

# Huatech

# iEDS

## Intelligent Expert Diagnosis System

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### Iterative upgrading of operation and maintenance methods

iEDS will effectively analyse product health and faults, upgrading reactive O&M iterations to proactive O&M, and providing early warning, prevention and prediction of equipment operation, which will shorten outage times, reduce the number of outages and prolong the operational life of equipment.

### Operation and maintenance and asset management

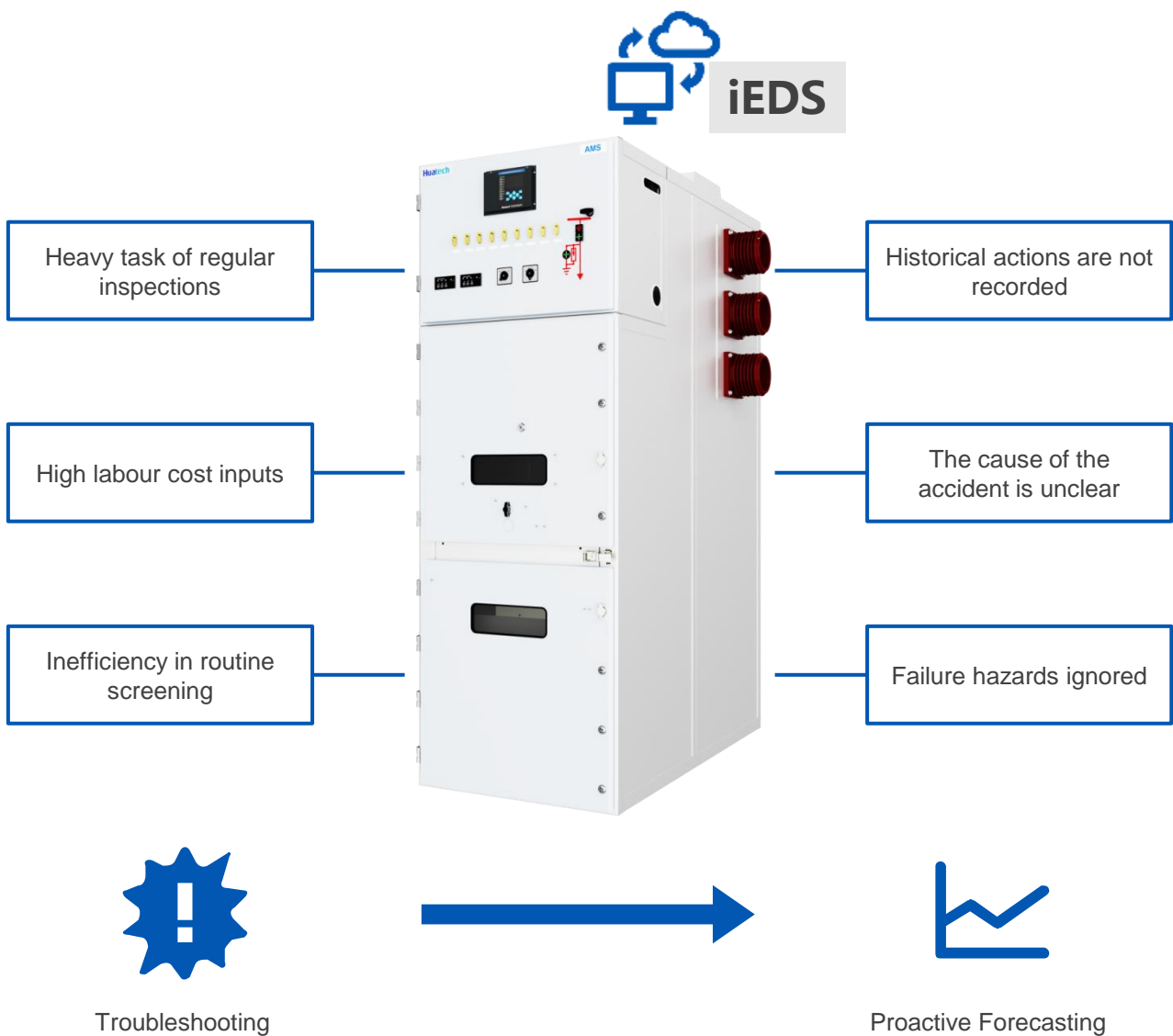
iEDS can provide multi-dimensional enquiry and related operation reports, electrical asset configuration information, LV asset energy management, circuit breaker aging life assessment, rapid fault diagnosis, real-time monitoring of operating temperatures, precise preventive maintenance guidance and planning, intelligent inspection of people and objects, etc.



# iEDS Intelligent Expert Diagnostic System Platform

## iEDS platform

The traditional operation and maintenance mode has multiple limitations, and it is impossible to know the status of switchgear in real time and analyse it accurately. iEDS is based on Huatech's 20 years of experience in switchgear manufacturing, and integrates a large amount of experimental data and a massive database, combining with edge computing, to accurately judge the status of switchgear, reduce unplanned outages, and improve the reliability of power supply.





### Overview

The expert diagnosis system was developed by Xiamen Huadian switchgear Co., Ltd. which is a professional doctor of the switchgear, integrating multi-disciplinary technologies such as high-voltage switch, electrical, computer, communication, big data analysis and artificial intelligence. On the basis of diagnosis strategy analysis method, industry expert experience and a large number of test station fault data, real-time monitoring, data analysis, self-diagnosis and operation and maintenance strategy guidance of the switchgear are carried out.

### Product function

iEDS is able to push diagnostic conclusions and operation and maintenance strategies to the client based on IoT communication technology means, realising the integration of remote monitoring and diagnosis, which reduces the technical requirements for fault diagnosis, prevents the emergence of equipment faults, and prolongs the service life of the equipment. The expert diagnosis system can also update the fault database information through self-learning, thus promoting the accuracy of fault analysis, health status monitoring and life prediction.

### Product features

iEDS is to install various sensors and meters on switchgear to collect switchgear health, temperature, current, operation curves and energy usage profiles. At the same time, it integrates professional diagnostic methods and theories, and analyses and diagnoses the collected data and switchgear in terms of switchgear comprehensively.

- Equipment Health Management
- Analysing potential faults in switchgear
- Early warning of defects and provision of solutions
- Energy efficiency management and power quality analysis

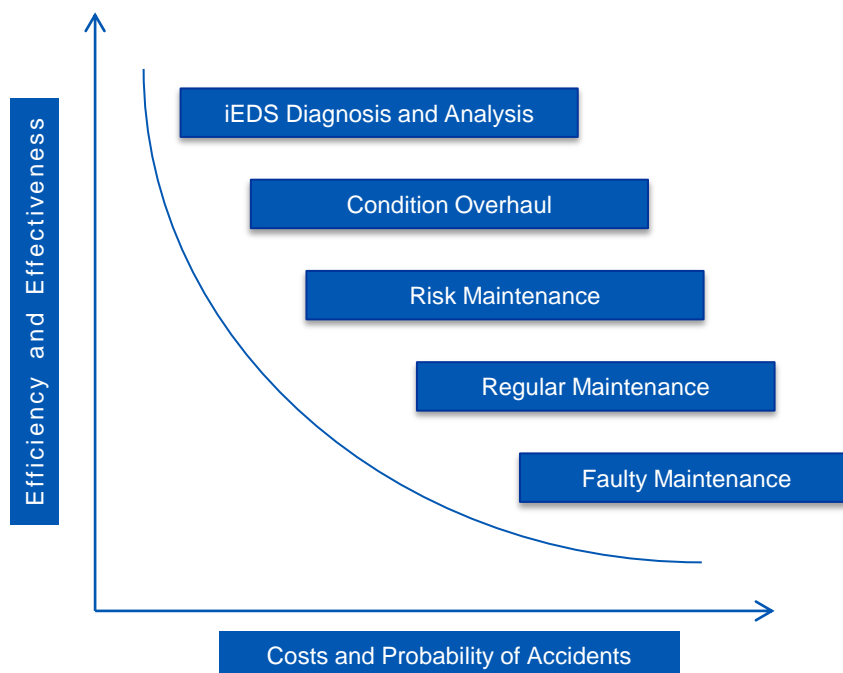
## Maintenance Efficiency

### Improve the efficiency of operations and maintenance

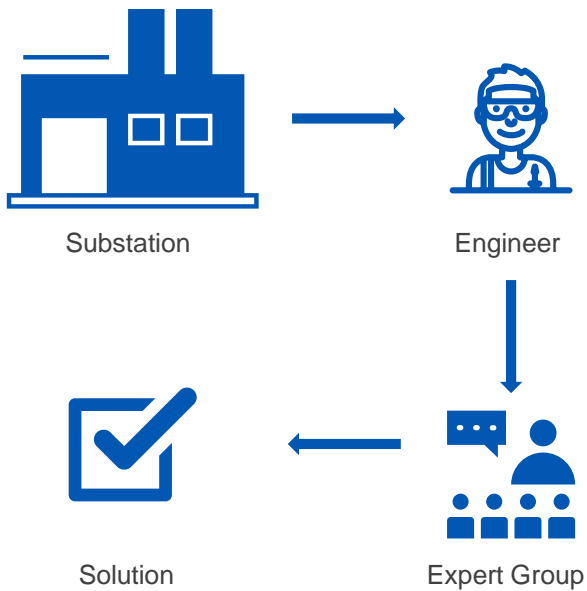
iEDS is able to monitor the status of switchgear and analyse switchgear failures, predict product lifespan, and identify switch health hazards. The entire diagnostic analysis does not require personnel involvement or hiring of experts, making it a fast, efficient, and low-cost professional diagnostic system.

### Provision of value-added services

- Faulty maintenance: Maintenance work carried out when a fault or abnormality is detected in equipment to restore it to its normal operating condition;
- Regular maintenance: visual inspection, equipment cleaning, lubrication of mechanical parts, replacement of worn parts and routine testing;
- Risk maintenance: analyse the operating parameters and environmental information of the equipment in the light of the environment in which the equipment is used, its operation in the system, and the conditions of the equipment's production process, etc., and assess the condition and risks of the equipment. The condition and risk of the equipment is assessed and a maintenance programme is determined;
- Condition overhaul: The group of experts looks at the operational data and analyses and determines the condition of the equipment;
- Diagnosis and analysis: The intelligent acquisition unit acquires switchgear operation data and stores it, and the expert diagnosis system analyses the data and determines the health condition of the equipment. The expert diagnosis system analyses the data and judges the health of the equipment, outputs the status of the equipment and predicts the life span.



## Comparison of Programmes

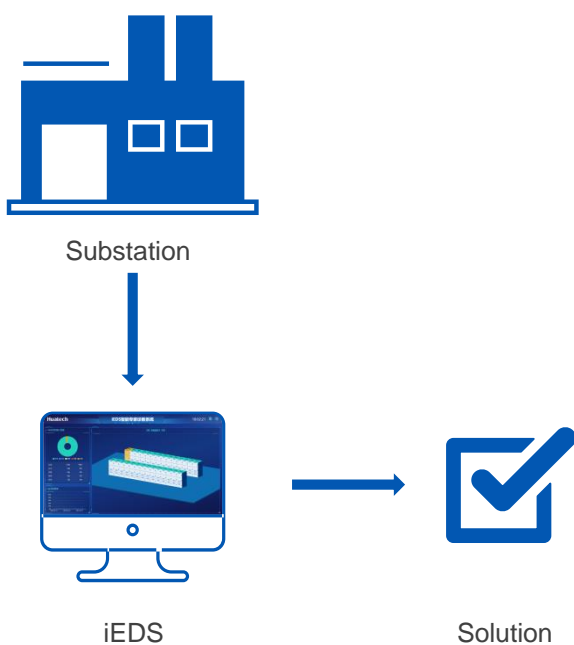


### ■ Solutions for online monitoring, condition-based maintenance

- On-site troubleshooting by professionals or remote realtime processing by online monitoring experts

### ■ Characteristic

- In response to the failure that has occurred, when the equipment malfunctions or abnormalities, the user needs to hire a team of experts to analyse and negotiate with the manufacturer to solve the problem. This is costly and time-consuming



### ■ Expert diagnostic system solutions

- The intelligent monitoring unit acquires operational data, compares and analyses it with the fault library, judges product health, predicts product life, analyses faulty products and outputs fault causes and solutions, which can be viewed and solved by on-site operation and maintenance personnel via mobile clients or laptops.

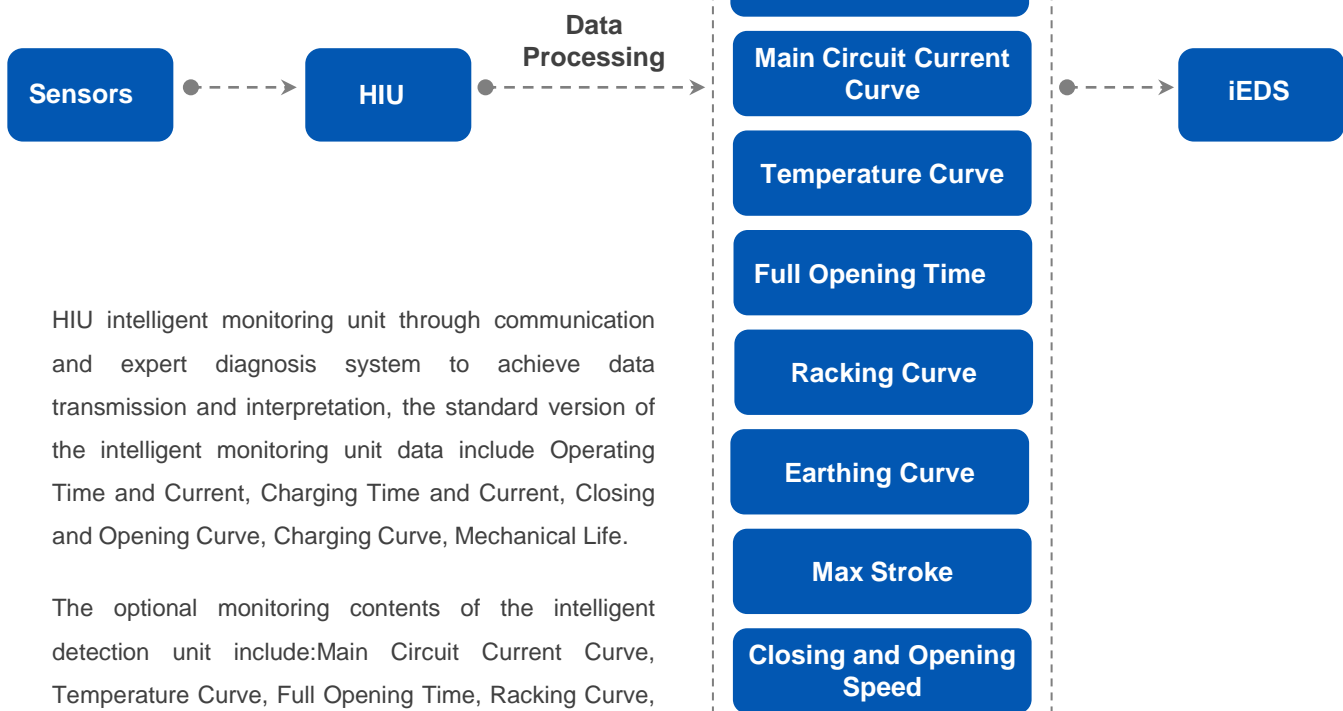
### ■ Characteristic

- It is possible to analyse and troubleshoot faults that have already occurred, as well as to predict life expectancy and identify potential faults. When equipment malfunctions or abnormalities occur, the expert diagnostic system informs the user of the fault problem and its cause, and the user contacts the manufacturer directly to solve the problem quickly. Reduced costs and maintenance time.

# HIU

Intelligent monitoring unit is an important

part of iEDS and intelligent switchgear. HIU intelligent monitoring unit not only meets the application requirements of traditional substation for the whole life cycle management of switchgear, but also meets the future requirements for the intelligentisation of medium-voltage switchgear.



HIU intelligent monitoring unit through communication and expert diagnosis system to achieve data transmission and interpretation, the standard version of the intelligent monitoring unit data include Operating Time and Current, Charging Time and Current, Closing and Opening Curve, Charging Curve, Mechanical Life.

The optional monitoring contents of the intelligent detection unit include: Main Circuit Current Curve, Temperature Curve, Full Opening Time, Racking Curve, Earthing Curve, Max Stroke, Closing and Opening Speed.



## Applicable Occasions

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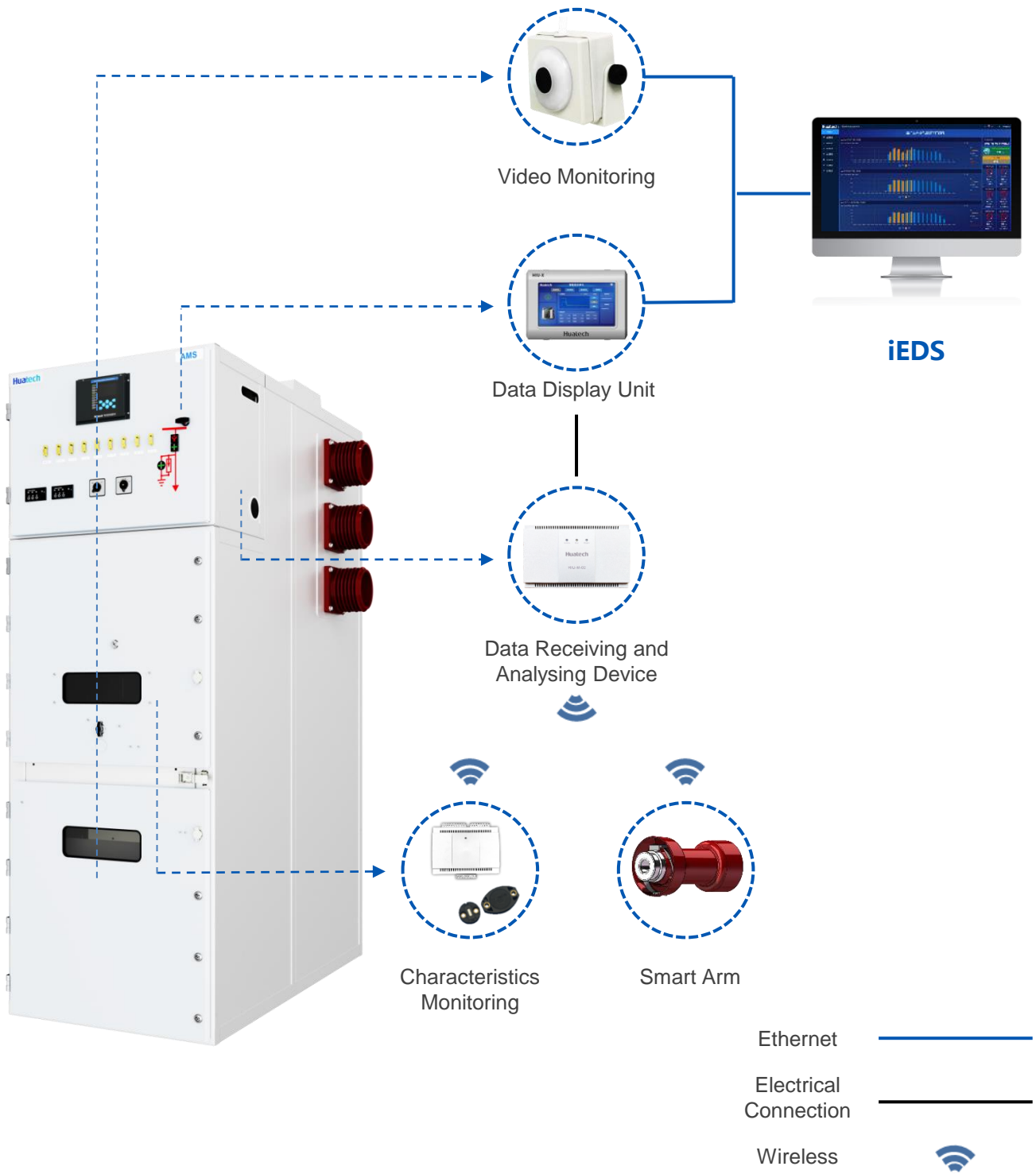
iEDS makes switchgear operation safer, more reliable and smarter, with a more economical investment in substation O&M solutions.

### Applicable occasions

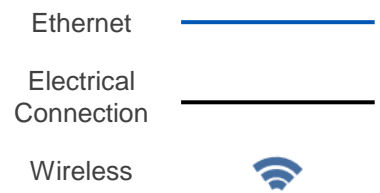
- Newly constructed substations
- Retrofit substations
- Extended life substations
- Operated and maintained substations
- Remotely maintained substations



# Functional Topology



# Functional Topology

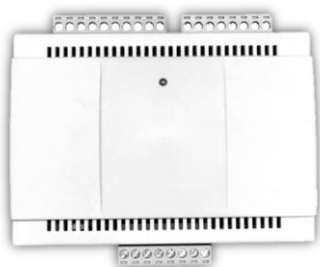




Data Display Unit



Data Receiving and Analysing Device



Characteristics Monitoring

### ■ Intelligent display unit

- Display Characteristics Monitoring, Temperature Monitoring, Partial Discharge Monitoring. It can be extended Video Monitoring and One-key Smooth Control Function.

### ■ Switchgear intelligent monitoring equipment

- Receive circuit breaker mechanical characteristic data wirelessly and analyse and diagnose, can upload the data to the Intelligent Display Unit and iEDS.
- Wireless reception of circuit breaker smart contact arm temperature data and copper row lap temperature.

### ■ Characteristics monitoring

- Acquisition of electrical and mechanical characteristics of circuit breaker, wireless form of external data transmission, without aerial insertion.



Wireless Temperature Sensors



Current Sensor



Non-contact Angular Displacement Sensors

### ■ Temperature rise real-time online monitoring

- Intelligent contact arm temperature, busbar lap surface temperature, outlet cable head lap temperature.

### ■ Current status monitoring

- Three-phase main circuit current status, energy storage motor status (energy storage time, energy storage current waveform), electric chassis truck motor status, ground switch motor status, coil voltage and current waveform, auxiliary switch status.

### ■ Characteristics monitoring

- Acquisition of breaker spindle rotation angle, converted into breaker travel data.



Smart Circuit Breaker



Smart Metering



Temperature Monitoring

### ■ Equipment health monitoring

- Intelligent interface display, protection function, measurement function, maintenance function

### ■ Power quality monitoring

- Voltage, current, power, frequency, energy, demand, polarity, total harmonic distortion rate, 2-31 harmonics, voltage-current imbalance, compound-rate energy metering

### ■ Wireless temperature measurement

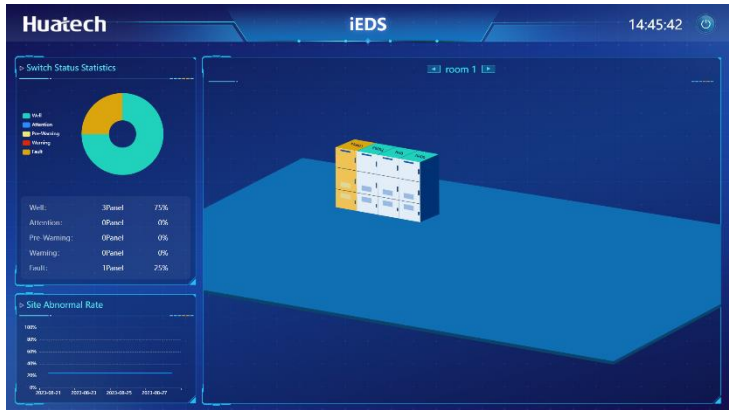
- Temperature rise monitoring at critical points, e.g. copper laps

The iEDS works with high quality sensors and intelligent monitoring units to realise the monitoring needs without changing the structure and reliability of the equipment itself.

The iEDS logic of "monitor-analyse-predict-fault-location" greatly reduces the probability of unanticipated outages, improves the quality of power supply, and allows customers to get a return on their investment in the first place.

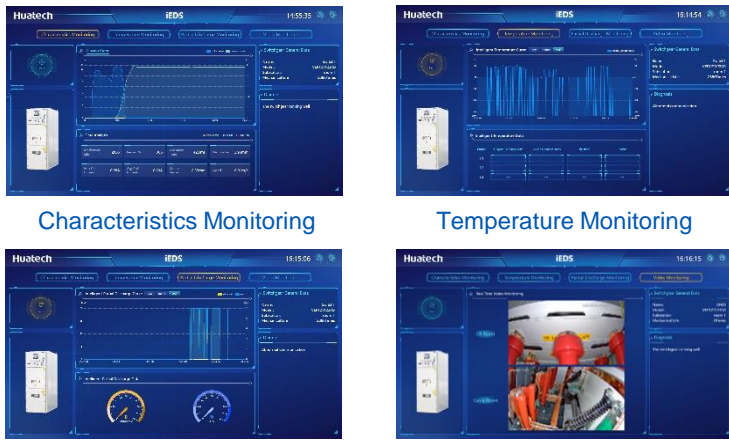
Function	Realisation and Features	The Value Embodiment
Temperature rise monitoring	Intelligent contact arm 6-point temperature measurement, feeder busbar 3-point temperature measurement, cable lap 3-point temperature measurement	<ul style="list-style-type: none"> <li>➤ Temperature rise monitoring</li> <li>➤ Early warning and alerts</li> <li>➤ Historical data recording</li> </ul>
Electrical characteristics monitoring	Circuit breakers with intelligent monitoring equipment, replacing the original anti-trip box	<ul style="list-style-type: none"> <li>➤ Operating time and current</li> <li>➤ Charging time and current</li> <li>➤ Mechanical life</li> </ul>
Mechanical characteristics monitoring	Breaker spindle retrofitted with non-contact angular displacement sensor	<ul style="list-style-type: none"> <li>➤ Max stroke</li> <li>➤ Closing and opening speed</li> </ul>
Video monitoring	Installation of surveillance cameras in the breaker room, grounding switches	<ul style="list-style-type: none"> <li>➤ Real-time location monitoring</li> <li>➤ Historical action replay</li> <li>➤ Motion detection alert</li> </ul>
Equipment health	Pre-installation of intelligent disconnectors on frame circuit breakers	<ul style="list-style-type: none"> <li>➤ Equipment health</li> <li>➤ Life point analysis</li> </ul>
Energy quality management	Low-voltage circuits are equipped with intelligent meters, and temperature sensors are installed at key points of temperature rise.	<ul style="list-style-type: none"> <li>➤ Energy management</li> <li>➤ Temperature rise monitoring</li> </ul>

# The System Interface



The screenshot displays the Huatech iEDS interface. On the left, there is a 'Switch Status Statistics' panel with a donut chart and a table showing status percentages: Well (3Phase: 75%), Attention (0Phase: 0%), Pre-Warning (0Phase: 0%), Warning (0Phase: 0%), and Fault (1Phase: 75%). Below it is a 'Site Abnormal Rate' panel with a line graph. The main area features a 3D model of a distribution room labeled 'room 1'.

- ✓ Switch Status Statistics
- ✓ Site Abnormal Rate
- ✓ Distribution Room Location
- ✓ Switchgear Location



This section shows four different monitoring views from the Huatech iEDS interface:

- Characteristics Monitoring:** Shows a line graph of characteristics over time.
- Temperature Monitoring:** Shows a line graph of temperature fluctuations.
- Partial Discharge Monitoring:** Shows a line graph of partial discharge levels.
- Video Monitoring:** Shows a live video feed of the internal components of a switchgear.

- ✓ Real-time Monitoring
- ✓ Historical Trend
- ✓ Analyse and Diagnose
- ✓ O&M Guidance




# The System Interface



The screenshot displays the 'Huatech' interface for a 'Sample project' under the '1# Distribution Room/001 - Tipper'. The main view is 'Device health', showing a 'Device health' status of 'Offline' with a '0%' indicator. A bar chart shows 'Trip and opening count distribution' with a peak at 100. A 'Health rankings' table lists '1, 1# Distribution room/001' and '2, 2# Distribution room/002'. A 'Device statistics values' table includes: Minimum phase A current (0 A), Minimum phase B current (0 A), Minimum phase C current (0 A), Minimum phase A voltage (---V), Minimum phase B voltage (---V), Minimum phase C voltage (---V), Operation count (14 times), Maximum device temperature (27 °C), Triped time (11 days 9:43), Maximum phase A current (277 A), Maximum phase B current (191.5 A), Maximum phase C current (93.8 A), Maximum phase A voltage (---V), Maximum phase B voltage (---V), Maximum phase C voltage (---V), Time of last operation (2023-05-17 14:03:04), Maximum device temperature (2023-05-14 03:48:03), and Life point (88).

- ✓ Equipment Health
- ✓ Equipment Value
- ✓ Equipment Picture
- ✓ Disconnect Counting
- ✓ Equipment Statistics
- ✓ Health Ranking



The four screenshots illustrate different energy management features:
 

- Summary of Energy Use:** Shows a dashboard with multiple charts and gauges for energy consumption.
- Sub-energy Consumption:** Displays a detailed view of energy usage across different sub-categories.
- Comparative Analyses:** Provides a side-by-side comparison of energy data for different periods or locations.
- Curve View:** Shows a detailed line graph of energy consumption over time.

- ✓ Summary of Energy Use
- ✓ Energy Management
- ✓ Curve View
- ✓ Report Management
- ✓ Operations Management
- ✓ Real-time Data
- ✓ Historical Data
- ✓ Historical Logs

# Qualification Certificate





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