V-□




### ■ LPD-14-C-□




### ■ LPD-103-□



## Specifications

| Model | LPD-14-V-□ | LPD-14-C-□ | LPD-14-IL2-□ | LPD-103-□ | LPD-103-IL2-□ |
|---|---|---|---|---|---|
| Detection range | 14 mm | | | 103 mm | |
| Detection object distance | 0.5 to 2.0 mm | | | 0.5 to 3.0 mm | |
| Function | Positioning | | | | |
| Detection type | Inductive | | | | |
| Linearity | ± 250 μm | | | ± 400 μm | |
| Repeatability | ± 80 μm | | | | |
| Response time | ≤ 30 ms | | | | |
| Power supply | 15 - 30 VDC⎓ , Rated voltage: 24 VDC⎓ | | | | |
| Max. power ripple | 10 % of rated voltage | | | 10 % of rated voltage | 15 % of rated voltage |
| Output spec. [01] | 0 - 10 VDC⎓ | DC 4 - 20 mA | IO-Link COM2 | 0 - 10 VDC⎓ DC 4 - 20 mA | IO-Link COM2 |
| OOR [02] output | 10 VDC⎓ | 20 mA | IO-Link COM2 | 11 ± 0.5 VDC⎓ DC 24 ± 2.5 mA | IO-Link COM2 |
| Load resistance | ≥ 2,000 Ω | ≤ 500 Ω | - | Voltage: ≥ 2,000 Ω Current: ≤ 500 Ω | - |
| Current consumption (no load) | ≤ 20 mA | | | ≤ 30 mA | ≤ 35 mA |
| Insulation resistance | ≥ 100 MΩ (500 VDC⎓ megger) | | | | |
| Dielectric strength | Between the charging part and the case: 500 VAC~ 50 / 60 Hz for 1 min | | | | |
| Vibration | 1.0 mm double amplitude at frequency 10 to 55 Hz in each X, Y, Z direction for 30 min. | | | | |
| Shock | Half-sinus, 30 g , 11 ms (EN 60068-2-27, Shock) | | | | |
| Protection circuit | Output short over current protection circuit, reverse polarity protection circuit | | | | |
| Ambient temp. [03] | -25 to 70 °C, storage: -25 to 70 °C (no freezing or condensation) | | | -25 to 85 °C, storage: -25 to 85 °C (no freezing or condensation) | |
| Ambient humi. | 35 to 85 %RH, storage: 35 to 85 %RH (no freezing or condensation) | | | | |
| Protection rating | IP67 (IEC standard) | | | | |
| Standard detection object material | Steel for general structure (SS275, SM45C, etc.). | | | | |
| Material | Housing, sensing part: PBT | | | | |
| Certification | CE KC cULus IO-Link [04] | | | | |

01) For more information, refer to 'Analog Output Feature Data'.
02) Out of Range. When there is no detection object within the detection range or teaching range
03) UL approved ambient temperature: 70 °C
04) It is applied to IO-Link communication output model.

| Model | LPD-14-□-□ | | | LPD-103-□-□ | |
|---|---|---|---|---|---|
| Connection type | Cable type | Cable connector type | | Connector type | |
| Connector spec. | - | M8 4-pin plug | M12 4-pin plug | M8 4-pin plug | M12 4-pin plug |
| Cable spec. | Ø 4 mm, 4-wire (oil resistant PVC) | Ø 4 mm, 4-wire (oil resistant PVC) | | - | |
| Cable length | 2 m | 300 mm | | | |
| Wire spec. | AWG 23 (0.08 mm, 60-core) | AWG 23 (0.12 mm, 50-core) | AWG 23 (0.08 mm, 60-core) | | |
| Insulator diameter | Ø 1.28 mm | Ø 1.6 mm | Ø 1.28 mm | | |
| Unit weight (package) | ≈ 67.74 g (≈ 76.7 g) | ≈ 25.33 g (≈ 50.34 g) | ≈ 33.06 g (≈ 42.6 g) | ≈ 49.4 g (≈ 74.8 g) | ≈ 53.5 g (≈ 79.0 g) |

## Communication Interface

### ■ IO-Link

| | |
|---|---|
| Version | Ver. 1.1 |
| Class | Class A |
| Baud rate | COM 2 (38.4 kbps) |
| Min. cycle time | 2.3 ms |
| Data length | PD: 2 byte, OD: 1 byte (M-sequence: TYPE_2_2) |
| Vendor ID | 899 (0x383) |

## Parameter Index

It is applied to IO-Link communication output model.

### ■ Process data

• The current data value is displayed in real time.

| | Bit 7 | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 |
|---|---|---|---|---|---|---|---|---|
| Byte0 (PD0) | Distance Data | | | | | | | |
| Byte1 (PD1) | Distance Data | | | | - | - | - | OOR Status Flag |

| Parameter | Description | Setting range | Type |
|---|---|---|---|
| Distance Data | Outputs the position of the detected object as specific 12 bit. | 0 to 4,095 | UInteger |
| OOR Status Flag | Indicates whether OOR status is present. | 0: OFF<br>1: ON | Boolean |

### ■ Identification menu

• The device's manufacturer information and device information is displayed.
It includes additionally information of companies and devices from the IO-Link standard.

| Index hex. | Index dec. | Parameter | Description | Type | Access |
|---|---|---|---|---|---|
| 0x10 | 16 | Vendor Name | Manufacturer name | String | RO |
| 0x11 | 17 | Vendor Text | Manufacturer description | String | RO |
| 0x12 | 18 | Product Name | Product name | String | RO |
| 0x13 | 19 | Product ID | Product ID | String | RO |
| 0x14 | 20 | Product Text | Product description | String | RO |
| 0x15 | 21 | Serial Number | Product serial number | String | RO |
| 0x16 | 22 | H/W Version | Hardware version | String | RO |
| 0x17 | 23 | F/W Version | Firmware version | String | RO |
| 0x18 | 24 | Application specific tag | Application program tag | String | RW |

### ■ Observation menu

• The device setting value is displayed.

| Index hex. | Index dec. | Subindex | Parameter | | Description | Access |
|---|---|---|---|---|---|---|
| 0x28 | 40 | - | Process Data Input | | Last detected object position | RO |
| 0x40 | 64 | - | Original Position Data | | Position of detection object before teaching | RO |
| 0x41 | 65 | - | Teaching Position Data | Position | START, END point setting value | RO |
| | | 1 | | START | START point teaching position | RO |
| | | 2 | | END | END point teaching position | RO |
| 0x47 | 71 | - | Operating Hours | | Device operating time | RO |

### ■ Parameter menu

• Product settings such as reset and lock can be changed according to the user environment.

| Index hex. | Index dec. | Subindex | Parameter | | Description | Setting range | Default | Type | Access |
|---|---|---|---|---|---|---|---|---|---|
| 0x2 | 2 | - | System Command | | Factory default reset | 130: Restore factory setting | - | UInteger | WO |
| 0xC | 12 | - | Device Access Locks | Device | Device lock settings | Data Storage function lock settings | - | Record | RW |
| | | 2 | | Data Storage | Data Storage function lock settings | 0: unlock, 1: lock | 0 | Boolean | RW |
| 0x41 | 65 | - | Teaching Position Data | Position | START, END point setting value | START and END point teaching position settings | - | UInteger | RO |
| | | 1 | | START | START point teaching position | 15 to 4 bit: position | 0 | UInteger | RO |
| | | 2 | | END | END point teaching position | 15 to 4 bit: position | 0 | UInteger | RO |
| 0x42 | 66 | - | Teaching Setup | | Teaching Setup | 0: Idle, 1: setting start, 2: START point setting, 3: END point setting, 4: setting complete, 5: reset | 0 | Record | RW |
| 0x43 | 67 | - | Teaching Setup Status | | Teaching setting status | 0: Idle, 1: setting start, 2: START point setting, 3: END point setting, 4: setting complete, 5: reset, 6: error | 0 | UInteger | RO |
| 0x48 | 72 | - | User Customize Operating Time | | Operating time alarm setting | 1 to 13,107 hour | 13,107 | UInteger | RW |

### ■ Diagnosis menu

• The information about problems encountered during device operation is displayed.

| Index hex. | Index dec. | Parameter | Description | Type | Access |
|---|---|---|---|---|---|
| 0x25 | 37 | Detailed Device Status | Product Detailed Status | Record | RO |
| 0x28 | 40 | Process Data Input | Last detected object position | UInteger | RO |
| 0x47 | 71 | Operating Hours | Device operating time | UInteger | RO |

### ■ Events

• When an event occurs, the red-green indicator lights alternately flash.

| Code hex. | Code dec. | Event | Description | Type |
|---|---|---|---|---|
| 0x1801 | 6145 | Load Short Circuit or Output | Output short over current warning | Warning |
| 0x1802 | 6146 | Transceiver Overheating | Transceiver overheating warning | |
| 0x1804 | 6148 | Supply Under Voltage | Low voltage detection warning | |
| 0x1805 | 6149 | Operation Time Elapsed | Operation time alarm warning | |
| 0x1807 | 6151 | EEPROM Error | EEPROM error warning | |
| 0x1806 | 6150 | Parameter Setting Error | Parameter error | Error |

## Teaching

Set the detection range through teaching. It will be applied immediately once the teaching settings are completed.
• START, END positions can be set in forward / reverse direction.
• Teach so that the distance between START and END points satisfies the following. Otherwise, a teaching error occurs and set from '2. START point teaching'.
- LPD-14-□-□ : > 7 mm
- LPD-103-□-□ : > 51.5 mm

### ■ Voltage / Current / Voltage + Current output model

Teach using the [Teach-in] button. Press the button axis correctly to proceed with the teaching operation.
• If there is no [Teach-in] button input for 120 seconds after '1. Entering teaching mode', the settings are not saved and returns to RUN mode.

**• Teaching**

| No. | | Operation |
|---|---|---|
| 1 | Entering teaching mode | In RUN mode, place the detection object within the detection range where the green indicator turns ON. |
| | | Press the [Teach-in] button for 2 sec. |
| | | The green indicator flashes (1 Hz). |
| 2 | START point teaching | Place the detection object at the START point. |
| | | Press the [Teach-in] button once. |
| | | The green indicator flashes (2 Hz). |
| 3 | END point teaching [01] | Place the detection object at the END point. |
| | | Press the [Teach-in] button once. |
| | | Save the teaching position value and return to RUN mode. |

01) In case of a teaching error, the red indicator flashes (2 Hz).

**• Teaching reset**

| No. | | Operation |
|---|---|---|
| 1 | Entering teaching mode | In RUN mode, place the detection object within the detection range where the green indicator turns ON. |
| 2 | Reset | Press the [Teach-in] button for 10 sec. |
| | | The green indicator flashes (3 Hz) for approximately 5 sec. |
| 3 | Reset complete | The green indicator turns ON and operates in RUN mode. |

### ■ IO-Link Communication output model

Teach using software atIOLink parameter settings.
• If there is no input to Index 66 (Teaching Setup) for 120 seconds after '1. Entering teaching mode', the value of Index 67 (Teaching Setup Status) becomes 4 (setting complete). The settings are not saved and returns to RUN mode.

**• Teaching**

| No. | | Operation |
|---|---|---|
| 1 | Entering teaching mode | In RUN mode, place the detection object within the detection range where the green indicator flashes. |
| | | Write 1 (setting start) at Index 66. |
| | | Confirm that the Index 67 value is 1. |
| 2 | START point teaching | Place the detection object at the START point. |
| | | Write 2 (START point teaching) at Index 66. |
| | | Confirm that the Index 67 value is 2. |
| 3 | END point teaching [01] | Place the detection object at the END point. |
| | | Write 3 (END point teaching) at Index 66. |
| | | Confirm that the Index 67 value is 3. |
| 4 | Return to RUN mode | Write 4 (setting complete) at Index 66. |
| | | Confirm that the Index 67 value is 4. |

01) In case of a teaching error, 6 (error) is displayed in Index 67.

**• Teaching reset**

| No. | | Operation |
|---|---|---|
| 1 | Entering teaching mode | In RUN mode, place the detection object within the detection range where the green indicator flashes. |
| | | Write 1 (setting start) at Index 66. |
| | | Confirm that the Index 67 value is 1. |
| 2 | Reset | Write 5 (reset) at Index 66. |
| | | Confirm that the Index 67 value is 5. |

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