# DL-1000 Series

PM1/2.5/10/CO/CO$_2$/HCHO/TVOC/NH$_3$/H$_2$S/
Temperature/Humidity/Dew Point Data Logger Module

## Features

- Able to record PM1/2.5/10, CO, CO$_2$, HCHO, TVOC, NH$_3$, H$_2$S, O$_2$, Temperature, Humidity, and Dew Point Measurements
- Non-dispersive Infrared (NDIR) CO$_2$ Sensor
- Electrochemical Sensor
- Up to 180,000 records with date and time stamps
- Web-based Configuration Interface
- Simple and Powerful Software Utility, iOS APP and Android App Included
- Supports the DCON, Modbus RTU/TCP, and MQTT Protocols
- Includes RS-485/Ethernet (PoE) Communication Interfaces
- Relay Output for Audible/Visual Alarm or IAQ Device Control
- Includes redundant power inputs: PoE (IEEE 802.3af, Class 1) and DC input
- IP 43 Protection Approval

## Introduction

The DL-1000 is a series of particle and gas measurement module that can measure the concentration of aerosols in the air, such as PM2.5, PM1, PM10 and the number of particles (0.3μm, 0.5μm, 1μm, 2.5μm, 5μm, 10μm). In addition, various fume concentrations related to human health can also be measured. For example, CO/CO$_2$/HCHO/NH$_3$/H$_2$S/TVOC. DL-1000 can record data and send alarm when concentration is too high. It can be used to record PM1/2.5/10, CO, CO$_2$, HCHO, TVOC, NH$_3$, H$_2$S, temperature, humidity and dew point information, including date and time stamps, and are able to store up to 180,000 downloadable records. Real-time data can be accessed from the DL-1000 series Data Logger from anywhere and at any time using the free Windows software, the iOS App or the Android App, as long as they are connected to the same local network as the Data Logger. It provides popular industrial protocols such as DCON, Modbus RTU, and Modbus TCP, as well as the emerging machine-to-machine (M2M)/IoT (Internet of Things) connectivity protocol-MQTT. The DL-1000 series Data Logger can be connected via widely used communication interfaces including RS-485, Ethernet and meaning that the device can be easily integrated into existing HMI or SCADA systems, and is easy to be maintained in a distributed control system. The DL-1000 series is designed for industrial applications in harsh environments that provides IP43 protection rating. The rugged RJ-45 ensures tight, robust connections, and guarantees reliable operation, even for applications that are subject to high vibration and shock.

## Multi-platform Remote Access Software

Real-time data from the DL-300 Data Logger can be accessed from anywhere and at any time using the DL-300 Utility, the iOS or Android App, or via a regular web browser, as long as they are connected to the same local network as the Data Logger.

## Simple and powerful utility

The DL-300 Utility can be used to configure the modules, monitor real-time data, group DL-1000 modules so that the status of distribution groups can be viewed and managed. The utility also allows the log data to be downloaded and exported to a .CSV file, and then it can be imported into any industry-standard software or spread sheet for analysis.
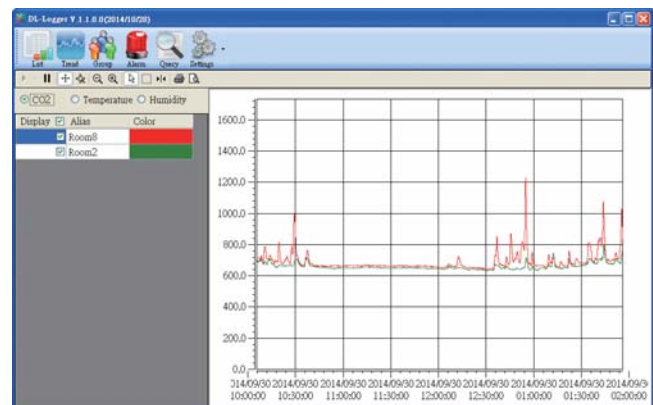
## ⊃ Replaceable Filter Patch (FLT-C001)

Generally, the PM2.5 measuring sensor on the market is usually installed in outdoor applications. Because the outdoor air is quite dusty, the measuring channel of PM2.5 sensor is easily clogged by aerosol, resulting in continued alarms for the heavy concentration. Due to the error data from the clogged sensor, this module is returned to the factory for repair. Downtime during the repair period often causes significant costs and losses. In order to solve this problem, ICP DAS designs the CL-200 series and DL-1000 series with replaceable patches, FLT-C001, which makes it easy for users to replace them without uninstall the devices. The cost of repair and time can be reduced by this innovated mechanical design.

## ⊃ Supports the MQTT Protocol for IoT Applications



FLT-C001
Filter Patch
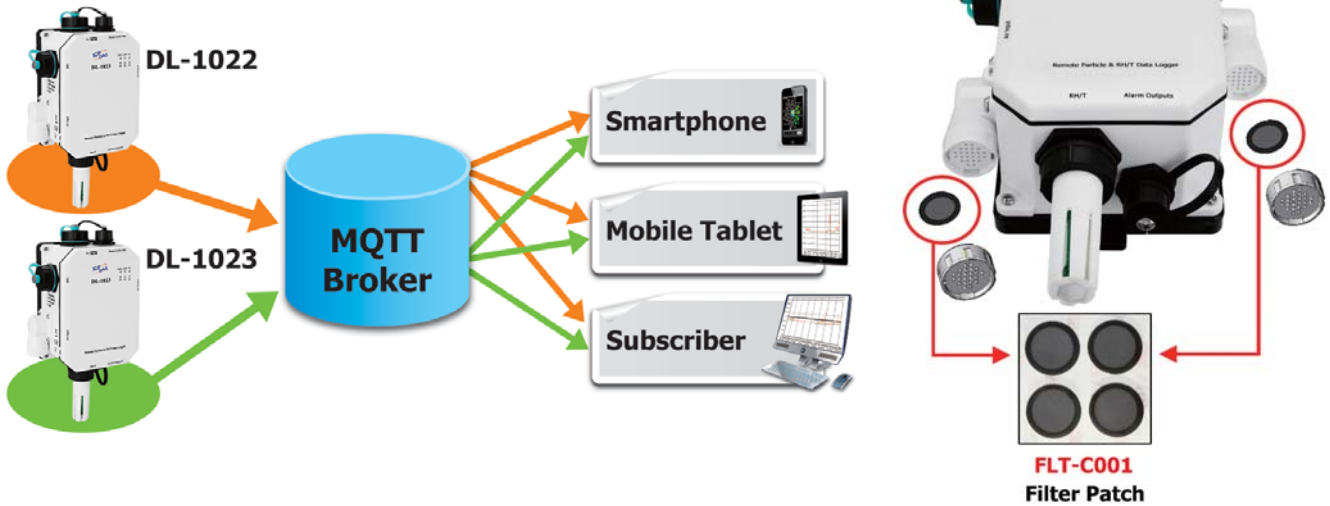
## ■ Applications

DL-1000 series products, with standard industrial communication protocol Modbus RTU/TCP, can integrate with smart city to achieve outdoor air quality monitoring such as $O_3$, CO, $CO_2$, $SO_2$, $NO_2$, TVOC, HCHO, and Particle Matter 1/2.5/10. Since these aerosol could accumulate around the sensor and would cause error record after using for a period of time, DL-1000 supports replaceable dust filter patches to easily change the patches inside the filter hood rather than uninstall the device.

## Outdoor Mobile Air Quality Detection Application

In developed countries, the air quality detection, statistics and evaluation is in urgent need for improvement. In a vast area, it can only rely on the vehicle to move to record status of air quality in the area, and to extract the off-line data and send it back. ICP DAS's DL-1000 series can integrate with our 3G/ 4G controllers to transmit data back to the control center wirelessly.



## Factory Gas Detection Application

In some factories, $H_2S$ is one of the harmful gases. Since the colorless and odorless are two characteristics quite hard to find or feel, sometimes the workers inside the factory get injured inevitably. Joint liability from the injury brings the company massive fines.

DL-1026 $H_2S$ detector module can be put on the spot. It is equipped with standard industrial protocols and with high flexibility to integrate information from devices and transmit it back to the control center. When the concentration of gas is too high, DL-1026 can also send alarm signals to inform relative personnel to evacuate people there.

# DL-10 X X - X

**Particle Matter Sensor**

1 : PM2.5
2 : PM2.5/1/10+Particle
3 : PM2.5/1/10+Particle+$CO$+$CO_2$
5 : $O_2$

PM Size :
0.3μm, 0.5μm, 1μm, 2.5μm,
5μm, 10μm

**Types of Gas Sensor**

0 : -
1 : CO
2 : $CO_2$
3 : $CO$+$CO_2$
4 : HCHO + TVOC
5 : $NH_3$
6 : $H_2S$
7 : HCHO
8 : TVOC

**Communication**

□ : Ethernet/PoE
WF : Wi-Fi

| DL-10xx Series | | Type of Sensor | | | | | | | | | Communication |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Particle | | Gas Sensor | | | | | | | |
| Basic Type | Wi-Fi | PM1/PM2.5/PM10/Particle | $O_2$ | CO | $CO_2$ | HCHO | $NH_3$ | $H_2S$ | TVOC | T & RH | |
| DL-1020 | DL-1020-WF | √ | - | - | - | - | - | - | - | √ | Basic type: RS-485 + Ethernet/PoE<br><br>WF type: Wi-Fi + RS-485 + Ethernet/PoE |
| DL-1021 | DL-1021-WF | √ | - | √ | - | - | - | - | - | √ | |
| DL-1022 | DL-1022-WF | √ | - | - | √ | - | - | - | - | √ | |
| DL-1023 | DL-1023-WF | √ | - | √ | √ | - | - | - | - | √ | |
| DL-1024 | DL-1024-WF | √ | - | - | - | √ | - | - | √ | √ | |
| DL-1025 | DL-1025-WF | √ | - | - | - | - | √ | - | - | √ | |
| DL-1026 | DL-1026-WF | √ | - | - | - | - | - | √ | - | √ | |
| DL-1027 | DL-1027-WF | √ | - | - | - | √ | - | - | - | √ | |
| DL-1028 | DL-1028-WF | √ | - | - | - | - | - | - | √ | √ | |
| DL-1034 | DL-1034-WF | √ | - | √ | √ | √ | - | - | √ | √ | |
| DL-1035 | DL-1035-WF | √ | - | √ | √ | - | √ | | - | √ | |
| DL-1036 | DL-1036-WF | √ | - | √ | √ | - | - | √ | - | √ | |
| DL-1037 | DL-1037-WF | √ | - | √ | √ | √ | - | - | - | √ | |
| DL-1038 | DL-1038-WF | √ | - | √ | √ | - | - | - | √ | √ | |
| DL-1050 | DL-1050-WF | - | √ | - | - | - | - | - | - | √ | |
| DL-1051 | DL-1051-WF | - | √ | √ | - | - | - | - | - | √ | |
| DL-1052 | DL-1052-WF | - | √ | - | √ | - | - | - | - | √ | |
| DL-1053 | DL-1053-WF | - | √ | √ | √ | - | - | - | - | √ | |
| DL-1054 | DL-1054-WF | - | √ | - | - | √ | - | - | √ | √ | |
| DL-1055 | DL-1055-WF | - | √ | - | - | - | √ | - | - | √ | |
| DL-1056 | DL-1056-WF | - | √ | - | - | - | - | √ | - | √ | |
| DL-1057 | DL-1057-WF | - | √ | - | - | √ | - | - | - | √ | |
| DL-1058 | DL-1058-WF | - | √ | - | - | - | - | - | √ | √ | |

## ■ System Specifications

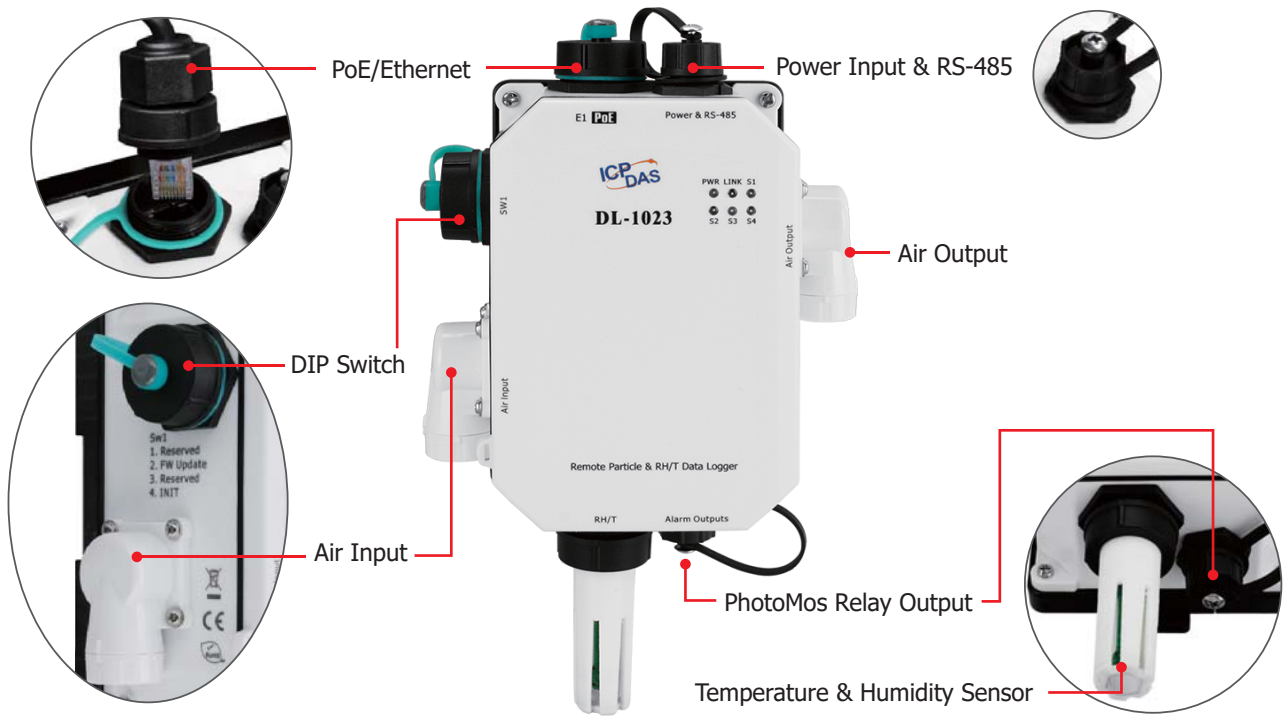| | | | |
|---|---|---|---|
| **Power** | Powered from Terminal Block | | +12 to +48 VDC |
| | Powered from PoE | | IEEE 802.3af, Class 1 (48 V) |
| | Power Consumption | PoE | 3.5 W MAX |
| | | Non-PoE | 3.3 W MAX |
| **System** | Alarm | | PM1/PM2.5/PM10/O$_2$/CO/CO$_2$/HCHO/TVOC/NH$_3$/H$_2$S/RH/Temperature |
| | Real Time Clock | | Yes |
| | Data Logger | | Yes, up to 180,000 records |
| | Relay Output | | PhotoMos Relay × 4, 100 VDC @ 1 A |
| **LED Indicators** | PWR | | Green for normal operation |
| | Link | | Green for the Ethernet-linked |
| | S1 ~ S4 | | Red for an alarm condition |
| **Environment** | Operating Temperature | | -20 to +50°C |
| | Storage Temperature | | -30 to +75°C |
| | Humidity | | 10 to 90% RH, Non-condensing |
| | Protection Rating | | IP43 |
| **Communication** | RS-485 Port | | Baud Rate = 1200 ~ 115200 bps |
| | Ethernet Port | | 10/100 Base-TX, 8-Pin RJ-45 x1 (Auto-negotiating, Auto-MDI/MDIX, LED indicators) |
| | Security | | IP filter (whitelist) and Password (web) |
| | Protocol | | Modbus RTU (RS-485), Modbus TCP (Ethernet) and MQTT (Ethernet) |
| | Dual Watchdog | | Yes, Module (2.3 sec), Communication (Programmable) |
| **Mechanical** | Installation | | DIN-Rail or Wall Mounting |
| | Dimensions (W x L x H) | | 130 mm x 211 mm x 70 mm |

## ■ I/O Specifications

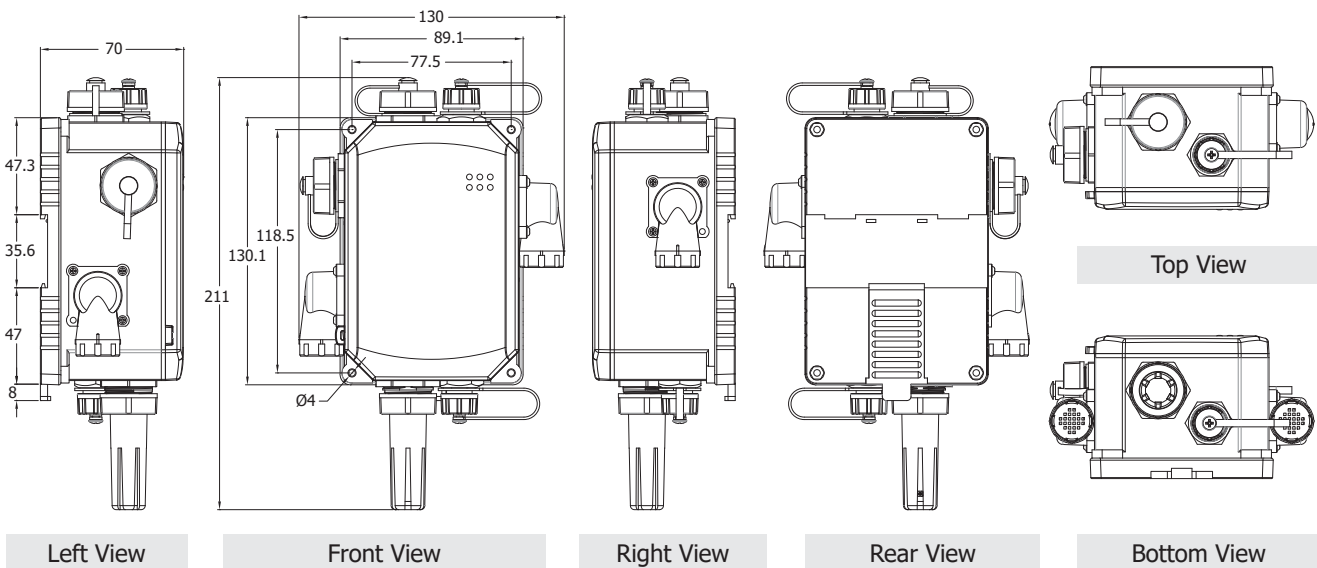| Type of Sensor | Range | Resolution | Accuracy | Response Time | Warm-up Time | Life Time |
|---|---|---|---|---|---|---|
| **PM1/PM2.5/PM10/Particle (Note1)** | 0 to 1,000 µg/m3 ( Laser Type) | 1µg/m3 | ± 10% of FSR. | 1 seconds | 20 seconds | 5 years |
| **CO** | 0 to 1000 ppm (Electrochemical) | 1 ppm | ±5% of measured value | 30 seconds | 60 seconds | 5 years |
| **CO$_2$** | 0 ~ 9999 ppm (NDIR) | 1 ppm | ±30 ppm ±3% of measured value | 120 seconds | 300 seconds | 15 years |
| **HCHO** | 0 ppb to 2000 ppb (Electrochemical) | 1 ppb | 0 ~ 300ppb : ±30ppb > 300ppb : ±10% | ≤60 seconds | 180 seconds | 3 years |
| **TVOC** | 0 ppb to 60000 ppb (MEMS Metal Oxide) | 1 ppb | ±15% | 60 seconds | 180 seconds | 5 years |
| **NH$_3$** | 0 to 100 ppm (Electrochemical) | 1 ppm | ±5% of measured value | < 40 seconds | 60 seconds | 2 years |
| **H$_2$S** | 0 to 100 ppm (Electrochemical) | 1 ppm | ±5% of measured value | < 30 seconds | 60 seconds | 2 years |
| **O$_2$** | 0 ~ 25% (Luminescence for O2 sensor) | 0.01% | ±2% | < 30 seconds (typical) | 120 seconds | 5 years |
| **Temperature** | -20 to +50°C | 0.1°C | ±0.6°C | - | - | 10 years |
| **Relative Humidity** | 0 to 100% RH, Non-condensing | 0.1% RH, Non-condensing | ±5% RH, Non-condensing | - | - | 10 years |
| **Dew Point** | Calculated using temperature and relative humidity | 0.1°C | - | - | - | 10 years |

**Note1:** 5 years, the filter patch (FLT-C001) by replaceable

| Particle | |
|---|---|
| **Sizes** | 0.3µm, 0.5µm,,1µm, 2.5µm,,5µm, 10µm |

## Appearance



- PoE/Ethernet
- Power Input & RS-485
- DIP Switch
- Air Output
- Air Input
- PhotoMos Relay Output
- Temperature & Humidity Sensor

DL-1023

Remote Particle & RH/T Data Logger

Sw1
1. Reserved
2. FW Update
3. Reserved
4. INIT

## Dimensions (Units: mm)



| Left View | Front View | Right View | Rear View | Bottom View |

Left View: 70, 47.3, 35.6, 47, 8
Front View: 130, 89.1, 77.5, 118.5, 130.1, 211, Ø4
Top View
Bottom View

### IP65 Ethernet Cap with Tether

57.2
Ø22.0
27,7
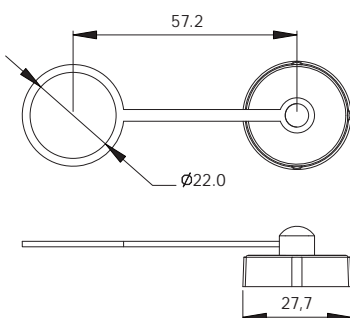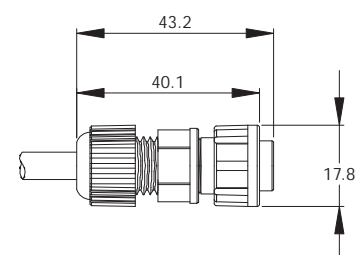
### IP65 Ethernet Plug

Cable Dia:
Max. 7.0 mm
Min. 5.5 mm

43.3
28.6
27.8
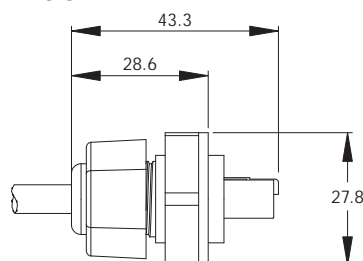
### IP65 PWR Plug

Cable Dia:
Max. 6.5 mm
Min. 5.0 mm

43.2
40.1
17.8

## 📁 Accessories

| Mode Name | NS-205-IP67 | NS-208PSE-IP67 | NS-208-IP67 |
|---|---|---|---|
| Picture |  |  |  |
| PoE | – | 802.3af x 8 | – |
| Input Voltage Range | +10 V$_{DC}$ ~ +30 V$_{DC}$ (1 kV Isolated) | +46 V$_{DC}$ ~ +53 V$_{DC}$ | +12 V$_{DC}$ ~ +53 V$_{DC}$ |
| Installation | Wall Mounting | Wall Mounting | |
| Dimensions (Unit: mm) | 85 x 76 x 137 (W x L x H) | 190 x 155 x 104 (W x L x H) | |

| FLT-C001 | Replaceable Filter Patch (Circle) (1 Pack 4 Patches) (RoHS) Size: (OD :16, ID:12)mm |
|---|---|

| IP67 RJ-45 Plug | IP67 Waterproof Cable, 1M | Cap with Tether | Replaceable Filter Patch |
|---|---|---|---|
|  |  |  |  |
| 4SASO-0001 | CA-05BFFM-LL7A01 | 4SASO-0004 | FLT-C001 |

## ■ Ordering Information

| | |
|---|---|
| **DL-1020 CR** | Remote PM1/2.5/10/Temperature/Humidity/Dew Point Data Logger with Ethernet/RS-485 and PoE (RoHS) |
| **DL-1021 CR** | Remote PM1/2.5/10/CO/Temperature/Humidity/Dew Point Data Logger with Ethernet/RS-485 and PoE (RoHS) |
| **DL-1022 CR** | Remote PM1/2.5/10/$CO_2$/Temperature/Humidity/Dew Point Data Logger with Ethernet/RS-485 and PoE (RoHS) |
| **DL-1023 CR** | Remote PM1/2.5/10/CO/$CO_2$/Temperature/Humidity/Dew Point Data Logger with Ethernet/RS-485 and PoE (RoHS) |
| **DL-1024 CR** | Remote PM1/2.5/10/HCHO/TVOC/Temperature/Humidity/Dew Point Data Logger with Ethernet/RS-485 and PoE (RoHS) |
| **DL-1025 CR** | Remote PM1/2.5/10/$NH_3$/Temperature/Humidity/Dew Point Data Logger with Ethernet/RS-485 and PoE (RoHS) |
| **DL-1026 CR** | Remote PM1/2.5/10/$H_2S$/Temperature/Humidity/Dew Point Data Logger with Ethernet/RS-485 and PoE (RoHS) |
| **DL-1027 CR** | Remote PM1/2.5/10/HCHO/Temperature/Humidity/Dew Point Data Logger with Ethernet/RS-485 and PoE (RoHS) |
| **DL-1028 CR** | Remote PM1/2.5/10/TVOC/Temperature/Humidity/Dew Point Data Logger with Ethernet/RS-485 and PoE (RoHS) |
| **DL-1034 CR** | Remote PM1/2.5/10/CO/$CO_2$/HCHO/TVOC/Temperature/Humidity/Dew Point Data Logger with Ethernet/RS-485 and PoE (RoHS) |
| **DL-1035 CR** | Remote PM1/2.5/10/CO/$CO_2$/$NH_3$/Temperature/Humidity/Dew Point Data Logger with Ethernet/RS-485 and PoE (RoHS) |
| **DL-1036 CR** | Remote PM1/2.5/10/CO/$CO_2$/$H_2S$/Temperature/Humidity/Dew Point Data Logger with Ethernet/RS-485 and PoE (RoHS) |
| **DL-1037 CR** | Remote PM1/2.5/10/CO/$CO_2$/HCHO/Temperature/Humidity/Dew Point Data Logger with Ethernet/RS-485 and PoE (RoHS) |
| **DL-1038 CR** | Remote PM1/2.5/10/CO/$CO_2$/TVOC/Temperature/Humidity/Dew Point Data Logger with Ethernet/RS-485 and PoE (RoHS) |
| **DL-1050 CR** | $O_2$/Temperature/Humidity/Dew Point Data Logger with Ethernet/RS-485 and PoE (RoHS) |
| **DL-1051 CR** | $O_2$/CO/Temperature/Humidity/Dew Point Data Logger with Ethernet/RS-485 and PoE (RoHS) |
| **DL-1052 CR** | $O_2$/$CO_2$/Temperature/Humidity/Dew Point Data Logger with Ethernet/RS-485 and PoE (RoHS) |
| **DL-1053 CR** | $O_2$/CO/$CO_2$/Temperature/Humidity/Dew Point Data Logger with Ethernet/RS-485 and PoE (RoHS) |
| **DL-1054 CR** | $O_2$/HCHO/TVOC/Temperature/Humidity/Dew Point Data Logger with Ethernet/RS-485 and PoE (RoHS) |
| **DL-1055 CR** | $O_2$/$NH_3$/Temperature/Humidity/Dew Point Data Logger with Ethernet/RS-485 and PoE (RoHS) |
| **DL-1056 CR** | $O_2$/$H_2S$/Temperature/Humidity/Dew Point Data Logger with Ethernet/RS-485 and PoE (RoHS) |
| **DL-1057 CR** | $O_2$/HCHO/Temperature/Humidity/Dew Point Data Logger with Ethernet/RS-485 and PoE (RoHS) |
| **DL-1058 CR** | $O_2$/TVOC/Temperature/Humidity/Dew Point Data Logger with Ethernet/RS-485 and PoE (RoHS) |