

變壓器智慧附件

Transformer Smart Accessories

# 免保養呼吸器使用說明書

SELF-DEHYDRATING BREATHER INSTRUCTION MANUAL

繁體中文 / English



FE-SDB-02



FE-DSDB-01

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## 備註

基於產品不斷研發改良，本手冊所包含的一切內容，可能與產品交貨時有所差異，且並未提供任何形式之承諾、保證與擔保，華城電機將盡力維持使用手冊的更新與正確性，華城電機有權力隨時變更本手冊的一切內容，恕不另行通知。

# 1. 安全

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1-1 安全須知

1-2 產品應用

1-3 設備操作重要須知

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# 1-1 安全須知

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所有受委託安裝免保養呼吸器的人員需遵循以下規定：


- ◆ 須經過符合規定之安裝訓練的專業人員從事。
- ◆ 須嚴格遵守本手冊操作步驟。


不當的安裝或操作步驟可能導致以下意外發生：

- ◆ 可能導致嚴重傷害。
- ◆ 可能對本設備或者使用者其他資產造成損壞。
- ◆ 可能降低產品運作效率。

本手冊提供以下三種不同層級之安全須知：

 **警告**：警告資訊提醒可能對人員生命安全產生的危害，忽視此訊息可能造成嚴重或者致命的傷亡。

 **注意**：注意資訊提醒可能對本設備或使用者其他資產造成的危害。

 **備註**：備註資訊提供本產品相關功能的附加說明。

## 1-2 產品應用

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免保養呼吸器適用於油浸式變壓器、電抗器與切換器等，具有儲油槽設計的設備使用，其作用為吸收進入油槽空氣之水氣、防止內部氣袋積水情形發生，且免保養呼吸器能自行進行乾燥劑再生流程，能長時間維持除濕功能，在任何時候皆能安全穩定運作，因此功能及效率皆優於傳統呼吸器。

### 注意

安裝免保養呼吸器前，須先確認其儲油槽容量大小與連接法蘭尺寸方可安裝。

若無氣袋變壓器要安裝免保養呼吸器，於運輸時需事先將免保養呼吸器拆除，避免運輸過程中漏油而影響到免保養呼吸器。

## 1-3 設備重要操作須知

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使用者應嚴格遵守政府規定之意外預防法規。接觸帶電部位時，應穿戴絕緣手套，並確認產品已經斷電，勿直接接觸。安裝時應符合相關電氣設備施工規範，必要時須安裝接地線，以確保施工過程正常進行。

### 注意

當呼吸器處於乾燥劑再生過程中或者環境炎熱時，碰觸表面時間過長（大於 4 秒），可能有輕微燙傷的風險。

### 注意

為了安全起見，未經華城電機技術人員許可，切勿執行任何不允許與不適當之動作，避免因不正確操作造成設備損壞。

### 注意

若需進行斷/復電作業，需先關閉免保養呼吸器的電源開關。

### 警告

確認設備安裝位置符合相關防火規範。

### 注意

請於送電後拔除下方橡膠塞。

## 2. 產品介紹

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2-1 產品特色

2-2 系統操作

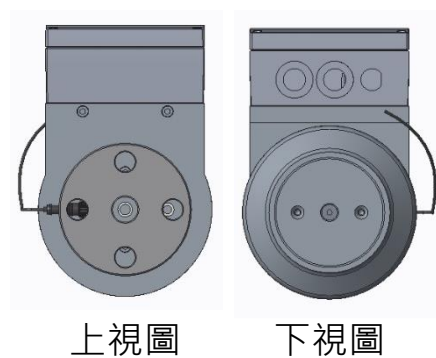
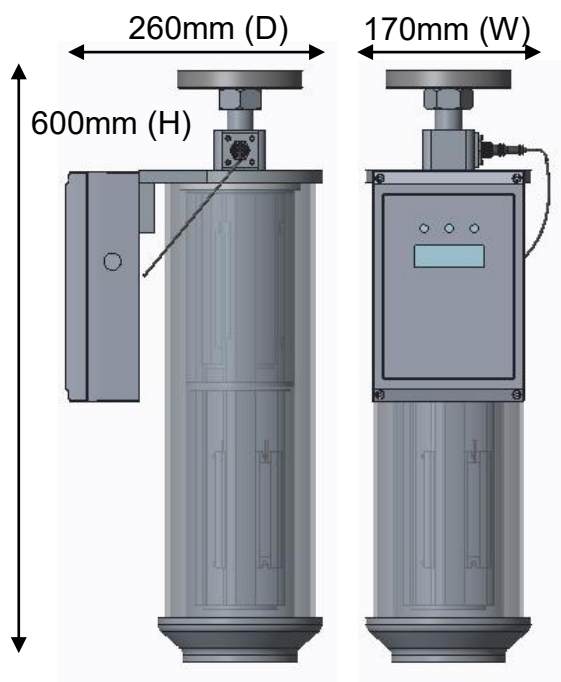
2-3 OLED 面板資訊說明

2-4 維護保養與 LED 指示燈號

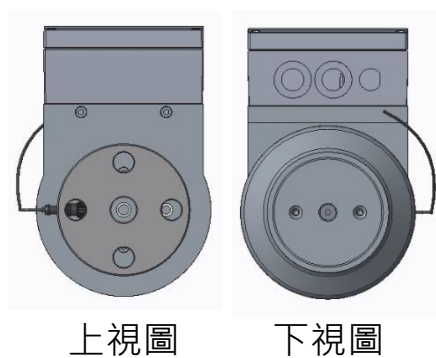
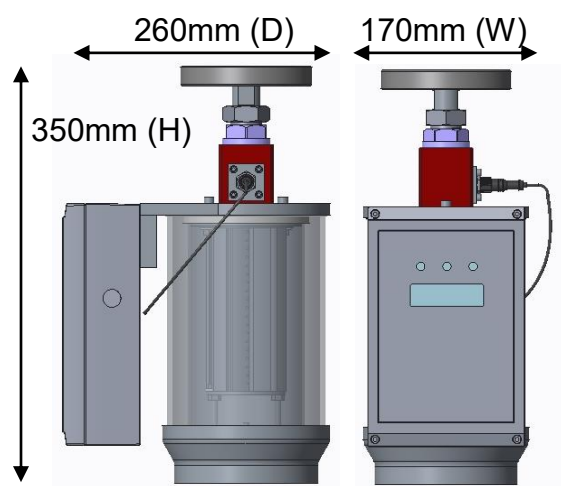
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## 2-1 產品特色

### ■ 電力級免保養呼吸器外型圖：



### ■ 配電級免保養呼吸器外型圖：





## 2-1 產品特色

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免保養呼吸器運作流程分為以下階段，當所屬設備負載下降時，油溫也會跟著下降，此時儲油槽會吸入空氣，外部空氣會從免保養呼吸器底部金屬濾網吸入，此濾網用途為防止外在大顆粒沙塵與昆蟲進入，接著潮濕空氣會通過白色矽膠乾燥劑，水氣將會在此被乾燥劑吸收，乾燥劑空氣再順著上方管線進入儲油槽中。

免保養呼吸器會監控濕度與溫度，根據情況會啟動加熱器進行乾燥劑再生動作，乾燥劑加熱時其所吸收之水氣會被逼出，並凝結於玻璃壁上，當水氣夠多時會形成水滴從下方金屬濾網排出，透過以上運作過程，免保養呼吸器不須更換乾燥劑，具有減少維護支出與達成長時間監測運作之功能。

## 2-2 系統操作



## 2-2 系統操作

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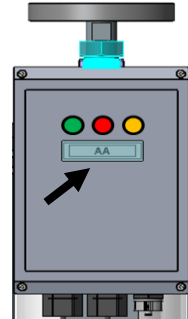
1. 連接法蘭：
  - ◆ 華城標準：請參考 4-3 附錄。
  - ◆ 相容：ANSI 1"、DIN2558 1/2"、DIN42562-3。
2. 控制盒：
  - ◆ 電纜接頭：2 x M20x1.5。
  - ◆ 接線端子：6mm<sup>2</sup>, AWG24~10。
  - ◆ 熔絲：1A / 5x20。
3. OLED 資訊面板：顯示運作狀態，請參照下一頁。
4. LED 指示燈：LED 綠、紅、黃，請參照 2-3 節。
5. 外部電源：AC 110V~240V。  
頻率：50 / 60 Hz。  
功率消耗：電力級 560W ( 乾燥劑加熱過程 )  
配電級 280W ( 乾燥劑加熱過程 )
6. 類比訊號輸出：
  - ◆ 訊號輸出：4~20mA。
7. 乾燥劑：無色無毒矽膠乾燥劑，吸水時亦不變色。( 不含氯化亞鈷 )
8. Reset 按鈕：可以手動重啟呼吸器，通常用於呼吸器發生當機時，重啟後，呼吸器會自動執行開機流程，恢復運作。

### 警告

為了安全起見，進行電源端子接續時，請拔除電源。

## 2-3 OLED 面板資訊說明

呼吸器具有自我監測功能，其相關運作資訊會透過 LED 指示燈與前方 OLED 面板進行顯示。



OLED 面板相關顯示重要資訊說明如下：



Temp. : 溫度  
RH. : 濕度



Predict Day : 預測倒數加熱天數  
Remain : 加熱時間倒數



Date : 日期  
Time : 時間



STD Count up : 標準倒數加熱天數



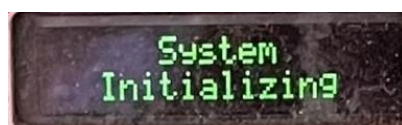
Cycle Status : 循環狀態(濕度)



Fortune Electric : 韌體版本



Status : 呼吸器狀態  
Heatings : 目前此呼吸器加熱次數



System Initializing : 系統初始化

## 2-4 維護保養與 LED 指示燈號

雖然此產品為免保養呼吸器，係針對乾燥劑部分，華城仍建議於變壓器日常巡檢時，對呼吸器執行以下步驟檢查：

- ◆ 檢查呼吸器外觀有無損壞（須特別注意金屬濾網部分）
- ◆ 檢查 LED 與 OLED 面板相關資訊
- ◆ 下列表格列出 LED 指示燈個別顯示狀況：

狀態	綠燈	紅燈	黃燈	備註
電源啟動	亮	關	關	-
加熱再生過程	亮	關	亮	-
電源異常	關	關	關	檢查電源接線是否正確安裝，若仍發生問題請聯絡華城維保人員。
內部異常	亮	閃爍	關	請輕按控制盒側邊 Reset 按鈕，若錯誤仍然發生，可能為內部感測器損壞造成，但呼吸器仍可運作一段時間，請盡速聯絡華城維保人員。

### 注意

為若久未使用免保養呼吸器，須將此產品存放於室內，建議環境濕度不超過 60%、溫度不超過 30°C。

## 3. 安裝

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### 3-1 安裝

### 3-2 連接 Plug-in 接頭

### 3-3 連接端子

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## 3-1 安裝

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### 注意

請嚴格遵守本手冊所提之操作與安裝規範，若未遵守導致產品損壞與功能異常，將不再享有保固服務。

請將呼吸器安裝於通風良好的環境，切勿於密閉環境中。

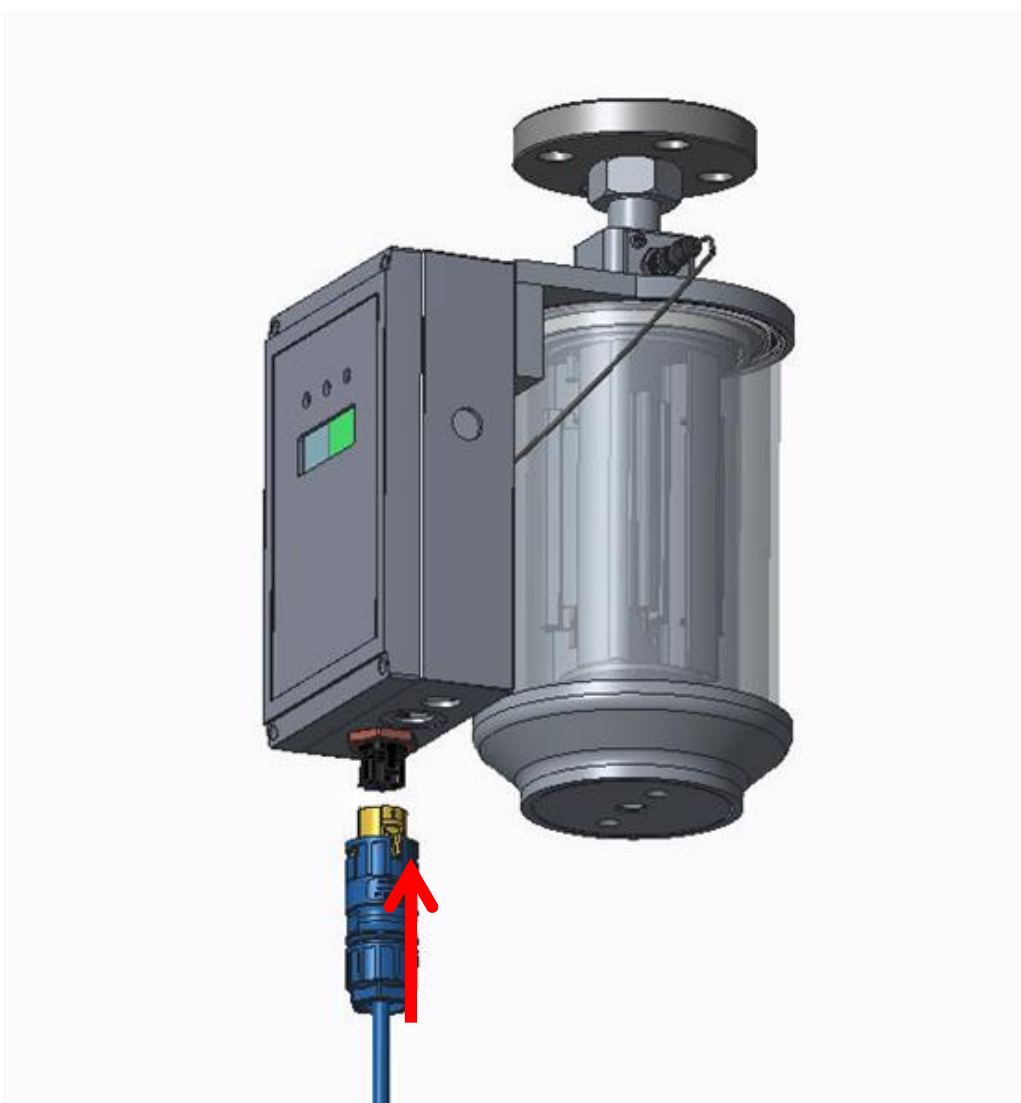
免保養呼吸器通常固定於儲油槽下方管路上，安裝前須先確認法蘭型式符合華城支援的種類 ( ANSI 1" / DIN2558 1/2" / DIN42562-3 )，若有特殊型式需求請與華城設計人員聯絡。法蘭由四個螺絲固定，且須確認連接處有放置防水墊圈，以確保整體系統密封良好，不會有漏氣情況發生。

## 3-2 連接 Plug-in 接頭

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安裝免保養呼吸器時，只需要透過 Plug-in 與免保養呼吸器的電源孔做連接。

若不使用 Plug-in 接頭，請開蓋拆除電路板，並使用活動板手卸下母頭後，可以(1/2")牙規格：M25\*1.5 材質：SUS304，進行後續安裝。





## 3-3 連接端子

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### 注意

為了安全起見，端子連接須由受過相關訓練之技術人員進行。

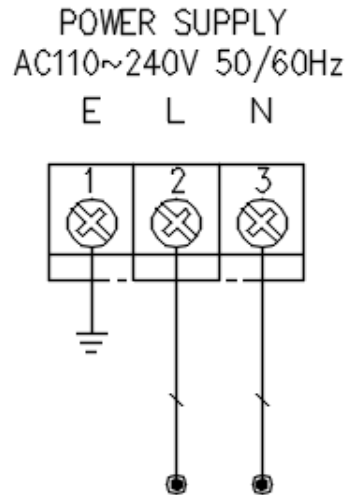
### 警告

電擊危險！打開控制盒前，請確定電源已經拔除。

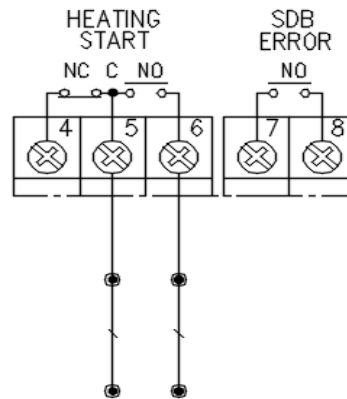


## 3-3 連接端子

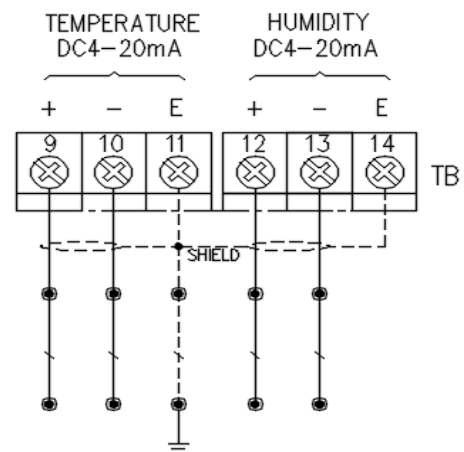
**步驟 1** 打開控制盒前方面板，連結外部電源至端子 2(L)與 3(N)，連結後即可啟動電源，在電源正確啟動後，呼吸器即會自動進入開機模式然後開始運轉。



**步驟 2** 端子 4、5 與 6 則是在乾燥劑加熱過程中作動，當加熱器正在運作時端子 5 與 6 則會連結，反之則 4 與 5 連結。異常訊息繼電器則是連結端子 7 與 8，當異常發生時 7 與 8 會連接。



**步驟 3** 類比訊號輸出包含溫度與濕度，溫度訊號輸出端子為 9(+)與 10(-)。濕度訊號端子為 12(+)與 13(-)，在連接類比輸出端子時，建議使用隔離線與端子 11 進行連接，以確保訊號穩定。



## 4. 技術資料

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4-1 產品規格

4-2 測試

4-3 附錄

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## 4-1 產品規格

機型	第二代電力級	配電級
型號	FE-SDB-02	FE-DSDB-01
輸入電壓	AC 110V~240V	AC 110V~240V
頻率	50 / 60 Hz	50 / 60 Hz
最大功率消耗	560W	280W
外部保護	NFB 16A or 20A	NFB 16A or 20A
外部保險絲	慢熔型 8A 保險絲	慢熔型 4A 保險絲
	若同時安裝電力級及配電級呼吸器請使用慢熔型 12A 以上保險絲。	
外型尺寸(mm)	170 <sub>(W)</sub> ×600 <sub>(H)</sub> ×260 <sub>(D)</sub>	170 <sub>(W)</sub> × 350 <sub>(H)</sub> × 260 <sub>(D)</sub>
重量	12.3 公斤	8.7 公斤
防護等級	IP56	IP56
操作溫度	寒帶 -30°C~ +80°C	
	非寒帶 0°C~+80°C	
輸出訊號	4~20mA (-30°C~+80°C / 0~100%)	4~20mA (-30°C~+80°C / 0~100%)
適用範圍	≥40MVA(≥300MVA 請使用三通管安裝兩台)	<40MVA
乾燥劑重量	2.2 公斤	1 公斤
乾燥劑種類	矽膠 ( 無色無毒且不含氯化亞鈷 )	
材料	所有外部零件均具有耐鹽、耐變壓器油與抗紫外光功能。	
連接法蘭	華城標準：請參閱 4-3 附錄 相容：ANSI 1" / DIN2558 1/2" DIN 42562-3 /	
儲存功能	內建 365 天記憶卡數據儲存空間	

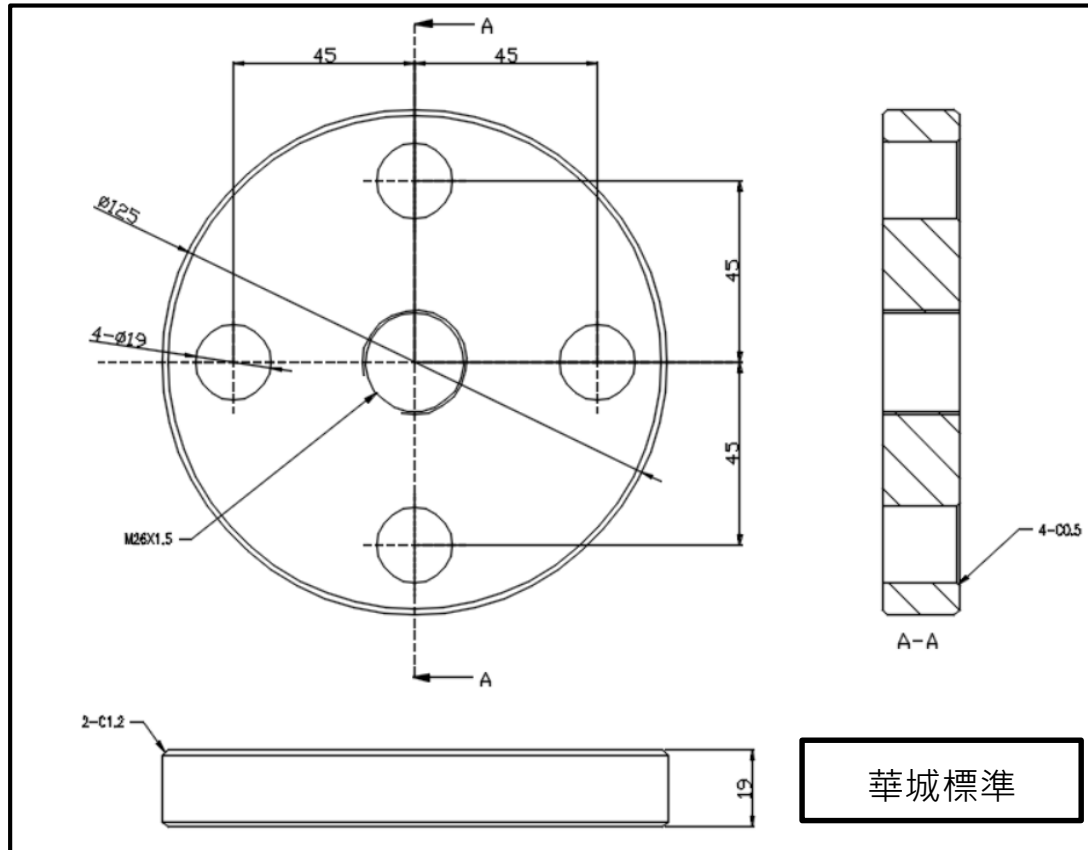
## 4-2 測試

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項目	相關標準
靜電放電抗擾性(ESD)	IEC 61000-4-2
快速暫態突波抗擾性(EFT)	IEC 61000-4-4
突波免疫力(Surge)	IEC 61000-4-5
傳導耐受性(CS)	IEC 61000-4-6
電源頻率磁場耐受性(PM)	IEC 61000-4-8
電壓暫降、短時中斷和電壓變化(DIP)	IEC 61000-4-11
操作溫度測試	JESD22-A103-D
三軸隨機振動測試	ISTA Test Procedure 2A
防水防塵測試-IP56	IEC 60529

# 4-3 附錄

連結法蘭：



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## NOTE

Data contained herein may differ in detailed from equipment delivered.

FE reserves the right to make modification without notice.

# 1. Safty

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1-1 Safety instructions

1-2 Specified applications

1-3 Important notes on equipment  
operation

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# 1-1 Safety instructions

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All personnel involved in installation or commissioning of this equipment must:


- ◆ be suitably qualified and
- ◆ strictly follow these operating instructions.


Improper operation or misuse can lead to

- ◆ serious injury
- ◆ damage to the equipment and other property of the user
- ◆ a reduction in the efficiency of the equipment.

Safety instructions in this manual are presented in three different forms to emphasize important information:

 **WARNING:** This information indicates particular danger to life and health. Disregarding such a warning can cause serious or fatal injury.

 **CAUTION:** This information indicates particular danger to equipment or other property of the user. Serious injury cannot be excluded. Must install on transformer when receive the equipment within 3 monthes.

 **NOTE:** These notes show important information on a certain issue.

## 1-2 Specified applications

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The Self-dehydrating breather (SDB) is used in oil-insulated transformers, reactors or tap changers to dry the air which is suctioned in by the oil conservator. The SDB provides automatic recharging of silica gel desiccant and reduces expensive maintenance cost. Continuous monitoring and consistent moisture absorption increase transformer reliability.

 **CAUTION**

It is important to choose the suitable breather for different volume of oil conservator before connecting to breather pipe.

## 1-3 Important notes on equipment operation

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The user is advised to strictly comply with the national accident prevention regulations.

It is especially emphasized that work on active components is only permissible while these components are either de-energized or protected against direct contact.

Electrical installation is subject to the relevant national safety regulations. It is necessary to connect the grounding cable in order to ensure safe operation.

### CAUTION

As The device heats up during the regeneration process or high ambient temperature, touching the surface may cause pain. Brief touches (< 4 seconds) are not expected to cause burn.

### CAUTION

For safety reasons, do not perform any unauthorized or inappropriate work or open control box without consulting FE.

### CAUTION

If you need to disconnect or restore the power, you need to turn off the power switch of the SDB.

### WARNING

All relevant fire protection regulations must be strictly followed.

 **CAUTION**

After power on, please remove the rubber under the equipment.

## **2. Product instructions**

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2-1 Features

2-2 Operation

2-3 OLED panel information description

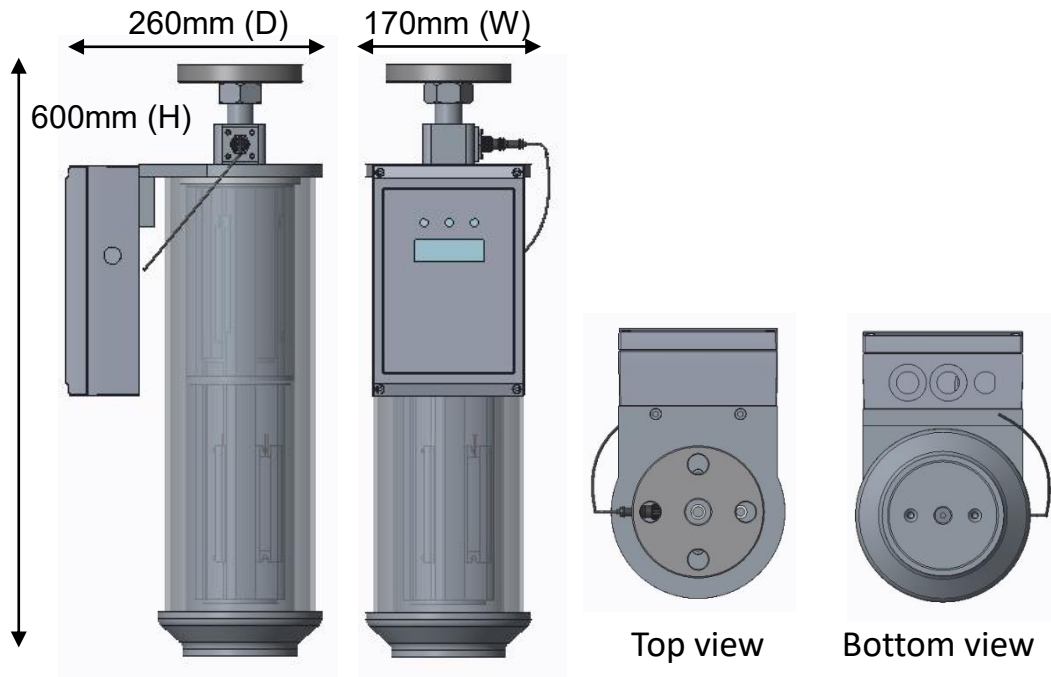
2-4 Maintenance & LED indicator

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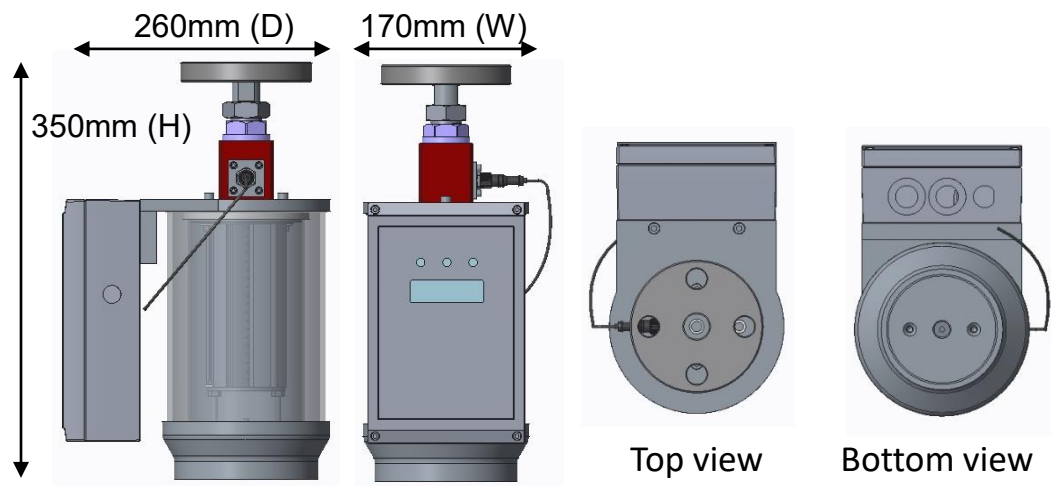
## 2-1 Features

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- The following are the drawing of power level SDB:



- The following are the drawing of distribution level SDB:



## 2-1 Features

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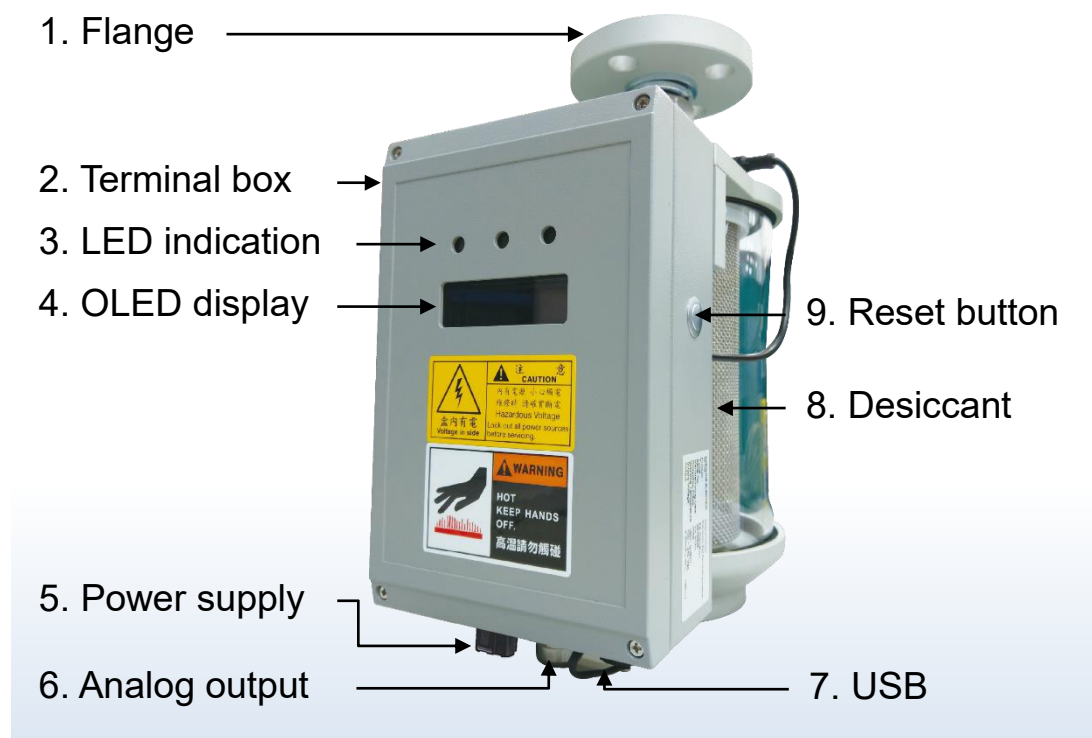
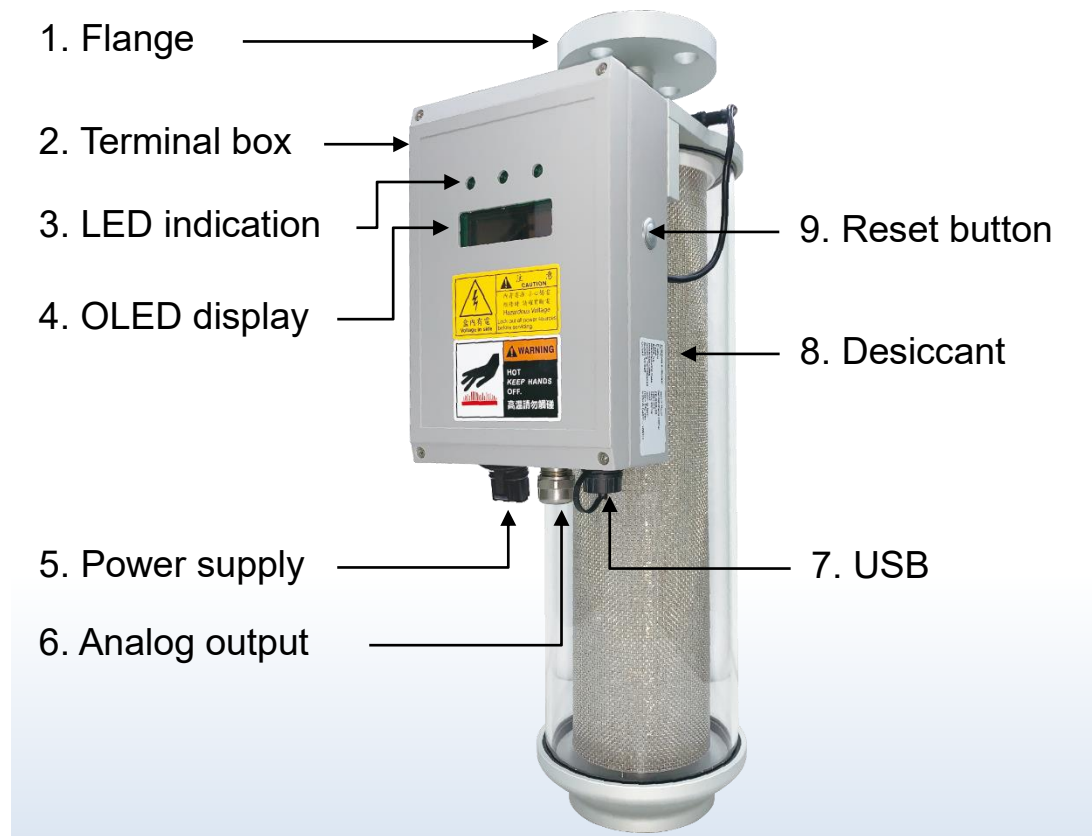
Self-dehydrating breather work according to the following principle. When the oil conservator suctions in air (e.g., due to the reduced load), the air flows through a filter made of stainless steel net to the inside of the device. This net filter bug, dust and other dirt particles form the air. The filtered air flows through the desiccant chamber filled with colorless Silica gel and is dehydrated. The dehydrated air rises further via the pipe into the oil conservator.

A sensor monitors the humidity and the temperature of desiccant. Depending on its state, the desiccant is regenerated with the heater located in the desiccant container. The moisture created by the heating process condenses into dew on glass .The condensed water exits the device through the stainless steel filter.

No maintenance is required for replacement and regeneration of the desiccant.

## 2-2 Operation

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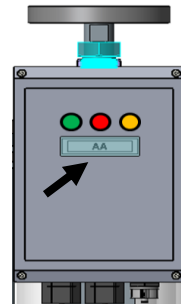




## 2-3 OLED panel information description

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The device uses the self-monitoring function to monitor its state and internal error, which are showed by LEDs and OLED display.



The OLED display shows information which is displayed as:



Temp. : air temperature(°C) through the SDB.

RH. : humidity in air through the SDB.



Predict Day: countdown to forecast.

Remain. : Heat up time countdown



Date: yyyy/mm/dd

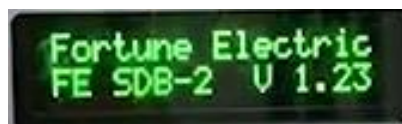
Time: mi:se



STD Count up: Standard countdown heat up days.



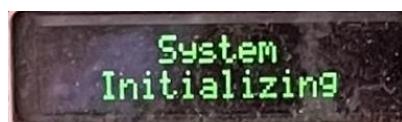
Cycle Status : Status of humidity cycle.



Fortune Electric:  
model / firmware version



Status: Status of Dehumidifier  
Heatings: regeneration process.



System Initializing

## 2-4 Maintenance & LED indicator

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During regular maintenance on transformer, we suggest performing the following checks on the SDB.

- ◆ Check the exterior condition of the equipment. (especially the stainless filter)
- ◆ Check the LED and display indication.
- ◆ The following table lists the individual conditions and faults:

Condition	LED green	LED red	LED yellow	Note
Power on	on	off	off	-
Regeneration process	on	off	on	-
Failure of the supply voltage	off	off	off	Check if the supply voltage is connected correctly. If the failure still remains, please contact FE.
Internal error	on	flashing	off	Push the reset button in the terminal box. If the error still remains, the sensor unit or load cell might be damaged. The device can still work for a long time, but please contact FE to replace it.

### CAUTION

If you have not used the SDB for a long time, you must store this product indoors. It is recommended that the ambient humidity does not exceed 60% and the temperature does not exceed 30°C.

# **3. Installation**

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3-1 Mounting

3-2 Connection plug-in

3-3 Electrical connection

---

## 3-1 Mounting

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### CAUTION

The operating and installation requirements described in this manual must be strictly followed. If not, the device can be damaged or a malfunction may occur.

Do not install in enclosed environment, proper ventilation is required.

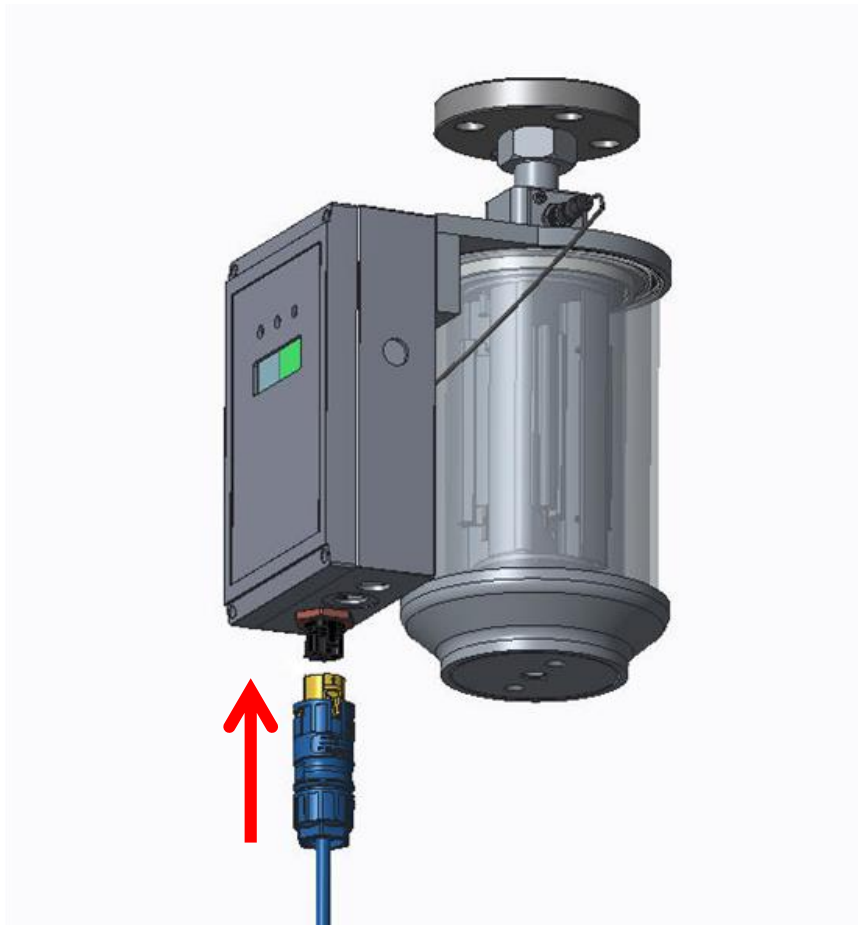
The SDB is mounted on the pipe to the oil conservator. Make sure that a suitable counter-flange can be installed on the pipe to mount the SDB. Supporting connection type: ANSI 1", DIN2558 1/2", DIN42562-3. If you have special style requirements, please contact Fortune's designers. During mounting, it is important to put the plane gasket between the two flanges. The flange is fixed with 4 screws and the system (pipe and SDB) must be assembled to guarantee the sealing.

## 3-2 Connection Plug-in

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When installing the SDB, simply insert the plug directly into the SDB's power port.

If not using the Plus in joint, please open the cover then remove the circuit board, also use the activity wrench to remove then nut. Then use the Material: SUS304 (Thread Specifications:1/2" (M25\*1.5) for next install.



## 3-3 Electrical connection

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### CAUTION

Electrical connection should be performed by qualified technician trained in relevant safety regulation.

### WARNING

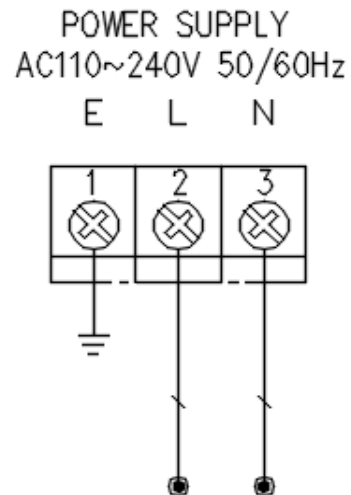
Dangerous electrical voltages! Disconnect power supply before opening the terminal box.



## 3-3 Electrical connection

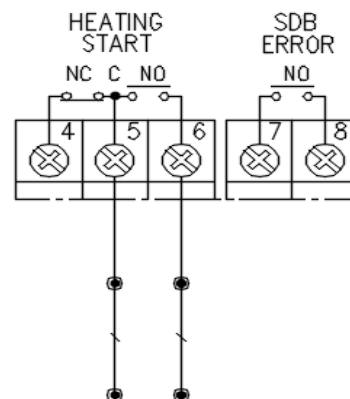
### STEP 1

To wire the self-dehydrating breather (SDB), open the terminal box. Connect the power supply to the terminals 2 (L) and 3 (N) and power on. The SDB will automatically enter its start-up procedure and begin to work.



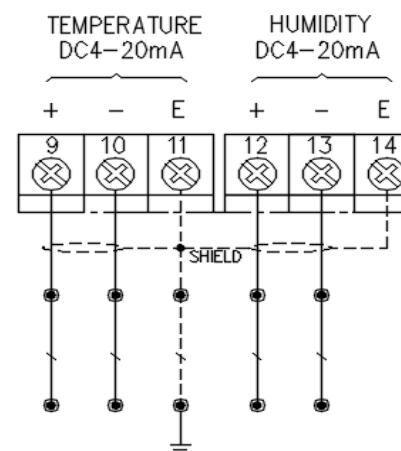
### STEP 2

The contact for the heating (regeneration process) is connected to terminals 4, 5 and 6. When the desiccant is regenerated, the terminal 5 and 6 are contacted. The error relay is connected to terminal 7 and 8. When a device error occurs, the contact closes.



### STEP 3

The analog output includes temperature and humidity. The temperature output is connected to terminal 9 (+) and 10(-). The humidity output is connected to terminal 12 (+) and 13 (-) and we suggest to use a shield cable for the connection and connecting the shield to terminal 11.





## **4. Technical data**

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4-1 Specification

4-2 Test

4-3 Appendix

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## 4-1 Specification

Item	Power Level	Distribution Level
Modle	FE-SDB-02	FE-DSDB-01
Supply Voltage	AC 110V~240V	AC 110V~240V
Frequency	50 / 60 Hz	50 / 60 Hz
MAX Power Consumption	560 W	280 W
External protection	NFB 16A or 20A	NFB 16A or 20A
External fuse protection	Slow Blow Fuse 8A	Slow Blow Fuse 4A
	If install Power Level and Distribution Lveel 2 machine at same time, please must use Slow Blow Fuse 12A.	
Dimension (mm)	170 <sub>(W)</sub> ×600 <sub>(H)</sub> ×260 <sub>(D)</sub>	170 <sub>(W)</sub> ×350 <sub>(H)</sub> ×260 <sub>(D)</sub>
Weight	12.3kg	8.7kg
Degree of Protection	IP56	IP56
Operation Temperature	Frigid zone      -30°C~ +80°C non-frigid zone    0°C~+80°C	
Output Signal	4~20mA (-30°C~+80°C / 0~100%)	4~20mA (-30°C~+80°C / 0~100%)
Applicable Transformer	≥ 40MVA( ≥ 300MVA Please use the three-way pipe to install two	<40MVA
Desiccant Weight	2.2kg	1.2kg
Desiccant	Colorless, non-poisonous silica gel.	
Material	All external parts are resistant to salt, transformer oil and ultraviolet rays.	
Connection Flange	FORTUNE's standard: Please refer to Appendix 4-3. Compatibility: ANSI 1" / DIN2558 1/2" DIN 42562-3 /	
Storage Function	Built-in memory card 365 days data storage space	

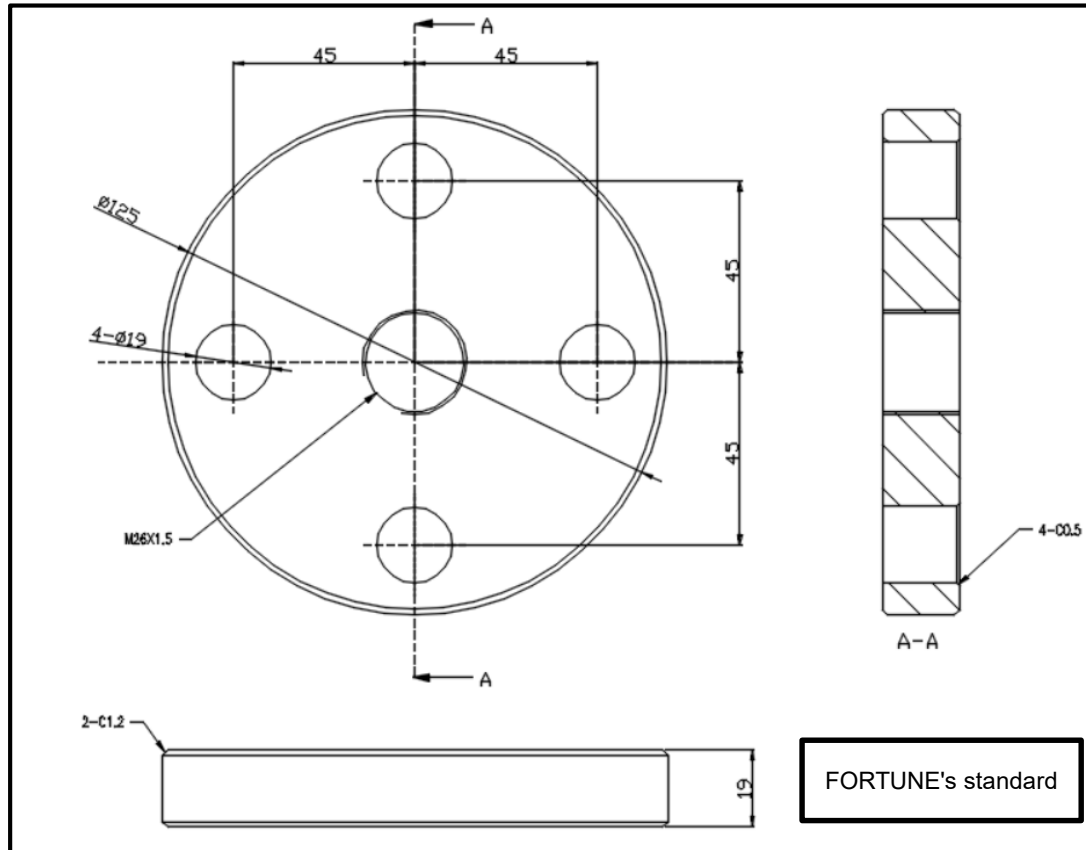
## 4-2 Test

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Description	Relevant standard
Electrostatic discharge	IEC 61000-4-2
Electrical fast transient/burst immunity test	IEC 61000-4-4
Surge immunity test	IEC 61000-4-5
Conducted disturbances	IEC 61000-4-6
Power frequency magnetic field	IEC 61000-4-8
Supply variation	IEC 61000-4-11
High Temperature Storage Life	JESD22-A103-D
PACKAGED VIBRATION TEST	ISTA Test Procedure 2A
Degrees of Protection Provided by Enclosures(IP56)	IEC 60529

# 4-3 Appendix

Connection flange:



**華城電機股份有限公司 Fortune Electric CO., LTD.**

總部及中壢廠：32063 桃園市中壢區吉林路 10 號

Headquarters: No.10, Jilin Rd., Zhongli Dist., Taoyuan City 320, Taiwan (R.O.C.)

TEL: +886 3 4526111

FAX: +886 3 4512833

E-mail: [fe@fortune.com.tw](mailto:fe@fortune.com.tw)

<http://www.fortune.com.tw/>

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