IDEX CORPORATION

Class 1

ISO 9001 CERTIFIED

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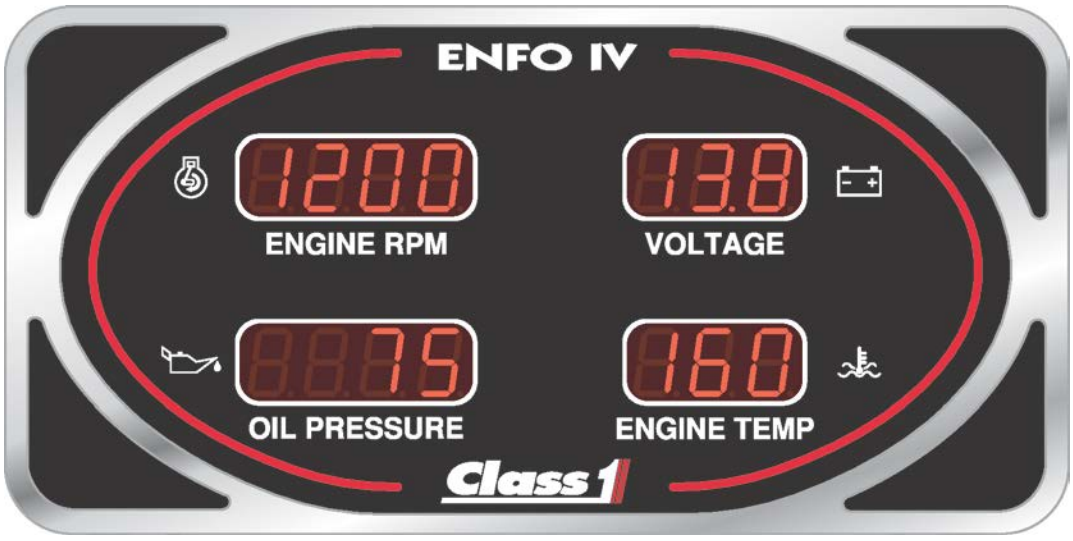
**SUITABLE FOR EXTERNAL DISTRIBUTION**

# TECHNICAL PRODUCT DATASHEET

## ENFO IV

**P/N 108661**
**P/N 112600 (metric)**
**P/N 112600-03 (metric, Chinese)**



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| | | | | | |
|---|---|---|---|---|---|
| | | | | PAGE | 1 of 12 |
| | | | | DATE | 5/27/2016 |
| PRODUCT GROUP | CAN | P/N | 108661, 112600 (metric) | REV | 1.30 |
| PRODUCT | ENFO IV | | | BY | AMS |

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## 1. Revision Log

| Rev | Date | Approved | Changes |
|---|---|---|---|
| **1.10** | 6-2-2008 | AGK | Initial requirements |
| **1.20** | 1-3-2013 | MH | Corrected typo in section 4.2 regarding menu items being displayed in OIL PRESSURE window |
| **1.30** | 5-27-2016 | GMC | Added CAN Auto Baud Information |

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## 2. System Overview

### 2.1. Scope

The ENFO IV is an engine monitoring device that reads and displays: engine RPM, engine coolant temperature, and engine oil pressure via SAE J1939 CAN messages from the engine Electronic Control Unit (ECU). The ENFO IV also displays vehicle voltage but this is independent of SAE J1939 CAN operation.

The ENFO IV can be used on both 12 and 24 Volt systems. The ENFO IV uses an automatic voltage detection system to determine the low voltage point for alarm activation.

The ENFO IV can be connected to an external alarm and external alarm silence switch. High engine temperature (250° F / 120° C), low oil pressure (10 PSI / 70 kPa / 0.70 Bar), or low voltage (11.9V or 23.8V) will cause the ENFO IV to activate the external alarm.

### 2.2. Part numbers

| | | |
|---|---|---|
| ENFO IV (English units) | C1 – P/N 108661 | – **12V and 24V** |
| ENFO IV (Metric units) | C1 – P/N 112600 | – **12V and 24V** |
| ENFO IV (Metric units) | C1 – P/N 112600-03 | – **12V and 24V** |

Colored corner tags

| | |
|---|---|
| Beige | C1 – P/N 106669 |
| Black | C1 – P/N 106030 |
| Blue | C1 – P/N 106023 |
| Brown | C1 – P/N 106025 |
| Burgundy | C1 – P/N 106667 |
| Gray | C1 – P/N 106668 |
| Green | C1 – P/N 106022 |
| Lime | C1 – P/N 106670 |
| Light Blue | C1 – P/N 106671 |
| Orange | C1 – P/N 106028 |
| Pink | C1 – P/N 106024 |
| Purple | C1 – P/N 106666 |
| Red | C1 – P/N 106029 |
| Rust | C1 – P/N 106027 |
| Silver | C1 – P/N 106026 |
| White | C1 – P/N 106665 |
| Yellow | C1 – P/N 106664 |

| | | |
|---|---|---|
| Installation Harness | C1 – P/N 110346 | – 10 feet |
| Terminating resistor (CAN) | C1 – P/N DT06-3S-P006 | |
| “Y” connector (CAN) | C1 – P/N DT04-3P-P007 | |

# 3. Operation

## 3.1. Display

The ENFO IV has 4 display windows which use 7-segment LEDs to show information and warnings received from the engine ECU (source address 0). For applications where the engine ECU address is not 0 (or the SAE J1939 CAN data is not transmitted from a device with the source address of 0) the ENFO IV can be set-up to mask the source address to ensure that the data will be received regardless of the transmitting devices source address number (see section 4.1).

### 3.1.1. ENGINE RPM display window

The engine RPM is received from the engine ECU via J1939 CAN message PGN 61444 (bytes 4 and 5) and displayed in this window. Dashes will be displayed when PGN 61444 is not received.

### 3.1.2. VOLTAGE display window

The vehicle voltage information is calculated within the ENFO IV based on the voltage present at pin 4 (supply voltage +) referenced to the ground potential present at pin 5 (supply voltage -).

### 3.1.3. OIL PRESSURE display window

The oil pressure is received from the engine ECU via J1939 CAN message PGN 65263 (byte 3) and displayed in this window. Dashes will be displayed when PGN 65253 is not received.

### 3.1.4. ENGINE TEMP display window

The engine (coolant) temperature is received from the engine ECU via J1939 CAN message PGN 65252 (byte 0) and displayed in this window. Dashes will be displayed when PGN 65252 is not received.

## 3.2. Defined alarm conditions

The ENFO IV sounds the external alarm and alternately displays a warning in the associated display window when any of the following conditions is true.

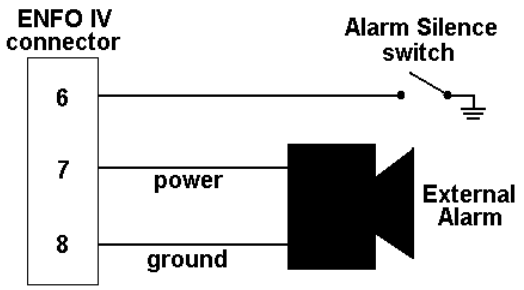
| Display window | Condition | Description |
|---|---|---|
| **Oil pressure** | 10 PSI (70 kPa / 0.70 Bar) or less | Display alternately shows the pressure and "**LO**" |
| **Engine temp** | 250ºF (120 ºC) or greater | Display alternately shows the temperature and "**HI**" |
| **Voltage** | 11.9V or less (12V system)<br>23.8V or less (24V system) | Display alternately shows the voltage and "**LO**" |

### 3.2.1. Audible alarm and alarm silence switch

The ENFO IV can be connected to an external audible alarm (250mA maximum) and alarm silence switch.

When the ENFO IV activates the alarm it will remain ON until the alarm condition is no longer present or the alarm silence button has been pressed.

The alarm will remain OFF for 5 minutes after which time the alarm will again activate (if the alarm condition is still present).



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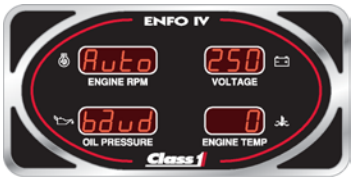
## 3.3. Initialization

The ENFO IV's initialization sequence is listed in the table below. This initialization sequence is designed to test the display LED segments and alert the observer to the voltage range detected and CAN status.

| Description | Displayed data |
|---|---|
| Auto Baud Selection will run on the first power up or if the Auto Baud reset has been activated. Once the baud rate has been determined it will save it to memory and no longer display this screen on power up. |  |
| Each display lights all of the LED segments for one second. |  |
| The software revision is shown in the VOLTAGE display for one second. |  |
| The CAN status is shown in the ENGINE RPM and OIL PRESSURE displays.<br>"**CAN GOOD**" indicates that at least one CAN message is being received and the physical CAN connections are good.<br>"**NO CAN**" indicates that no CAN messages are being received and that there may be an issue with the physical CAN connections. |  |
| The voltage range is shown in the ENGINE TEMP display.<br>"**=12**" indicates that the voltage range is detected between 9V and 17.5V.<br>"**=24**" indicates that the voltage range is detected between 17.6V and 32V. |  |
| The ENFO IV then begins normal operation by displaying received data. |  |

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## 4. Menu

### 4.1. Entering the menu

Press and hold the external silence switch until the ENGINE RPM display shows “SEL” (approximately 5 seconds). Release the external silence switch. Press the silence switch to cycle through the menu items (see section 4.2).

### 4.2. Menu items

Menu selection is handled by pressing the external silence switch to select the desired menu item (shown in the OIL PRESSURE window) and then allow the time remaining indicator (time in seconds shown in the ENGINE TEMP window) to count down to 0. Each activation of the silence switch resets the time remaining indicator back to 5 seconds.

| Menu item | Description | Secondary menu item | Description |
|---|---|---|---|
|  | **Exit menu**<br><br>Allow the timer to time-out to exit the menu. | NONE | NONE |
|  <br>*Note 4* | **Unit of measure**<br><br>Select the unit of measure for the temperature display (English or metric). |  | Use the silence switch to toggle the unit of measure shown in the VOLTAGE window (ENG = English, INT = metric).<br><br>*When the desired selection is shown allow the timer to count down to 0 to save to memory.* |
|  | **Test displays**<br><br>Turn all LED segments and alarm output ON for 3 seconds. | NONE | NONE |
|  | **View the battery range**<br><br>View the auto-selected battery voltage range.<br>“**=12**” indicates the ENFO IV has auto-detected 12 Volt range.<br>“**=24**” indicates the ENFO IV has auto-detected 24 Volt range. | NONE | NONE |
|  | **Show alarm point**<br><br>Show the alarm trip points for the VOLTAGE, OIL PRESSURE, and ENGINE TEMP displays. | NONE | NONE |

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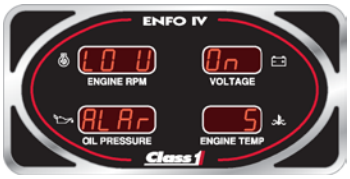
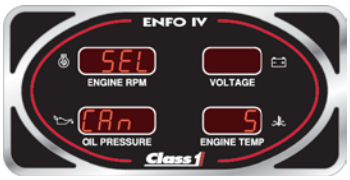
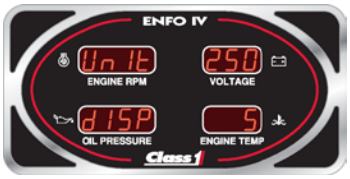
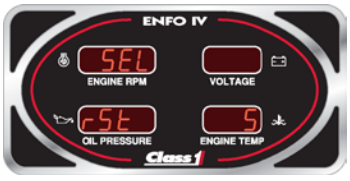
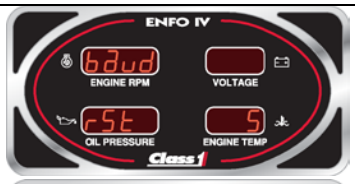
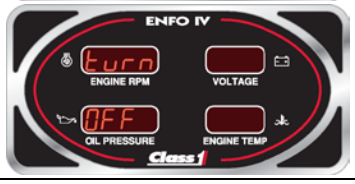
| Menu item | Description | Secondary menu item | Description |
|---|---|---|---|
|  <br>*Note 1*<br>*Note 2* | **Source address selection**<br><br>Allows selection of source address for the three SAE J1939 CAN messages. Either the normal engine ECU address (0) or any address may be selected.<br><br>The menu goes through each CAN message individually beginning with OIL PRESSURE, then ENGINE TEMPERATURE, and finally ENGINE RPM. |  <br>  <br>  | Use the silence switch to toggle the source address shown in the VOLTAGE window (nor = normal address 0, Any = any address is allowed).<br>*When the desired selection is shown allow the timer to count down to 0 to save to memory.* |
|  <br>*Note 1* | **Low Voltage Alarm Enable**<br><br>Allows the low voltage alarm to be enabled or disabled. |  | Use the silence switch to toggle the unit shown in the VOLTAGE window (ON, OFF).<br>*When the desired selection is shown allow the timer to count down to 0 to save to memory..* |
|  <br>*Note 1* | **Voltage accuracy tune**<br><br>Allows tuning the voltage accuracy. Due to minor differences in the protection components within the ENFO IV the voltage accuracy may be slightly inaccurate (low) and this menu item allows adding tenths of volts to correct the inaccuracy. |  | Use the silence switch to toggle the tenths of volts shown in the VOLTAGE window.<br>*When the desired selection is shown allow the timer to count down to 0 to save to memory.* |
|  <br>*Note 1*<br>*Note 5* | **CAN Baud Rate Selection**<br><br>The ENFO IV can be set to work with either 250k or 500k baud rate. |  | Use the silence switch to toggle the unit shown in the VOLTAGE window (250, 500).<br>*When the desired selection is shown allow the timer to count down to 0 to save to memory.* |
|  <br>*Note 1*<br>*Note 6* | **Auto Baud Reset Selection**<br><br>The Auto Baud Selection on power up can be reset. |  <br>  | *When the timer counds down to 0 the selection will be save to memory.*<br><br>*Then the display will direct the user to power the unit down. On the next power cycle it will auto detect the CAN baud rate if the unit is connected to the CAN network.* |

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| Menu item | Description | Secondary menu item | Description |
|---|---|---|---|
|  *Note 1* | **Show mode**<br><br>The ENFO IV can be set to "show mode". This mode is useful as a show display when CAN data is not present. This mode is not intended as a functional mode. |  | Use the silence switch to toggle the show mode (ON or OFF) shown in the VOLTAGE window.<br>*Show mode only lasts for the current power cycle.* |
|  *Note 1*<br>*Note 3* | **Alarm silence input verification**<br><br>Allows verification of the ground input for alarm silence operation. |  | The OIL PRESSURE window shows the current state of the input in number of bits (0 to 1023). When the alarm silence input is activated with a ground the number will be closer to 0. |
|  *Note 1* | **Bootload**<br><br>Enter the firmware upgrade mode (bootloader).<br><br>This will disable the unit if not reprogrammed! |  | The unit is now in firmware upgrade mode. The new firmware must be loaded for the unit to function. |

Note 1: These items are only available within the first 60 seconds after power-up.
Note 2: This item is only available for software version 1.5 and later.
Note 3: This item is only available for software version 1.4 and later.
Note 4: This item is only available for software version 1.3 and later.
Note 5: This item is only available for software version 1.6 and later.
Note 6: This item is only available for software version 1.7 and later.

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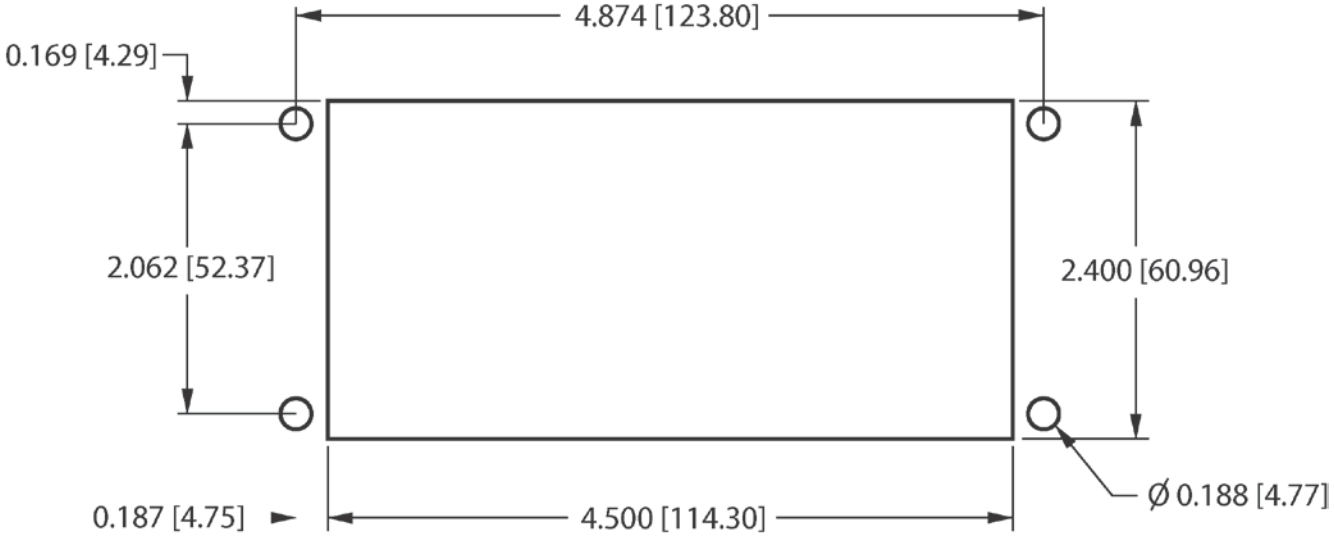
## 5. Installation

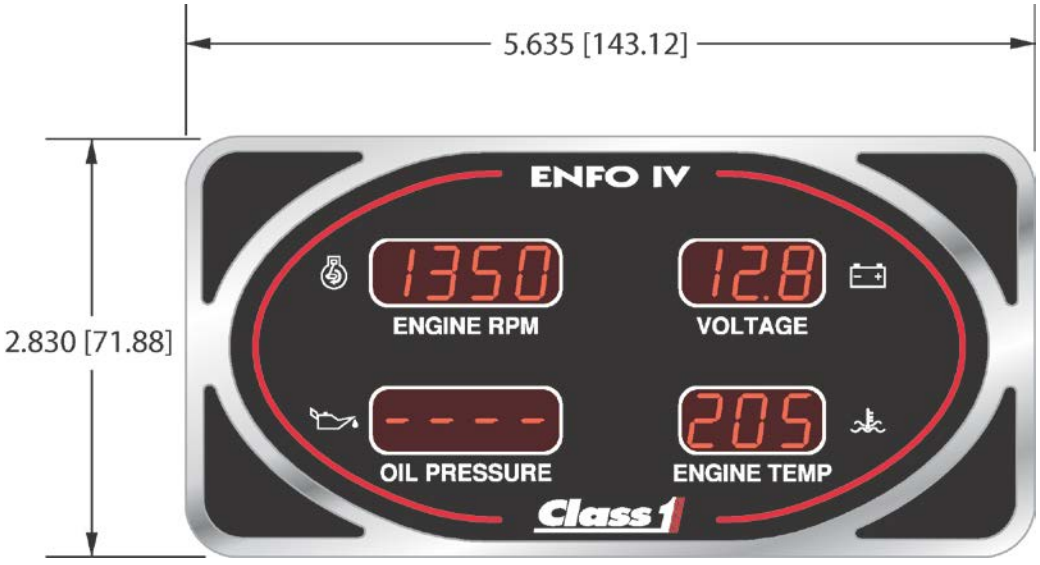
### 5.1. Cutout dimensions

The display requires a cutout as shown. The display is water tight and may be mounted in any location on the operator's panel.




**Unit of scale: inches [millimeters]**

### 5.2. Outer bezel dimensions




**Unit of scale: inches [millimeters]**

## 6. Wiring

**Mating connector:** Amp P/N 776286-1 C1 P/N 106297
**Mating sockets:** Amp P/N 770520-3 C1 P/N 106298
**Recommended wire gage:** 14-18 AWG

| PIN | CIRCUIT | DESCRIPTION | |
|---|---|---|---|
| 1 | CAN High | CAN communication | (SAE J1939, 250KB/s) |
| 2 | CAN Low | CAN communication | (SAE J1939, 250KB/s) |
| 3 | CAN Shield | CAN communication | (SAE J1939, 250KB/s) |
| 4 | Supply + | Module supply | (+9VDC…+32VDC) |
| 5 | Supply - | Module supply | (ground) |
| 6 | Silence input | Alarm silence input | (ground polarity) |
| 7 | Alarm + | Alarm output supply | (positive supply voltage) |
| 8 | Alarm - | Alarm output | (ground, switched output) |

## 7. Acronym list

| | |
|---|---|
| **LED** | Light Emitting Diode. The lights on the display used to show tank level and information |
| **PSI** | Pounds per Square Inch. Pressure measurement |
| **kPa** | kilo Pascal. Pressure measurement |
| **CAN** | Controller Area Network. SAE J1939 communication method |
| **SAE** | Society of Automotive Engineers |
| **TBD** | To Be Developed |
| **ESD** | ElectroStatic Discharge |
| **IP** | Ingress Protection (IP 67, etc) |
| **P/N** | Part Number |
| **C1** | Class 1 |
| **ECU** | Electronic Control Unit |
| **PGN** | Parameter Group Number |
| **mA** | milli Amps |
| **AWG** | American Wire Gauge |

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# 8. Technical details

## 8.1. Electrical and physical specifications

| | |
|---|---|
| Product category | ENFO IV |
| Voltage range | +9VDC…+32VDC |
| Power consumption | |
| @13.8VDC | 185 mA |
| @27.6VDC | 115 mA |
| Operational temperature range | -40ºC…+85ºC |
| Alarm output | 250 mA maximum (ground polarity) |
| Environmental range | IP 67 |
| CAN specification | SAE J1939 proprietary, 250 Kbits/second |
| Protection | Internal thermal fuse<br>Reverse voltage protection (pins 1 and 2 of connector)<br>CAN buses protected to 24V<br>ESD voltage protected to SAE J1113 specification for heavy duty trucks<br>Transient voltage protected to SAE J1113 specification for heavy duty trucks |
| Dimensions (W x H x D) in inches | 5.635 [143.12] x 2.830 [71.88] x 2.060 [52.32] |
| Weight in ounces [grams] | 6.7 [189.94] |

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|---|---|---|---|---|---|
| | | | | DATE | 5/27/2016 |
| PRODUCT GROUP | CAN | P/N | 108661, 112600 (metric) | REV | 1.30 |
| PRODUCT | ENFO IV | | | BY | AMS |

## 9. 产品中有毒和有害的物质或成份的名称和含量 – (NAMES AND CONTENTS OF THE TOXIC AND HAZARDOUS SUBSTANCES OR ELEMENTS IN THE PRODUCTS)

**Class1** is committed to comply with the Management Methods on Control of Pollution from Electronic Information Products of China (China RoHS). The RoHS Directive restricts substances including lead (Pb), mercury (Hg), Cadmium (Cd), hexavalent chromium (CrVI) and certain halogenated flame retardants such as polybrominated biphenyls (PBB) and polybrominated diphenyl ethers (PBDE) in electrical and electronic equipment.

| 零件名称 Parts | 有毒和有害的物质或成份 TOXIC AND HAZARDOUS SUBSTANCES OR ELEMENTS | | | | | |
|---|---|---|---|---|---|---|
| | 铅 (Pb) | 汞 (Hg) | 六价铬 (CrVI) | 多溴联苯 (PBBs) | 多溴二苯醚 (PBDEs) | 镉 (Cd) |
| 盒子 Box | O | O | O | O | O | O |
| 面板 Faceplate | O | O | O | O | O | O |
| 标签 Label | O | O | O | O | O | O |
| 元器件 Components | X | O | O | O | O | O |
| 连接器 Connector | O | O | O | O | O | O |
| 基准 Base | O | O | O | O | O | O |
| 螺钉 Screw | O | O | O | O | O | O |
| 印制电路 PCB | X | O | O | O | O | O |
| 镀层 Coating | O | O | O | O | O | O |

○：表示该有毒有害物质在该部件所有均质材料中的含量均在SJ/T 11363-2006标准规定的限量要求以下。

○：Indicates that this hazardous substance contained in all homogeneous materials of this part is below the limit requirement in SJ/T 11363-2006.

×：表示该有毒有害物质至少在该部件的某一均质材料中的含量超出SJ/T 11363-2006标准规定的限量要求。

×：Indicates that this hazardous substance contained in at least one of the homogeneous materials of this part is above the limit requirement in SJ/T 11363-2006.


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The Environment-Friendly Use Period (EFUP) for all enclosed products and their parts are per the symbol shown here, unless otherwise marked. The Environment-Friendly Use Period is valid only when the product is operated under the conditions defined in the product manual.