# Test Project

## Module E – Data center power and environmental monitoring

## *Intelligent Security Technology*

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# Module E – Data center power and environmental monitoring system

**Competition time:** 240 minutes

This project simulates the construction and operation and maintenance scenario of a power and environmental monitoring system for the core equipment room, power room, and key equipment area of a biopharmaceutical industrial park. The core equipment, precision instruments, and production support facilities of the industrial park have high requirements for the stability of operating environmental parameters, such as temperature, humidity, and light. A power and environmental monitoring system is required to realize real-time environmental parameter collection, abnormal alarm, device linkage control, and full-process operation and maintenance traceability, ensuring safe and stable equipment operation, avoiding environmental failure risks, and meeting production compliance requirements.

Competitors shall independently complete the hardware wiring, network configuration, protocol connection, and platform management of devices including the integrated data collector, temperature and humidity sensor, light sensor, and IO controller. Competitors shall also complete MQTT data transmission configuration, alarm level definition, alarm model threshold setting, and linkage rule configuration. Finally, Competitors shall verify data collection accuracy, alarm triggering effectiveness, linkage execution timeliness, closed-loop operation and maintenance management capability, and deliver a stable, reliable, traceable, and maintainable power and environmental monitoring solution.

## Instructions to the Competitor

1. At the beginning of the Competition, Competitors shall read and confirm all task requirements. Competitors shall complete the tasks in the order provided to better manage the Competition pace and ensure completeness of answers.
2. Only a limited number of finished network cables will be provided on site. Competitors shall make additional network cables as required. All network cables must be checked according to the required standard. If a cable does not meet the standard, it must be remade immediately.
3. During the Competition, Competitors shall not modify device usernames or passwords unless specifically required by the Test Project.
4. Competitors shall have basic system troubleshooting and fault-location ability. Competitors shall be able to inspect and make necessary adjustments to the operating environment by checking system logs, service status, network connectivity, and related configuration files.
5. All screenshots or videos generated during the Competition must be saved in the specified folder: Desktop\Exam Materials\Module E\Screenshots. Materials must be complete and accurately named for later assessment.
6. All submitted screenshots must show the complete current screen and must not be cropped or obscured.
7. A screenshot tool is provided, with the file path: Desktop\Exam Materials\Configuration Tool\Snipaste\Snipaste.exe

# Initial information

## Integrated data collector

| ITEM | CONTENT |
|---|---|
| Device Type | Integrated Data Collector |
| Device Name | Data Collector |
| Device IP Address | 192.168.3.11 |
| Subnet Mask | 255.255.255.0 |
| Gateway Address | 192.168.3.1 |
| Server IP Address | 192.168.3.122 |
| Port | 3000 |
| Username | admin |
| Password | admin123 |

## Digital intelligent security platform

| ITEM | CONTENT |
|---|---|
| Digital Intelligent Security Platform | 192.168.3.122 |
| Username | admin |
| Password | vcom@2026 |


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# Task E-1 – Equipment installation

## Task description

According to the requirements of Equipment Installation Design Drawing.drawio located at Desktop\Exam Materials\Module E\Equipment Installation Design Drawing\Equipment Installation Design Drawing.drawio, complete the device installation on the assigned workstation.

Prior to cable routing and wiring construction, finish the System Connection Design Drawing. All cables shall be routed reasonably, neatly and orderly.

The entire installation process shall ensure that the equipment is securely fixed, accurately positioned, and correctly connected.

### Requirement 1

1. Launch the drawing software. Navigate to Desktop\Exam Materials\Configuration Tool\draw.io\ and double-click draw.io.exe to start the program.

2. Import the equipment library. Navigate to File → Import Library, and select the file Desktop\Exam Materials\Module E\draw.io Equipment Library\Data Center Power & Enviromental Monitoring System.xml to complete the equipment library import.

3. Open the drawing project. Open the file System Connection Design Drawing.drawio for diagram editing.

4. Place all required devices on the canvas, all eleven (11) pieces of equipment as listed:

Fan, Light, Power Supply Cabinet, IO Controller, Switch, Serial Port Server, Integrated Data Collector, Light Sensor, Temperature and Humidity Sensor, Computer, Rack PDU.

Ensure all eleven (11) devices are fully displayed with no omissions or incorrect model information. Capture a screenshot of this view and save it to `Desktop\Exam Materials\Module E\Screenshots` with the filename E-1-1.png.

### Requirement 2

Complete the full editing and connection debugging of System Connection Design Drawing.drawio to ensure the system connection diagram is complete, standardized and compliant. Export the final finished diagram, and save it to the path Desktop\Exam Materials\Module E\Screenshots with the standard file name E-1-2.png.

### Requirement 3

Fill out the Construction Scheme and Schedule Arrangement document.

File path: Desktop\Exam Materials\Module E\Construction Scheme and Schedule Arrangement\Module E-Construction Scheme and Schedule Arrangement

### Key Requirements and Notes

This module adopts a centralized wall-mounted installation method.

The equipment shall be installed in the corresponding positions shown in the Equipment Installation Design Drawing. Wiring shall be completed according to the requirements. Labels and cable ties shall be used for identification. Unused wire harnesses shall be insulated with electrical tape to prevent short circuits and device damage.

# Task E-2 – Integrated data collector access configuration

## Task description

The core of the power and environmental monitoring system is the integrated data collector. Competitors shall complete collector power-on, network parameter configuration, platform search and binding, hierarchical object creation, and system management. A communication link shall be established between the collector, the power and environmental monitoring platform, and the MQTT server, providing hardware and network support for various sensors and monitoring devices and ensuring stable data collection and transmission.

## Configuration requirements

### Integrated data collector setting – Device information

| CONFIGURATION ITEM | CONTENT |
|---|---|
| Device Type | Integrated Data Collector |
| Device Name | Data Collector |
| Device IP Address | 192.168.3.11 |
| Subnet Mask | 255.255.255.0 |
| Gateway Address | 192.168.3.1 |

### Collection service configuration tool login – Configuration information

| CONFIGURATION ITEM | CONTENT |
|---|---|
| Server IP Address | 192.168.3.122 |
| Server Port | 3000 |
| Asset Configuration Port | 3100 |
| Username | admin |
| Password | @ZLcx8980 |


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# Task requirements

## Requirement 1

Connect the integrated data collector device, connect AC220V power, and ensure that the device is powered on normally.

## Requirement 2

This task requires you to complete the device information and network parameter configuration of the integrated data collector via the Collection Service Configuration Tool to make all parameters meet specified requirements.

Configure the following items on the Set Device Information interface:

| CONFIGURATION ITEM | CONTENT |
|---|---|
| Device Name | Integrated Data Collector |
| Password | 0 |
| DNS1 Address | 192.168.3.26 |
| DNS2 Address | 192.168.3.12 |
| Network Card  Number2A-Network Card Information | |
| MAC Address | Subject to the actual MAC address retrieved by device search |
| IP Address | 192.168.3.26 |
| Subnet Mask | 255.255.255.0 |
| Gateway Address | 192.168.3.1 |
| Network Card  Number2A-Network Card Information | |
| MAC Address | Subject to the actual MAC address retrieved by device search |
| IP Address | 192.168.3.12 |
| Subnet Mask | 255.255.255.0 |
| Gateway Address | 192.168.3.3 |

Capture a full screenshot of the finished Set Device Information pop-up window. (Save the interface screenshot as E-2-1.png)


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## Requirement 3

This task requires you to complete login authentication for the Collection Service Configuration Tool, locate the integrated data collector using the IP search function, and finish device information configuration to ensure all parameters comply with specified standards.

Configure the following items on the login interface:

| CONFIGURATION ITEM | CONTENT |
|---|---|
| Server IP | 192.168.3.26 |
| Server Port | 3000 |
| Asset Configuration Port | 3100 |
| Username | admin |
| Password | @ZLcx8980 |
| Checkbox | Check 【Remember】 |

Capture a screenshot of the login interface after completing all settings. (Save the interface screenshot as E-2-2.png)

## Requirement 4

This task requires you to use the object configuration function of the Collection Service Configuration Tool to create the "Key Security Area" object under the "Server" node, and master the operation procedure of hierarchical object management.

Configure the following parameters on the Add Object interface:

| CONFIGURATION ITEM | CONTENT |
|---|---|
| Name | Key Security Area |
| Custom Object Type | Area |
| Add Quantity | 1 |

Capture a screenshot after finishing the Add Object configuration. (Save the interface screenshot as E-2-3.png)

# Task E-3 – Temperature and humidity configuration

## Task description

The temperature and humidity of the equipment room directly affect the operation of precision equipment. Competitors shall complete the physical wiring, serial parameter configuration, device template creation, MQTT protocol connection, and data point configuration of the temperature and humidity sensor. This realizes real-time collection and standardized upload of equipment room temperature and humidity, providing basic data support for environmental monitoring and abnormal alarms.

## Configuration requirements

| CONFIGURATION ITEM | CONFIGURATION CONTENT |
|---|---|
| Temperature and Humidity Sensor (Model: S80-A3-ATHT02-S03) - Configuration Parameters | |
| Acquisition Mode | Serial Port |
| Serial Port Number | COM1 |
| Affiliated Data Collector | Integrated Data Collector |
| Temperature Threshold Range | 18-28℃ |
| Humidity Threshold Range | 40-60%RH |
| Illuminance Threshold Range | - |

## Task tequirements

### Requirement 1

Connect the Temperature and Humidity Sensor to the Integrated Data Collector, power on the devices, and ensure stable device connection.

### Requirement 2

This task requires you to complete the device addition and parameter configuration of the Temperature and Humidity Sensor under Key Security Area in the Collection Tree of the Collection Service Configuration Tool.

Operation Path: Collection Service Configuration Tool → Device Template Management → Click Add Device Template → Edit Device Template

Enter the Editing A Device Template pop-up window and complete the basic information configuration.


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| CONFIGURATION ITEM | CONFIGURATION CONTENT |
|---|---|
| Name | Temperature and Humidity Sensor |
| Template Type | COVT (Standard COVT, compatible with Version 1 protocol library) |
| XML File | Choose：Desktop \ Exam Materials \Configuration Tool \ Temperature and Humidity Sensor<br>.xml |
| Excel File | Choose：Desktop \ Exam Materials \Configuration Tool \ Temperature and Humidity Sensor.xls |
| Global Guid | Click "Generate" to generate automatically. |

Complete the configuration of point list data, including a total of 3 points.

| INDEX | POINT TYPE | NAME | UNIT | PRECISION | DESCRIBE |
|---|---|---|---|---|---|
| 1 | Switch Point | Online Point | - | 0 | 0:Offline;1:Online |
| 2 | Floating Point | temperature value | ℃ | 2 | - |
| 3 | Floating Point | humidity value | % | 2 | - |

Complete a full screenshot of the finished Editing A Device Template pop-up window and save it. (Save the screenshot as E-3-1.png)

Screenshot Requirements: Fully display the entire pop-up window. Make the point type, name, unit and precision information of all data points clearly visible, with the aforesaid parameters of temperature-related and humidity-related data points presented distinctly.

## Requirement 3

This task requires you to complete the parameter configuration addition for the Temperature and Humidity Sensor via the auxiliary service module of 【Add Object】, and fill in the contents on the Server Configuration interface. The detailed contents are as follows:

This task requires you to add the Temperature and Humidity Sensor device under Key Security Area and finish its parameter configuration within the Collection Tree management section of 【Collection Service Configuration Tool】. Configure the settings below on the 【Add Object】 interface:

| CONFIGURATION ITEM | CONFIGURATION CONTENT |
|---|---|
| Name | Temperature and Humidity Sensor |
| Custom Object Types | Physical Device |
| Add Number | 1 |
| Device Template | Temperature and Humidity Sensor |
| Collection Methods | Serial Port |
| Covt Protocol Library | Version2 |
| Serial NO. | COM1 |
| BaudRate | 9600 |
| DataBits | 8 |
| Check Digit | 无 |
| Stop Bit | 1 |
| Head Timeout (Ms) | 500 |
| Character Timeout(Ms) | 100 |
| Model | RS485 |
| Collection Interval(Ms) | 3000 |
| Collection Timeout(Ms) | 1000 |
| ErrorRetry Times | 3 |
| Discharge SaveInterval(S) | 0 |

Take a full screenshot of the configured 【Add Object】 pop-up window and save it. (Name the screenshot E-3-2.png)

## Requirement 4

This task requires you to complete the login parameter configuration for MQTT CONFIGURATION TOOL via the auxiliary service module of 【Collection Service Configuration Tool】, and fill in relevant content on the 【Server Configuration】 interface. Details are as follows:

| CONFIGURATION ITEM | CONFIGURATION CONTENT |
|---|---|
| Server Ip | 192.168.3.26 |
| Service Port | 3577 |
| Collection Service Port | 3000 |
| User Name For Collection Service | admin |
| Password For Collection Service | @ZLcx8980 |

Take a full screenshot of the completed 【Server Address】 pop-up window and store it, with the screenshot filename set to E-3-3.png

## Requirement 5

This task requires you to access 【MQTT CONFIGURATION TOOL】 from the auxiliary service module of 【Collection Service Configuration Tool】 and finish the connection parameter configuration for the MQTT platform, so as to master the docking workflow of IoT data transmission platforms.

Complete the settings on the 【MQTT CONFIGURATION TOOL Platform Configuration】 interface with the contents listed below:

| CONFIGURATION ITEM | CONFIGURATION CONTENT |
|---|---|
| ADDRESS | **192.168.3.122** |
| PORT | **1883** |
| CLIENTID | Custom input format: combination of numbers, uppercase and lowercase letters. It must be globally unique with a fixed length of 10 characters. |
| USERNAME | **qozik** |
| PASSWORD | **Qozik@1234** |

Capture the full interface of the fully configured 【MQTT Platform Configuration】 page and save the screenshot. (Save the screenshot as E-3-4.png)

## Requirement 6

This task requires you to define the content format of the Upload Template in【MQTT CONFIGURATION TOOL】, replace the system default template with the specified JSON format, and ensure that data from IoT devices is uploaded periodically in compliance with the standard format.

Complete the configuration on the 【Periodic Upload Template】 page as follows:

```
{
"device": "{__dtag__}",
"values": {
"Attributes": "{__attrs__}",
"DataTags": "{__tags__}",
"OnlineStatus": "{__online__}",
"SendTime": "{__st__}",
"TagsArray": "{__atags__}"
}
}
```

Capture the full page of the fully configured 【Upload Template】 and save the screenshot. The JSON content inside the editing box must be clearly displayed. (Save the screenshot as E-3-5.png)

## Requirement 7

This task requires you to create the Temperature and Humidity Sensor Device Template and configure its basic parameters in the device template module of 【MQTT CONFIGURATION TOOL】, to ensure device data is uploaded in accordance with the specified policy. Configure the following content on the 【Device Template Configuration】 interface:

| CONFIGURATION ITEM | CONFIGURATION CONTENT |
|---|---|
| Name | Temperature and Humidity Sensor |
| Upload Policy | Interval |
| Interval | 10 |
| MC4Device Template | Temperature and Humidity Sensor |

Capture the entire interface of the fully configured 【Device Template Configuration】 pop-up window. (Save the screenshot of the 【Device Template Configuration】 interface as E-3-6.png)

## Requirement 8

This task requires you to add custom attributes for the "Temperature value" point in the device template point list of 【MQTT CONFIGURATION TOOL】, master the refined configuration process of the device point list, and guarantee the accuracy of device data collection.

【Device Template Configuration-Point Table】

Complete the configuration on the 【Custom Attribute Configuration】 page according to the parameters specified below:

| CONFIGURATION ITEM | CONFIGURATION CONTENT |
|---|---|
| ATTRIBUTE KEY | bindingPoint |
| VALUE TYPE | Number |
| VALUE | 2 |
| Selected Status | √ |

Capture the full page of the fully configured 【Custom attribute configuration】 and save the screenshot. Selected Status, ATTRIBUTE KEY, VALUE TYPE and VALUE shall be clearly visible. (Save the screenshot as E-3-7.png)

## Requirement 9

This task requires you to add custom attributes for the "humidity value" point in the device template point list of 【MQTT CONFIGURATION TOOL】, master the refined configuration workflow of the device point list, and ensure the accuracy of device data collection.

【Device Template Configuration-Point Table】

Configure the following contents on the 【Custom attribute configuration】 page:

| CONFIGURATION ITEM | CONFIGURATION CONTENT |
|---|---|
| ATTRIBUTE KEY | bindingPoint |
| VALUE TYPE | Number |
| VALUE | 3 |
| Selected Status | √ |

Capture the complete page of the fully configured 【Custom attribute configuration】 and take a screenshot. The check status, ATTRIBUTE KEY, VALUE TYPE and VALUE must be clearly visible. (Save the screenshot of this interface as E-3-8)

## Requirement 10

This task requires you to check and confirm "temperature value" and "humidity value" in the device template point list of 【MQTT CONFIGURATION TOOL】, then save the configured template and apply it to the device to make the device collection strategy take effect. Perform the following configuration on the 【Device Template Configuration - Point Table】 page:

| CONFIGURATION ITEM | CONFIGURATION CONTENT |
|---|---|
| temperature value-Selected Status | The checkbox shall display a tick mark "√". |
| temperature value-CUSTOM ATTRIBUTES | 2 |
| humidity value-Selected Status | The checkbox shall display a tick mark "√". |
| humidity value-CUSTOM ATTRIBUTES | 3 |
| Checkbox of 【Online point】 | Checkbox marked with a tick "√" |

Take a full screenshot of the fully configured 【Device Template Configuration - Point Table】 page and save it. The checked status of "temperature value" and "humidity value", must be clearly visible. (Save the interface screenshot as E-3-9.png)

## Requirement 11

This task requires you to use the function "Add Device from MC4 (Auto Select Device Template)" in the object tree module of 【MQTT CONFIGURATION TOOL】. Meanwhile, add the Key Security Area under the MQTT Object Tree synchronously. Associate the temperature and humidity sensor devices in Select MC4 Object to the MQTT object tree, automatically match the pre-configured device template, and complete the binding between devices and the MQTT transmission channel. Configure the following settings on the 【Select MC4 Object】 page:

| CONFIGURATION ITEM | CONFIGURATION CONTENT |
|---|---|
| MC4 Object Tree-Selected Status | The checkbox shall display a tick mark "√". |
| Key security Area-Selected Status | The checkbox shall display a tick mark "√". |
| Temperature and Humidity Sensor<br>-Selected Status | The checkbox shall display a tick mark "√". |

Take a full screenshot of the fully configured 【Select MC4 Object】 pop-up window and save it. The ticked Selected Status of the three (3) nodes "MC4 Object Tree", "Key security Area" and "Temperature and Humidity Sensor" must be clearly visible. (Save the interface screenshot as E-3-10.png)


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## Requirement 12

This task requires you to fully apply the configured temperature and humidity sensor device template to all associated devices in 【MQTT CONFIGURATION TOOL】, so that the device collection strategies can take effect uniformly. Complete the configuration on the 【Select Template Application Scope】 page as follows:

| CONFIGURATION ITEM | CONFIGURATION CONTENT |
|---|---|
| Select Template Application Scope-Selected Status | The checkbox shall display a tick mark "√". |

Capture the entire interface of the fully configured 【Select Template Application Scope】 pop-up window and save the screenshot. The checked status of "Apply to All Devices " must be clearly displayed. (Save the interface screenshot as E-3-11.png)

## Requirement 13

This task requires you to check the key data collection points (Temperature value, humidity value) for the temperature and humidity sensor in the object tree module of 【MQTT CONFIGURATION TOOL】 and save the configuration, so that these two (2) core data points are included in the MQTT data push process to guarantee valid data collection. Complete the configuration on the point list page as follows:

| CONFIGURATION ITEM | CONFIGURATION CONTENT |
|---|---|
| Temperature value-Selected Status | The checkbox shall display a tick mark "√". |
| humidity value-Selected Status | The checkbox shall display a tick mark "√". |

Take a full screenshot of the completed point list page and save it. The tick mark "√" status of "Temperature value" and "Humidity value" shall be clearly displayed. (Save the interface screenshot as E-3-12.png)


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# Task E-4 – Light sensor configuration

## Task description

The light intensity of the equipment room and equipment area affects equipment heat dissipation and manual inspection safety. Competitors shall complete hardware access, serial communication configuration, device template creation, MQTT access, and core data point configuration of the light sensor. This enables accurate collection of environmental light data and provides data basis for insufficient light alarms and supplementary lighting linkage.

## Configuration requirements

| CONFIGURATION ITEM | CONTENT |
|---|---|
| Device Model | S80-A3-ALGT01-S01 |
| Collection Method | Serial Port |
| Serial Port Number | COM2 |
| Associated Data Collector | Data Collector |
| Light Threshold Range | 100-1000 lux |

## Task requirements

### Requirement 1

Connect the light sensor to the integrated data collector, connect the power supply, and ensure that the device connection is stable.


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## Requirement 2

This task requires you to create a device template for the illuminance sensor with Modbus RTU protocol in the device template configuration module of the Collection Service Configuration Tool. Familiarize yourself with the standardized configuration process for industrial sensor device templates to ensure template parameters meet data collection requirements.

Complete the configuration on the Edit Device Template page as specified below:

| CONFIGURATION ITEM | CONTENT |
|---|---|
| Basic Information | |
| Name | Light Sensor |
| Template Type | Modbus |
| Subtype | Modbus RTU |
| Point Table Content | |
| Name | Light Intensity |
| Point Type | Numeric Point |
| Precision | 0 |
| Edit A Device Template - Configure Point Table | |
| Point Index | 2 |
| Unit | LUX |
| Data Type | Bin_int16N |
| Read Function Code | 3 |
| Write Function Code | 6 |
| Register Address | 7 |
| Coefficient | 0 |

Capture a full screenshot of the finished Edit Device Template pop-up window. The screenshot must clearly show the template basic information and all parameter settings in the point list (including unit, data type, function codes, etc.). (Save the interface screenshot as E-4-1.png)

## Requirement 3

This task requires you to add an IO device of Light Sensor for the "Key Security Area" in the object configuration module of the Collection Service Configuration Tool and complete the configuration of serial communication and collection parameters to master the hierarchical access process of industrial sensors.

Complete the configuration on the Add Object page with the following parameters:

| CONFIGURATION ITEM | CONTENT |
|---|---|
| Name | Light Sensor |
| Custom Object Type | Physical Device |
| Device Template | Light Sensor |
| Collection MethodS | Serial Port |
| COVT Protocol Library | Version2 |
| Device Address | 1 |
| Serial NO. | COM2 |
| Baud Rate | 9600 |
| Data Bits | 8 |
| Check Digit | Null |
| Parity Bit | None |
| Stop Bits | 1 |
| Header Timeout (ms) | 500 |
| Trailer Timeout (ms) | 100 |
| Mode | RS485 |

Capture a full screenshot of the configured Add Object pop-up window, which shall clearly display all parameter settings. (Save the interface screenshot as E-4-2.png)

## Requirement 4

This task requires you to complete the login parameter configuration for the MQTT Configuration Tool in the auxiliary service module of the Collection Service Configuration Tool, so as to ensure correct connection parameters between the MQTT service and collection service and lay a foundation for subsequent data transmission.

Complete the configuration on the Server Configuration interface with the following parameters:

| CONFIGURATION ITEM | CONTENT |
|---|---|
| Server IP | 192.168.3.26 |
| Service Port | 3577 |
| Collection Service Port | 3000 |
| Username For Collection Service | admin |
| Password For Collection Service | @ZLcx8980 |

Capture a full screenshot of the finished Server Configuration pop-up window, which must clearly show all filled parameters. (Save the interface screenshot as E-4-3.png)

## Requirement 5

This task requires you to access the MQTT Configuration Tool under the auxiliary service module of the Collection Service Configuration Tool and complete the connection parameter settings for the MQTT platform. This ensures IoT device data can be normally uploaded to the designated platform via the MQTT protocol.

Complete the configuration on the MQTT Platform Configuration page as follows:

| CONFIGURATION ITEM | CONTENT |
|---|---|
| Address | 192.168.3.122 |
| Port | 1883 |
| Client ID | Custom input, consisting of digits, uppercase and lowercase letters; must be globally unique with a fixed length of 10 characters |
| Username | qozik |
| Password | Qozik@1234 |

Capture a full screenshot of the finished MQTT Platform Configuration page, which shall clearly display the configured Address, Port, Client ID, Username and Password. (Save the interface screenshot as E-4-4.png)


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## Requirement 6

This task requires you to define the content format of the Upload Template in【MQTT CONFIGURATION TOOL】, replace the system default template with the specified JSON format, and ensure that data from IoT devices is uploaded periodically in compliance with the standard format.

Complete the configuration on the 【Periodic Upload Template】 page as follows:

```
{
"device": "{__dtag__}",
"values": {
"Attributes": "{__attrs__}",
"DataTags": "{__tags__}",
"OnlineStatus": "{__online__}",
"SendTime": "{__st__}",
"TagsArray": "{__atags__}"
}
}
```

Capture a full screenshot of the configured Periodic Upload Template page, which must clearly display the JSON content inside the editing box. (Save the interface screenshot as E-4-5.png)

## Requirement 7

This task requires you to create the Temperature and Humidity Sensor Device Template and configure its basic parameters in the device template module of 【MQTT CONFIGURATION TOOL】, to ensure device data is uploaded in accordance with the specified policy. Configure the following content on the 【Device Template Configuration】 interface:

| CONFIGURATION ITEM | CONTENT |
|---|---|
| Name | Light Sensor |
| Upload Policy | Interval |
| Interval | 10 |
| MC4 Device Template | Light Sensor |

Capture the entire interface of the fully configured 【Device Template Configuration】 pop-up window. (Save the screenshot of the 【Device Template Configuration】 interface as E-4-6.png)


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## Requirement 8

This task requires you to add custom attributes for the "Light Intensity" data point in the device template point table of the MQTT CONFIGURATION TOOL. Master the refined configuration workflow of the device point table to guarantee the accuracy of device data collection.

【Device Template Configuration-Point Table】

Complete the settings on the Custom attribute configuration page according to the following requirements:

| CONFIGURATION ITEM | CONFIGURATION CONTENT |
|---|---|
| ATTRIBUTE KEY | bindingPoint |
| VALUE TYPE | Number |
| VALUE | 2 |
| Selected Status | √ |

Capture a full screenshot of the finished Custom Attribute Configuration page. The screenshot shall clearly display the selected tick status. (Save the interface screenshot as E-4-7.png)

## Requirement 9

This task requires you to check and confirm the data point of "Light Intensity" in the device template point table of the MQTT CONFIGURATION TOOL, then save the device template to ensure this core data point is included in the MQTT data collection and transmission process.

Complete the configuration on the Device Template Configuration - Point Table page as specified below:

| CONFIGURATION ITEM | CONTENT |
|---|---|
| Checkbox of 【Light Intensity】 | Checkbox marked with a tick "√" |
| Checkbox of 【Online point】 | Checkbox marked with a tick "√" |
| 【Light Intensity】-CUSTOM ATTRIBUTES | 1 |

Capture a full screenshot of the configured Device Template Configuration - Point Table page. The screenshot must clearly show the tick "√" for Light Intensity and the custom attribute value set . (Save the interface screenshot as E-4-8.png)


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## Requirement 10

This task requires you to use the function "Add Device from MC4 (Auto Select Device Template)" in the object tree module of 【MQTT CONFIGURATION TOOL】. Meanwhile, add the Key Security Area under the MQTT Object Tree synchronously. Associate the temperature and humidity sensor devices in Select MC4 Object to the MQTT object tree, automatically match the pre-configured device template, and complete the binding between devices and the MQTT transmission channel. Configure the following settings on the 【Select MC4 Object】 page:

| CONFIGURATION ITEM | CONFIGURATION CONTENT |
|---|---|
| MC4 Object Tree-Selected Status | The checkbox shall display a tick mark "√". |
| Key security Area-Selected Status | The checkbox shall display a tick mark "√". |
| Light Sensor<br>-Selected Status | The checkbox shall display a tick mark "√". |

Take a full screenshot of the fully configured 【Select MC4 Object】 pop-up window and save it. The ticked Selected Status of the three (3) nodes "MC4 Object Tree", "Key security Area" and "Light Sensor" must be clearly visible. (Save the interface screenshot as E-4-9.png)

## Requirement 11

This task requires you to use the MQTT CONFIGURATION TOOL to fully apply the configured device templates (such as temperature and humidity sensor templates and illuminance sensor templates) to all associated devices, ensuring uniform activation of device collection policies.

Complete the configuration on the Select Template Application Scope page with the following requirements:

| CONFIGURATION ITEM | CONTENT |
|---|---|
| Apply to All Devices - Selected Status | Checkbox marked with a tick "√" |

Capture a full screenshot of the configured Select Template Application Scope pop-up window, which must clearly display the tick "√" for the option "Apply to All Devices". (Save the interface screenshot as E-4-10.png)

## Requirement 12

This task requires you to check the core data collection point (Light Intensity) for the illuminance sensor and save the configuration in the object tree module of the MQTT CONFIGURATION TOOL. Ensure this data point is included in the MQTT data push process to guarantee valid data collection.

Complete the configuration on the Point List page as follows:

| CONFIGURATION ITEM | CONTENT |
|---|---|
| Light Intensity - Selected Status | Checkbox marked with a tick "√" |

Capture a full screenshot of the finished Point List page, which must clearly display the tick "√" for Light Intensity. (Save the interface screenshot as E-4-11.png)

# Task E-5 – Basic device configuration

## Task description

To build the core data collection and management foundation of the power and environmental monitoring system and realize unified access, protocol conversion, and platform-based control of various front-end sensor data, the system management configuration of the integrated data collector shall be completed. The integrated data collector serves as the core aggregation node of the power and environmental monitoring system and is responsible for centralized collection, standardized upload, and command forwarding of data from temperature and humidity, light, and other devices.

## Configuration requirements

| CONFIGURATION ITEM | CONTENT |
|---|---|
| Device Type | Integrated Data Collector |
| Device Name | Integrated Data Collector |
| Device IP Address | 192.168.3.26 |
| Device Port | 3000 |
| Asset Configuration Port | 3100 |
| Username | admin |
| Password | @ZLcx8980 |

## Task requirements

### Requirement 1

Log in to the backend of the Power and Environmental Monitoring System. Go to Device Management > Device List, click Add, complete all parameters of the integrated data collector, and save.

After completion of addition, capture a screenshot of the edit page and save it as E-5-1.png.

### Requirement 2

In the device management module, verify whether the core data points of the temperature and humidity sensor, including Temperature Value and Humidity Value, are normally displayed. Save the device point table screenshot as E-5-2.png.

### Requirement 3

In the device management module, verify whether the core data point of the light sensor, Light Intensity, is normally displayed. Save the device point table screenshot as E-5-3.png.


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# Task E-6 – Communication interface device (IO controller) configuration

## Task tescription

The IO controller is the core execution device for linkage. Competitors shall complete wiring between the serial server and the IO controller, serial parameters, network configuration, and function mapping. This establishes a communication link between the platform and the IO controller and provides the hardware control foundation for execution actions such as high-temperature fan linkage and light linkage supplementary lighting.

## Configuration requirements

| CONFIGURATION ITEM | CONTENT |
|---|---|
| Device Type | RS485 - Eight Serial Ports |
| Device Name | Serial Server |
| Device Serial Number | Manual Input |
| Serial IP Address | 192.168.3.80 |
| Subnet Mask | 255.255.255.0 |
| Gateway Address | 192.168.3.1 |
| Serial Port | Serial Port 5 |
| Local Port | 506 |
| Target Port | 10563 |
| Target IP Address | 192.168.3.122 |
| Baud Rate | 9600 bps |
| Data Bits | 8 |
| Stop Bits | 1 |
| Parity Bit | None |
| Access Device Type | IO Controller |
| Access Device | IO Controller |
| Channel Type - Input RX | IO Controller |
| Channel Type - Output TX | None |


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# Task requirements

## Requirement 1

Connect the serial server and IO controller, connect the power supply, and ensure that the device connection is stable.

## Requirement 2

Launch Serial Server Configuration Tool; its executable path is Desktop\Exam Materials\Configuration Tool\Serial Server Configuration Tool.exe.
and complete the parameter settings of the serial port connected to the IO controller according to the configuration requirements.

## Requirement 3

Log in to the backend of the Power and Environmental Monitoring System.

Go to Device Management > Communication Interface Device, add and configure a communication interface device for Serial Port 5 to connect the IO controller. The screenshot shall clearly show all configuration parameters, including working mode, local port, target IP/port, serial parameters, access device type, and channel configuration. Save the screenshot as E-6-1.png.

# Task E-7 – Alarm level settings

## Task description

To standardize the power and environmental abnormality handling process, Level 1 and Level 2 alarms shall be defined. Different alarm levels shall clearly indicate risk level, handling priority, and response requirements, providing classification standards for subsequent alarm model binding and operation and maintenance handling and realizing differentiated alarm management.

## Alarm level configuration information

| ITEM | CONTENT |
|---|---|
| Alarm Level Name 1 | Level 1 Alarm |
| Description 1 | Device parameters seriously exceed the standard and may cause system failure or safety risks |
| Alarm Level Name 2 | Level 2 Alarm |
| Description 2 | Device parameters slightly exceed the standard and do not affect core system functions, but timely inspection is required |

## Task requirements

Log in to the backend of the Power and Environmental Monitoring System. Go to Alarm Management > Alarm Level, add and configure Level 1 and Level 2 alarm levels, and clarify the descriptions and response requirements of different alarm levels. The screenshot shall show the names, descriptions, and Created At of Level 1 Alarm and Level 2 Alarm. Save the screenshot as E-7-1.png.

# Task E-8 – Alarm model configuration

## Task description

For two (2) core risks, including equipment room high temperature and insufficient light, alarm thresholds, trigger conditions, delay and repeat rules shall be configured. Corresponding monitoring devices and alarm levels shall be bound, and alarm/recovery content shall be defined to realize automatic abnormality identification and accurate alarm reporting.

## Alarm model configuration information

### High temperature alarm

| ITEM | CONTENT |
|---|---|

| | |
|---|---|
| Alarm Name | Equipment Room High Temperature Alarm |
| Alarm Level | Level 1 Alarm |
| Alarm Type Description | **High Temperature Overlimit Alarm** |
| Trigger Type | Numeric |
| Alarm Threshold | Upper Alarm Threshold |
| Alarm Upper Limit | 15 |
| Delay Time | 10 seconds |
| Alarm Repeat Interval | 1 minutes |
| Upper Limit Alarm Content | Equipment room temperature exceeds 15 degC. Please check the cooling equipment immediately! |
| Upper Limit Recovery Content | Equipment room temperature has returned below 15 degC. Device operation is normal. |
| Associated Device | Temperature and Humidity Sensor |

### Insufficient light alarm

| ITEM | CONTENT |
|---|---|
| Alarm Name | Equipment Room Insufficient Light Alarm |
| Alarm Level | Level 2 Alarm |
| Alarm Type Description | **Illuminance Lower Limit Exceeding Alarm** |
| Trigger Type | Numeric |
| Alarm Threshold | Lower Alarm Threshold |
| Alarm Lower Limit | 100 |
| Delay Time | 10 seconds |
| Alarm Repeat Interval | 1 minutes |
| Lower Limit Alarm Content | Equipment room light is below 100 lux. Please turn on supplementary lighting! |
| Lower Limit Recovery Content | Equipment room light has returned above 100 lux. Status is normal. |
| Associated Device | Light Sensor |

# Task requirements

## Requirement 1

Go to Alarm Management > Alarm Model, click Add, and complete the Equipment Room High Temperature Alarm model configuration. After completion of addition, capture a screenshot of the editing page and save it as E-8-1.png.

The screenshot shall clearly show all parameters, including alarm name, alarm level, threshold, trigger delay, and alarm content.

## Requirement 2

Go to Alarm Management > Alarm Model, click Add, and complete the Equipment Room Insufficient Light Alarm model configuration. After completion of addition, capture a screenshot of the editing page and save it as E-8-2.png.

The screenshot shall clearly show all parameters, including alarm name, alarm level, threshold, trigger delay, and alarm content.

# Task E-9 – Linkage rule configuration

## Task description

To realize automatic abnormality handling, high-temperature fan linkage and insufficient light supplementary lighting linkage rules shall be configured. Alarm models, communication interfaces, and execution actions shall be bound so that devices can automatically respond after an alarm is triggered, forming a closed loop of **abnormality identification - automatic handling** and improving system automation.

## Configuration requirements

### High temperature fan linkage

| CONFIGURATION ITEM | CONTENT |
|---|---|
| Linkage Name | High Temperature Linkage Fan On |
| Trigger Alarm Model | Equipment Room High Temperature Alarm |
| Associated Communication Interface Device | Serial Server |
| Associated Serial Port | COM5 |
| Access Device Type | IO Controller |
| Execution Action 1 | (DO1) On - Fan |
| Duration | 5s |

### Insufficient light supplementary lighting linkage

| CONFIGURATION ITEM | CONTENT |
|---|---|
| Linkage Name | Insufficient Light Linkage Supplementary Light On |
| Trigger Alarm Model | Equipment Room Insufficient Light Alarm |
| Associated Communication Interface Device | Serial Server |
| Associated Serial Port | COM5 |
| Access Device Type | IO Controller |
| Execution Action 2 | (DO2) On - Supplementary Light |
| Duration | 5s |


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## Task requirements

### Requirement 1

In the linkage management module of the power and environmental monitoring system, add a linkage configuration named High Temperature Linkage Fan On. The complete Linkage Management > Linkage Configuration page shall show the linkage name, configuration status On, and Action Execution (DO Port Level - Connected Device - Contact Status) (DO1) On - Fan - Off. Save the screenshot as E-9-1.png.

### Requirement 2

Add a linkage configuration named Insufficient Light Linkage Supplementary Light On. The complete Linkage Management > Linkage Configuration page shall show the linkage name, configuration status On, and Action Execution (DO Port Level- Connected Device - Contact Status) (DO2) On - Supplementary Light - Off. Save the screenshot as E-9-2.png.

# Task E-10 – Alarm record and linkage result verification

## Task description

To verify the effectiveness of alarms and linkage, high temperature and insufficient light alarms shall be simulated and triggered. Competitors shall check the completeness and accuracy of alarm records and confirm that linkage actions are executed normally, ensuring that the whole process of alarm triggering, linkage response, and log retention is reliable.

## Configuration requirements

### Alarm record

| ITEM | INSUFFICIENT LIGHT ALARM | HIGH TEMPERATURE ALARM |
|---|---|---|
| Alarm Name | Equipment Room Insufficient Light Alarm | Equipment Room High Temperature Alarm |
| Alarm Level | Level 2 Alarm | Level 1 Alarm |
| Alarm Content | Equipment room light is below 100 lux. Please turn on supplementary lighting | Equipment room temperature exceeds 15 degC. Please check the cooling equipment immediately |
| Status | Pending | Pending |

### Linkage record

| ITEM | CONTENT |
|---|---|

| | |
|---|---|
| Linkage Name | Insufficient Light Linkage Supplementary Light On/High Temperature Linkage Fan On |
| Execution Action | (DO2) On - Supplementary Light/(DO1) On - Fan |

## Task requirements

### Requirement 1

Go to Alarm Management > Alarm Record and verify the Equipment Room Insufficient Light Alarm event information. Save the screenshot as E-10-1.png.

### Requirement 2

Go to Alarm Management > Alarm Record and verify the Equipment Room High Temperature Alarm event information. Save the screenshot as E-10-2.png.

### Requirement 3

Go to Linkage Management > Linkage Record and filter the linkage name High Temperature Linkage Fan On with execution action (DO Port Level- Connected Device - Contact Status) (DO1) On - Fan. Verify that the system generates and retains the linkage execution log. Save the screenshot as E-10-3.png.

### Requirement 4

Go to Linkage Management > Linkage Record and filter the linkage name Insufficient Light Linkage Supplementary Light On with execution action (DO2) On - Supplementary Light. Verify that the system generates and retains the linkage execution log. Save the screenshot as E-10-4.png.

# Task E-11 – Alarm handling for operation and maintenance management

## Task description

To realize closed-loop alarm management, the triggered high temperature and insufficient light alarms shall be checked and handled. Competitors shall fill in handling content and retain records to form an alarm handling ledger, ensuring that abnormalities are traceable and verifiable and improving operation and maintenance standardization.

## Configuration requirements

| ITEM | INSUFFICIENT LIGHT ALARM | HIGH TEMPERATURE ALARM |
|---|---|---|
| Alarm Name | Equipment Room Insufficient Light Alarm | Equipment Room High Temperature Alarm |
| Alarm Level | Level 2 Alarm | Level 1 Alarm |


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| | | |
|---|---|---|
| Alarm Content | Equipment room light is below 100 lux. Please turn on supplementary lighting | Equipment room temperature exceeds 15 degC. Please check the cooling equipment immediately |
| Processing Content | Turn on supplementary light | Turn on fan |

# Task requirements

## Requirement 1

Go to Alarm Management > Alarm Record, locate the Equipment Room High Temperature Alarm, fill in the handling measure, and complete closed-loop alarm handling. After processing, click Details for the record and capture the complete alarm details pop-up. The screenshot shall clearly show alarm name, alarm level, alarm content, and processing content Turn on fan. Save the screenshot as E-11-1.png.

## Requirement 2

Go to Alarm Management > Alarm Record, locate the alarm record, fill in the handling measure, and complete closed-loop alarm handling. After processing, click Details for the record and capture the complete alarm details pop-up. The screenshot shall clearly show alarm name, alarm level, alarm content, and processing content Turn on supplementary light. Save the screenshot as E-11-2.png