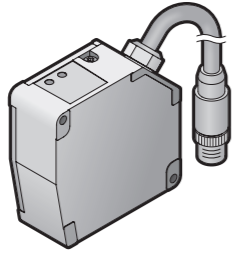


High-Accuracy Laser Displacement Sensor

CDX Series


OPTEX FA CO.,LTD.

- Thank you for purchasing this High-Accuracy Laser Displacement Sensor CDX Series.
- Before using this product, please read this manual carefully to ensure proper use.
- Read this manual thoroughly, and then keep this manual at hand so that it can be used whenever necessary.
- The warranty period of this product is one year after delivery. However, any fault attributable to natural disasters or any other similar disasters or modification or repair will be excluded from the scope of the warranty.
- When exporting a device in which this product is embedded to an EU nation*, the EU Battery Directive applies even to embedded devices, so we ask that you provide the following support.
 - When exporting a product to an EU nation*, include the latest instruction manual of this product. If it is not possible to include the instruction manual of this product, write the section <Symbol mark explanation> in the device's manual.
 - *: The term EU nation includes Switzerland, Ireland, Norway, Liechtenstein, and Turkey in addition to the member nations of EU.

Safety Precautions

Safety precautions for ensuring safe operation of this product are displayed as follows with the following symbols.

Precautions listed here describe important information about safety. Make sure to follow them accordingly.

Safety Symbols

| | | |
|--|----------------|---|
| | WARNING | Indicates that any improper operation or handling may result in moderate or minor injury, and in rare cases, serious injury or death. Also indicates a risk of serious property damage. |
| | CAUTION | Indicates that any improper operation or handling may result in minor injury or property damage. |

| WARNING | | |
|----------------|--|--|
| | | This product cannot be used as protective equipment for the purpose of protecting the human body. |
| | | Do not disassemble, repair, modify, deform under pressure, or attempt to incinerate this product. Doing so may cause injury or fire. |
| | | Do not use this product in water or in a location where it may be exposed to water. Do not use this product if wet. Doing so may cause a fire or damage the product. |
| | | This product is not explosion-proof and should not be used around flammable or explosive gases or liquids. Doing so may cause ignition resulting in an explosion or fire. |
| | | Do not use air dusters or any spray that uses flammable gas around the product or on the inside of the product. Doing so may cause ignition resulting in an explosion or fire. |
| | | Do not install this product in any of the following locations. Doing so may cause a fire, damage, or a malfunction. <ol style="list-style-type: none"> 1. Locations where dust, salt, iron powders, or vapor (steam) is present. 2. Locations subjected to corrosive gases or flammable gases. 3. Locations where oil or chemical splashes may occur. 4. Locations where heavy vibrations or impacts may occur. 5. Locations where the ambient temperature exceeds the rated range. 6. Locations subject to rapid temperature changes (or where condensation occurs). 7. Locations with strong electric or magnetic fields. 8. Outdoor locations or locations subject to direct light. |
| | | Do not use the product at voltages or with AC power supplies that exceed the rated voltage. Doing so may cause a fire or damage the product. |
| | | This is a class A product. In a domestic environment this product may cause radio interference, in which case the user may be required to take adequate measures. |
| | | This product is not intended for use with nuclear power, railways, aviation, vehicles, medical equipment, food-handling equipment, or any application where particular safety measures are required. Absolutely do not use this product for any of these fields. |
| | | This product cannot be used in applications that directly or indirectly detect human bodies for the purpose of ensuring safety. Do not use this product as a detection device for protecting the human body. |
| | | What to do in the event of a malfunction such as smoke being emitted from the product If you detect any malfunction including emission of smoke, abnormal smells or sounds, or the body becoming very hot, immediately stop operating the product and turn off the sensor power. Failure to do so may cause a fire. Repairing the product is dangerous and should in no way be performed by the customer. Contact an Optex FA sales representative for repairs. |
| | | What to do if water enters the product If water or any other liquid enters the product or the cable, immediately stop operating the product and turn off the power. Using the product in this condition may cause a fire. |

CAUTION

- Make sure to turn the power off before wiring the cable or connecting/disconnecting the connector. Connecting or disconnecting while energized may damage the product or cause electric shock.
- Do not wire with high voltage cables or power lines. Doing so may cause malfunction or damage by induction.
- Do not bend the cable when below the freezing point. This may cause the cable to break.
- Do not drop the product or subject the product to strong impacts. Doing so may damage the product.
- Follow the instructions in this manual or the specified instruction manual when wiring the product or the dedicated controller for the correct wiring method. Incorrect wiring can damage the product or the controller, or cause a malfunction.
- When disconnecting the connector, be careful not to touch the terminals inside the connector, and do not allow foreign objects to enter the connector.
- Install this product as far away as possible from high-voltage equipment, power equipment, equipment that generates large switching surges, inverter motors, welders, or any equipment that can be a source of noise.
- When connecting or disconnecting the cable, make sure to hold it by the connector portion, and do not apply excessive force to the cable.
- Do not touch the product or the cable with wet hands. Doing so may damage the product.
- Use the dedicated cable for connecting the product.
- Use of anything other than the dedicated cable may cause a malfunction or damage the product.
- Tighten the sensor head mounting screws (included screws or the like) with a tightening torque of no more than 0.8N·m. Excessive tightening torque may damage the sensor head.
- Use the product and dedicated controller within the rated ranges.
- Do not excessively twist or apply stress to a cable. Doing so may damage the cable or its connector.
- Install this product and dedicated controller securely. Failure to ensure secure installation may result in the products falling and becoming damaged.
- During operation, this product becomes very hot. Do not touch it for long time. Doing so may cause a low-temperature burn.
- Do not disassemble or modify this product. Using the product after it has been modified may cause induction and radiation interference.

Precautions for Laser Use

- This product emits a Class 1 visible laser beam that is compliant with JIS C6802 / IEC60825-1 laser product safety standards.
- If this product will be exported to the United States, approval must first be obtained from the FDA (Food and Drug Administration), the laser regulating body of the United States.
- A report for this product has been submitted to the CDRH (Center for Devices and Radiological Health).
- Do not look directly at the laser beam or intentionally shine the laser beam into another person's eyes. Doing so may have adverse effects on the eyes, including temporary blindness.
- If installing this product in your own equipment, ensure that the product is properly handled according to the laws and regulations of the relevant country or region.
- This product does not have a function that stops the emission of light from the laser during disassembly. Do not disassemble the product.

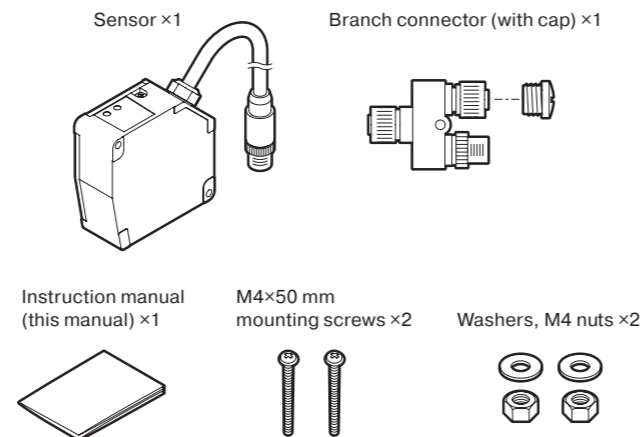
NOTICE

- After carefully considering the intended use, required specifications, and usage conditions, install and use the product within the specified ranges.
- All specifications may be changed without notice.
- When using this product, it is the responsibility of the customer to ensure necessary safety designs in hardware, software, and systems in order to prevent any threat to life, physical health, and property due to product malfunction or failure.
- Do not use this product for the development of weapons of mass destruction, for military use, or for any other military application. Moreover, if this product is to be exported, comply with all applicable export laws and regulations, including the "Foreign Exchange and Foreign Trade Act" and the "Export Administration Regulations," and carry out the necessary procedures pursuant to the provisions therein.
- Before using this product, fully examine the applicable environmental laws and regulations, and operate the product in conformity to such laws and regulations. Optex FA does not assume any responsibility for damages or losses occurring as a result of noncompliance with applicable laws and regulations.

About Export Trade Control Orders

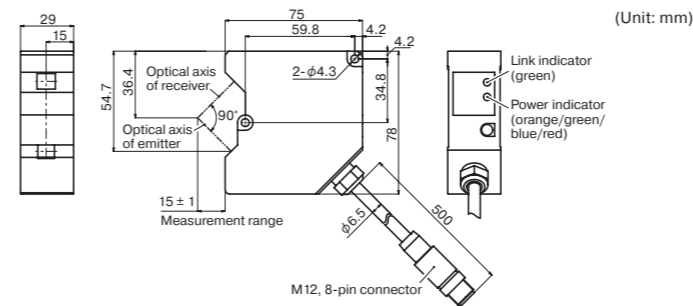
Part of this product corresponds to the measurement devices subject to Export Trade Control Order Appended Table 1 2-(12)-2. If this product is to be exported, carry out the necessary procedures such as filling out an application for export provided by the Japanese government.

1. Included Accessories

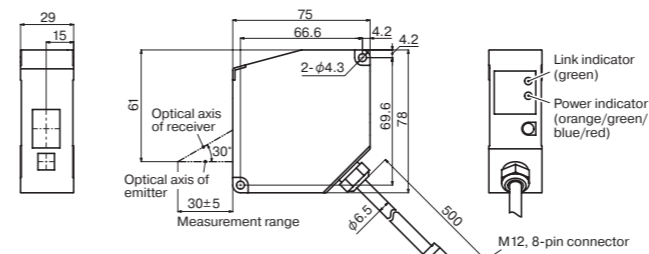


2. Dimensions

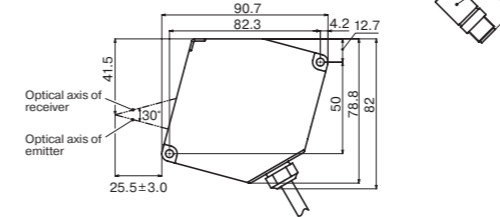
15mm type



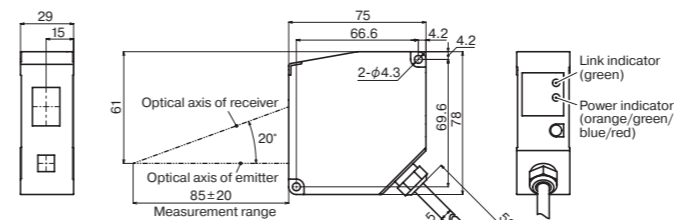
30mm type



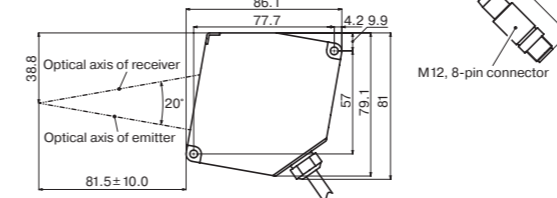
[Specular installation]



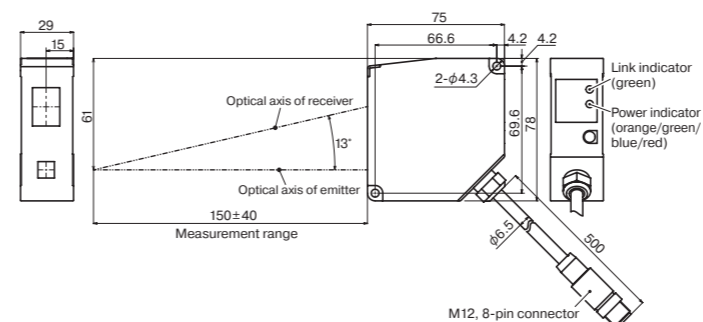
85mm type



[Specular installation]

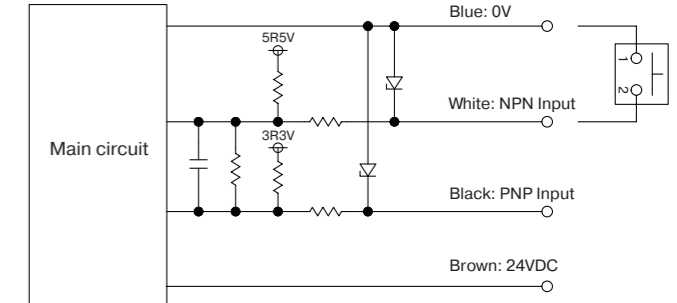


150mm type

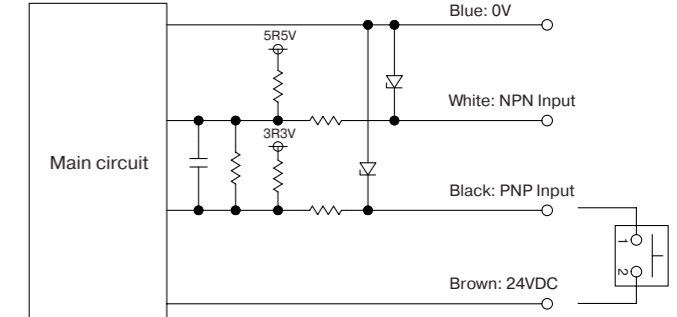


3. Input Circuit Diagram

NPN Input

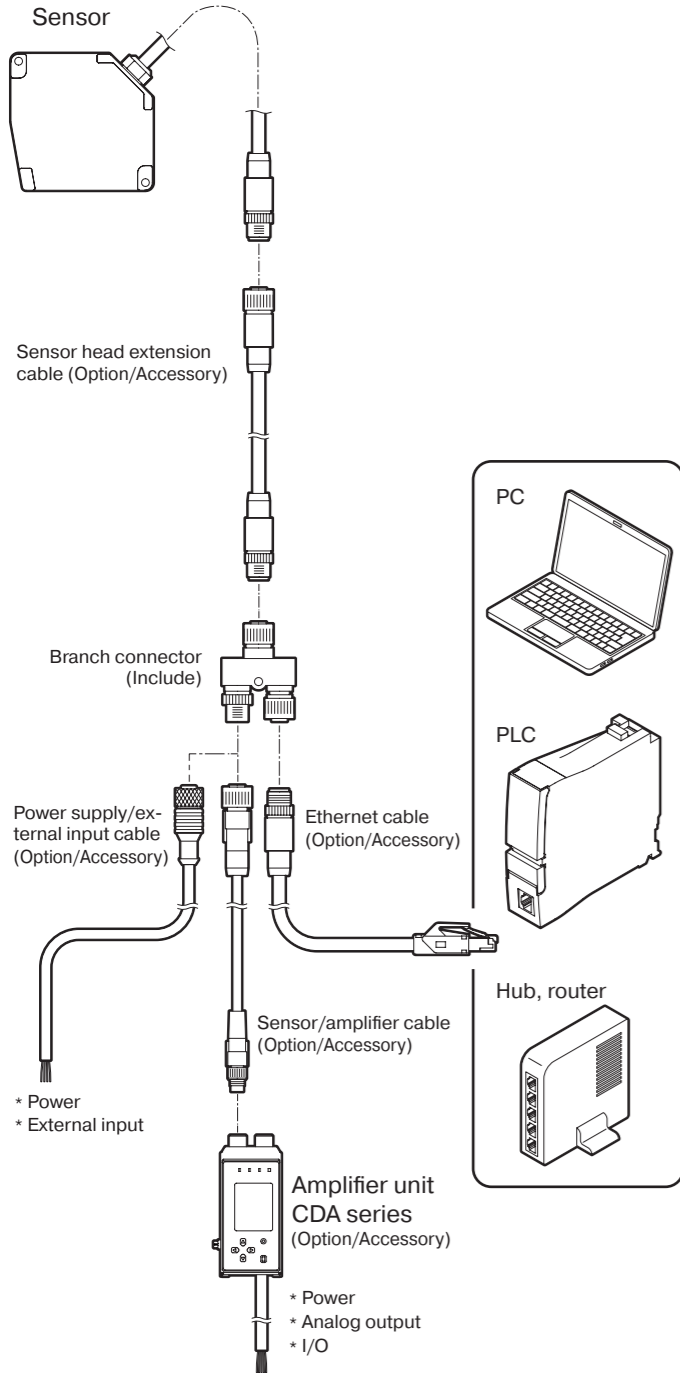


PNP Input



4. System Configuration

In addition to being usable as a standalone device, the product can be used by connecting to CDA series, a displacement sensor amplifier unit.

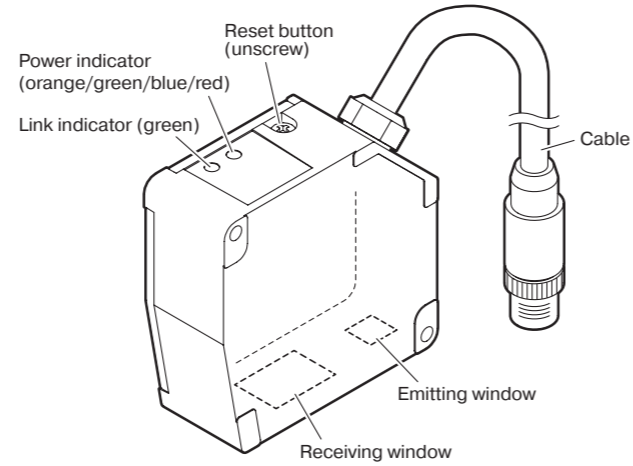


This product is set to DHCP by default, meaning IP address is obtained automatically under network which DHCP server is connected. When using this product without DHCP server, such as connecting directly to PC or PLC, press a reset button for 1 to 5 sec. Then, the IP address will be set to "192.168.0.10".

The IP address can also be changed by using a CDX seeker, can be downloaded from our website for free. For more details about a CDX seeker, please visit our website.

* DHCP: A protocol that automatically assigns the IP address and other required information to devices connected to the network.

5. Part Names



Link indicator, Power indicator

| Name | LED color and condition |
|-------------------|---|
| Power indicator | Blue (flash): Laser off |
| | Red (flash): No detection |
| | Red (2 flashes): Detected one surface but not the other side of surface |
| | Orange: Output ON |
| Green: Output OFF | |
| Link indicator | Green: Ethernet communication connected |

Reset button

| Name | Press time | Status LED | Description |
|--------------|-----------------|------------------------|---|
| Reset button | Less than 1 sec | No change | The change may not be applied if the button is not pressed long enough. |
| | 1~5 sec | Orange flashing (slow) | Change IP address to "192.168.0.10" |
| | 5~10 sec | Green flashing (slow) | Change IP address automatically by DHCP |
| | Over 10 sec | Green flashing (fast) | Initialize all settings |

* When pressing the reset button, do so lightly with a flat-tipped object (such as a 2mm Allen wrench or an M2 screw). Do not use a flathead screwdriver.

Cable

Connects to the sensor head extension cable or the branch connector.

Emitting window

The light from the laser is emitted here. Never look into this window.

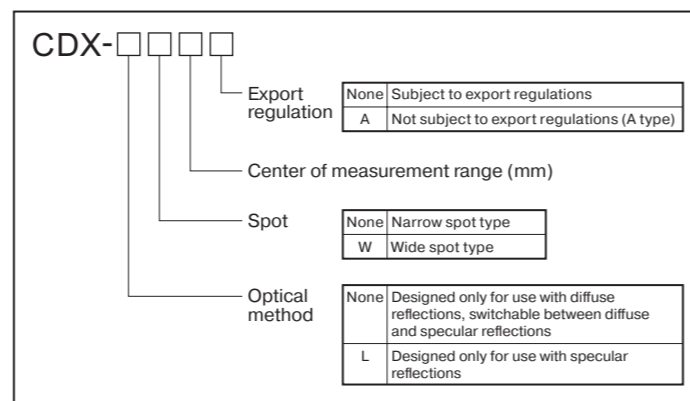
Receiving window

The reflected laser light enters this window. During measurement, ensure that this window is not blocked.

6. Specifications

Model naming rules

The CDX series model name is expressed as shown below.



Model Based Specifications

| Item | CDX-L15 | CDX-LW15 | CDX-30 | CDX-W30 |
|-------------------|-----------------------|-----------------------|-------------------|-------------------------|
| Measurement range | Diffuse installation | — | | 30±5mm |
| | Specular installation | 15±1mm | | 25.5±3.0mm |
| Spot size*1 | φ30μm | 30 × 1000μm | φ30μm | 30 × 1000μm |
| Linearity | Diffuse installation | — | | ±0.03% of F.S. (±3μm) |
| | Specular installation | ±0.05% of F.S. (±1μm) | | ±0.04% of F.S. (±2.4μm) |
| Resolution*2 | 0.01μm*3 | | 0.05μm*3 | |
| Repeat accuracy*4 | 0.01μm*3 | | 0.05μm*3 | |
| Temperature drift | -10 to +40°C | ±0.02% of F.S./°C | ±0.03% of F.S./°C | ±0.01% of F.S./°C |
| | +40 to +50°C | ±0.03% of F.S./°C | ±0.1% of F.S./°C | ±0.03% of F.S./°C |
| Weight | Approx. 300g | | Approx. 280g | |

| Item | CDX-85 | CDX-W85 | CDX-150 | CDX-W150 |
|-------------------|-----------------------|----------------------------|------------------------|--------------------------|
| Measurement range | Diffuse installation | 85±20mm | | 150±40mm |
| | Specular installation | 81.5±10.0mm | | — |
| Spot size*1 | φ70μm | 70 × 2000μm | φ120μm | 120 × 4000μm |
| Linearity | Diffuse installation | ±0.018% of F.S. (±7.2μm)*5 | ±0.015% of F.S. (±6μm) | ±0.03% of F.S. (±24μm)*6 |
| | Specular installation | ±0.03% of F.S. (±6μm) | ±0.03% of F.S. (±6μm) | — |
| Resolution*2 | 0.1μm*3 | | 0.2μm*3 | |
| Repeat accuracy*4 | 0.1μm*3 | | 0.2μm*3 | |
| Temperature drift | -10 to +40°C | ±0.01% of F.S./°C | | |
| | +40 to +50°C | ±0.03% of F.S./°C | | |
| Weight | Approx. 280g | | | |

<Measurement Condition>

Unless specified, specifications are based on following measurement conditions. Ambient temperature: 25°C (room temperature), Supply voltage: 24V DC, Sampling period: 50μs, Moving average: 256, Median filter: 31, Center of measurement range, Standard measured object (specular reflection: Aluminum vapor deposition mirror (85mm types), Glass (15mm, 30mm types), Diffuse reflection: Visible light shielding ceramic), Sensor head fixing jig: Aluminum

*1: Defined with center strength $1/e^2$ (13.5%). There may be leak light other than specified spot size. The sensor may be affected when there is highly reflective object close to the detection area.

*2: The smallest determinable step when changing the distance between the sensor and the target one step at a time (at moving average of 65536)

*3: This is limited to 0.25μm for products that are not subject to export regulations (A type).

*4: Peak to peak value of measurement in stationary state (at moving average of 65536)

*5: [Measurement range] 85 to 105mm: ±0.03% of F.S. (±12μm)

*6: [Measurement range] 150 to 190mm: ±0.04% of F.S. (±32μm)

Common specifications

| Item | CDX series |
|--------------------------|--|
| Light source | Medium (Wavelength) |
| | Pulse duration |
| | Pulse repetition rate |
| | Maximum output |
| Laser class | CLASS 1 (IEC/JIS/FDA*1) |
| Sampling period | 12.5/25/50/100/200/500/1000μs/Auto |
| Indicators | Link indicator (green)/Power indicator (orange/green/blue/red) |
| External input | Laser OFF, Hold/Reset, Storage start, Offset |
| Communication interface | Ethernet (100BASE-TX)/Corresponding to IEEE1588 |
| Supply voltage | 12 to 24V DC (±10%, including ripple) |
| Current consumption | 340mA (at 12V DC), 180mA (at 24V DC) |
| Environmental resistance | Degree of protection |
| | Ambient temperature/humidity |
| | Storage temperature/humidity |
| | Ambient illuminance |
| | Vibration resistance |
| Shock resistance | |
| Material | Main unit: Aluminum die cast, Emitting and Receiving window: Glass |
| Applicable regulations | EMC |
| | Environment |
| | Safety |
| Applicable standards | EN 60947-5-2: 2007/A1: 2012, IEC 60825-1: 2007, 2014 |

*1: This product is classified as Class 1 by IEC 60825-1: 2007 according to Laser Notice No.50, FDA Guidance Document.

This device complies with part 15 of the FCC Rules.

Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

*This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

Symbol mark explanation

- This symbol mark means that the product contain batteries.
- This symbol mark also means that disposing batteries as unsorted municipal waste are not allowed.
- The wasted-batteries that are not properly collected nor recycled may cause hazardous for human-health and environment.
- This product should be disposed properly at local community by its waste collection / recycling facilities under applicable laws and regulations.
- Your close attention is appreciated.



- Support for the China RoHS directive

10 For details on the support for the China RoHS (the Administrative Measure on the Control of Pollution Caused by Electronic Information Products), see the following website.
http://www.optex-fa.com/rohs_cn/

- Specifications are subject to change without notice
- For more information, questions and comments regarding product, please contact us below.

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<http://www.optex-fa.com>