LV Switchboard Electrical Nodes Multi-channel Cloud IoT Wireless Temp. Monitoring

Wireless Temperature Monitoring, for LV switchboard/switchgear, IoT cloud & local temperature display & alarm, electrical nodes temp.

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Acrel Co., Ltd.

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2023/12/18 Ver.

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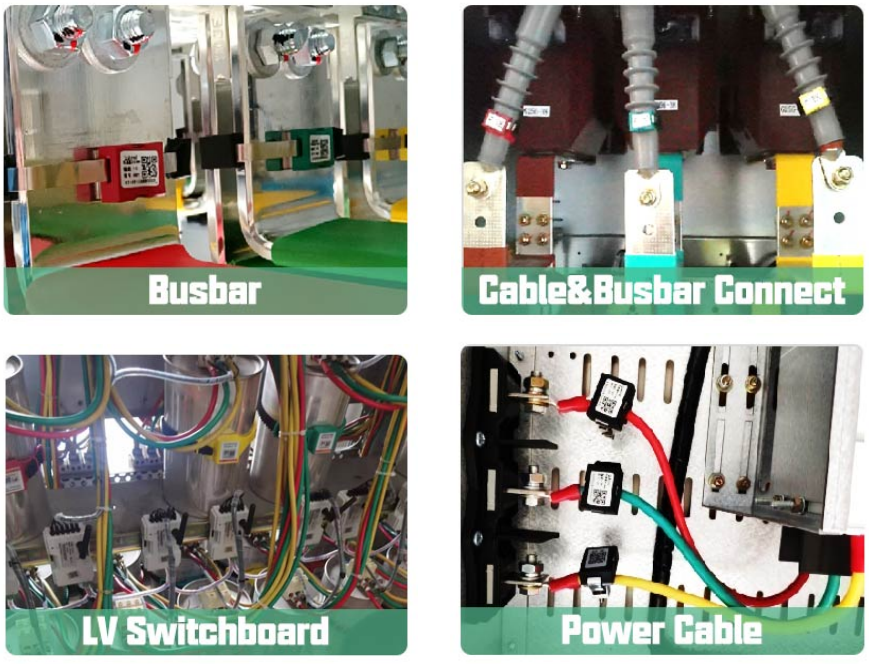
0. Application Scenario

(1) This multi-channel wiressless temperature monitoring solution was majorly designed for monitoring & alarming temperature of crucial electrical connection nodes in **LV Switchboard** or **LV Switchgear** like busbar, power cable, cable&busbar connection/joints and etc.
(2) Such electrical connection nodes have the potential threat of fire hazard due to the aging of material, slackness of connection and etc. Thus a real-time temperature monitoring and alarm system will be necessary to prevent it from potential fire hazard causing by the rising of temperature.
(3) Solution here was major designed for both cloud & local temperature display and alarm. Distinguish from other Acrel wireless temperature monitoring soloution which has only local temperature display and alarm.
(4) Unlike the traditional wired temperature monitoring solution, wireless temperature monitoring solution make the connection between temeperature sensor and temperature transceiver wireless. This will largely ease the installation and make the overall solution more flexible.



(1) Major Temperature Monitoring Nodes Showcase

(4) WIreless Connection for esasy installation

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0. Solution Selection Logic

Judging by final data upstream methods which was decided by site network condition [4G, WiFi, Ethernet]. And request for temp. data display&alarm methods - either both Cloud& Local Temp. Display&Alarm or just only Cloud Temp. Display&Alarm. The standard solutions could be devided into 5 basic solutions [Cloud display&alarm here means computer or mobile accessed IoT system platform temperature for display and alarm]:

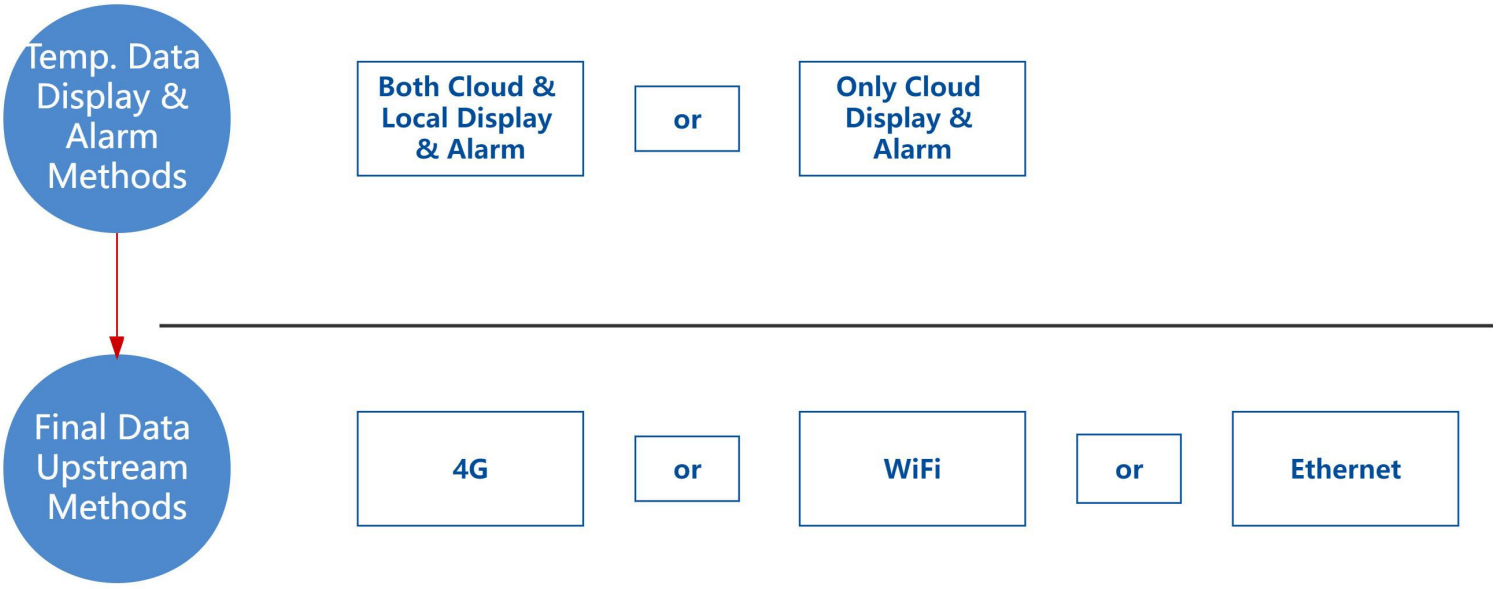
(1) Multi-channel 4G IoT Cloud&Local Wireless Temperature Monitoring Solution [with both Cloud&Local Temp. Display&Alarm, 4G based]

(2) Multi-channel WiFi IoT Cloud&Local Wireless Temperature Monitoring Solution [with both Cloud&Local Temp. Display&Alarm, WiFi based]

(3) Multi-channel Ethernet IoT Cloud&Local Wireless Temperature Monitoring Solution [with both Cloud&Local Temp. Display&Alarm, Ethernet based]

(4) Multi-channel 4G IoT Cloud Wireless Temperature Monitoring Solution [with only Cloud Temp. Display&Alarm, 4G based]

(5) Multi-channel WiFi&Ethernet IoT Cloud Wireless Temperature Monitoring Solution [with only Cloud Temp. Display&Alarm, WiFi&Ethernet based]



(1) Solution Selection Logic

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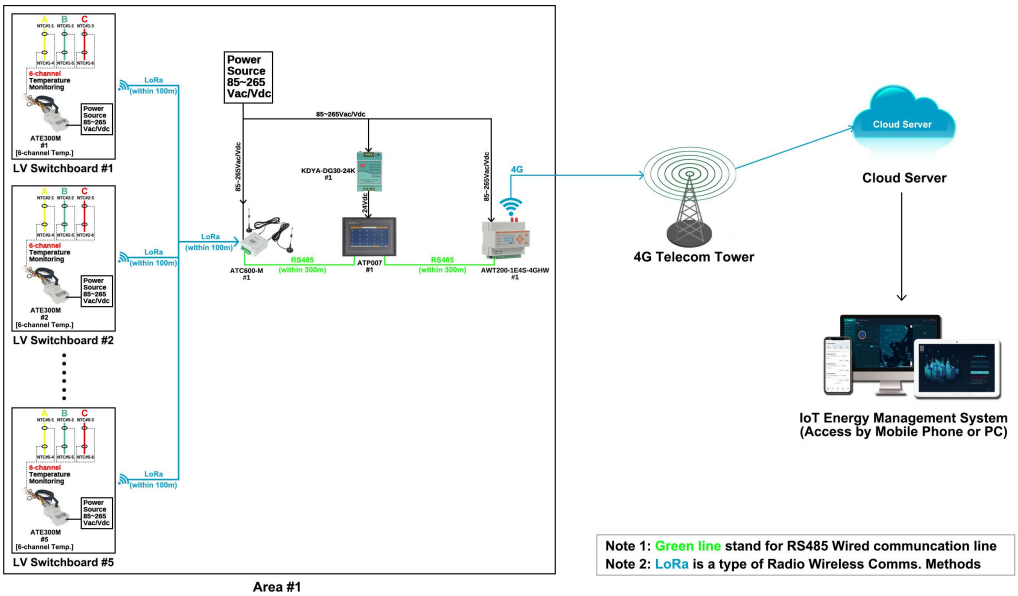
1. Scenario Preset [4G IoT Cloud&Local Wireless Temperature Monitoring Solution]

(1) The target was to monitor and alarm the temperature of 5 switchgears deployed in a single room. Both IoT cloud & local display and alarm of temperature was requested.
(2) Each switchgear require 6 temperature moniotoring points for electrical connection nodes. Thus there will be 30 temperature monitoring points in total.
(3) The system voltage of switchgear will be 0.4kV. Network with stable 4G Comms.

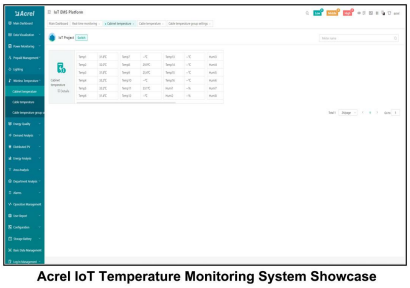
1. Devices Deployment [4G IoT Cloud&Local Wireless Temperature Monitoring Solution]

Area #1 - LV Switchboard #1 ~ #5:
- 1* AWT200-1E4S-4GHW IoT Gateway [For further uploading the data from ATP007 to Acrel IoT Cloud System via 4G Comms.]
- 1* ATP007 Temperature Display Touchscreen [For local display and alarm for all temperature data and further upload the data to upstream IoT gateway]
- 1* ATC600-M Wireless Temperature Transciever [For collecting the temperature data from ATE300M wireless temp. sensors and further upload the data to ATP007]
- 5* ATE300M Multi-channel Wireless Temperature Sensor [For monitoring up to 6-channel temperature of electrical connection nodes and send the data to ATC600-M via LoRa wirelesss Comms.]
- 30* TPSNT503F415FAL1200 NTC Thermistor [Paired with ATE300M for temp. signal input]
- 1* KDYA-DG30-24K Power Supply Module [Paired with ATP007 for 85~265Vac/Vdc Power Supply input]



Area #1

Switchboard Temperature Monitoring Point Showcase



Acrel IoT Temperature Monitoring System Showcase

(1) Devices deployment plan Illustraton

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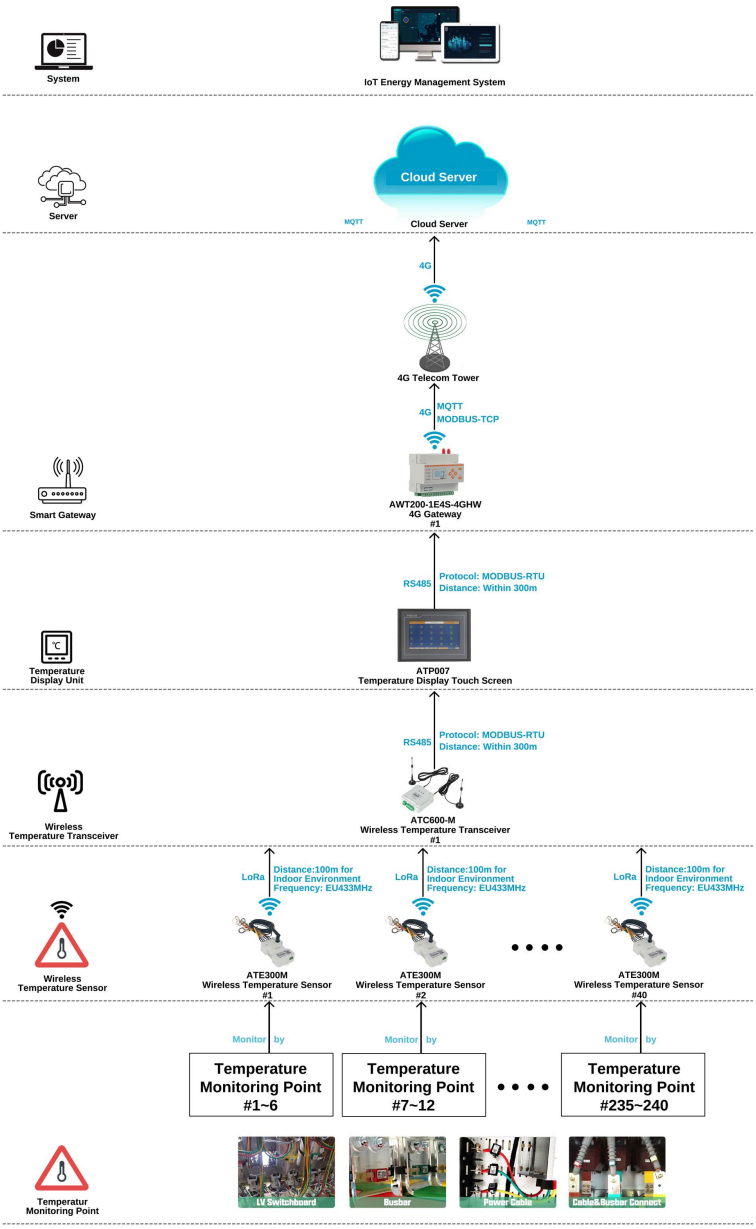
1. Comms. Structure & Logic [4G IoT Cloud&Local Wireless Temperature Monitoring Solution]

(1) Between ATE300M wireless temperature sensor and ATC600-M wireless temperature transceiver, we are using a radio wireless communications called LoRa. The communication distance is within 100m [when in indoor environment and penetrate 1 layer of metal cover of switchgear]. The communication protocol is self defined protocol. [1 ATC600-M can support up to 240 pcs ATE300M if comms. distance allowed.]

(2) Between ATP007 smart touch screen and ATC600-M wierless temperature transceiver. and between ATP007 touch screen and AWT200-1E4S-4GHW IoT gateway, we are both using common RS485 communications based on MODBUS-RTU protocol. Although for this RS485 communication, it's wired comms. But normally these devices were always installed closedly to each other, so that remain the most part of communication structure still wireless. [1 pcs ATP007 can support and display the temp. data of up to 240 points]

(3) Between AWT200-1E4S-4GHW IoT gateway and Acrel IoT system, we are using 4G comms. methods based on either MQTT or MODBUS-TCP protocol.



(1) Communication Structure

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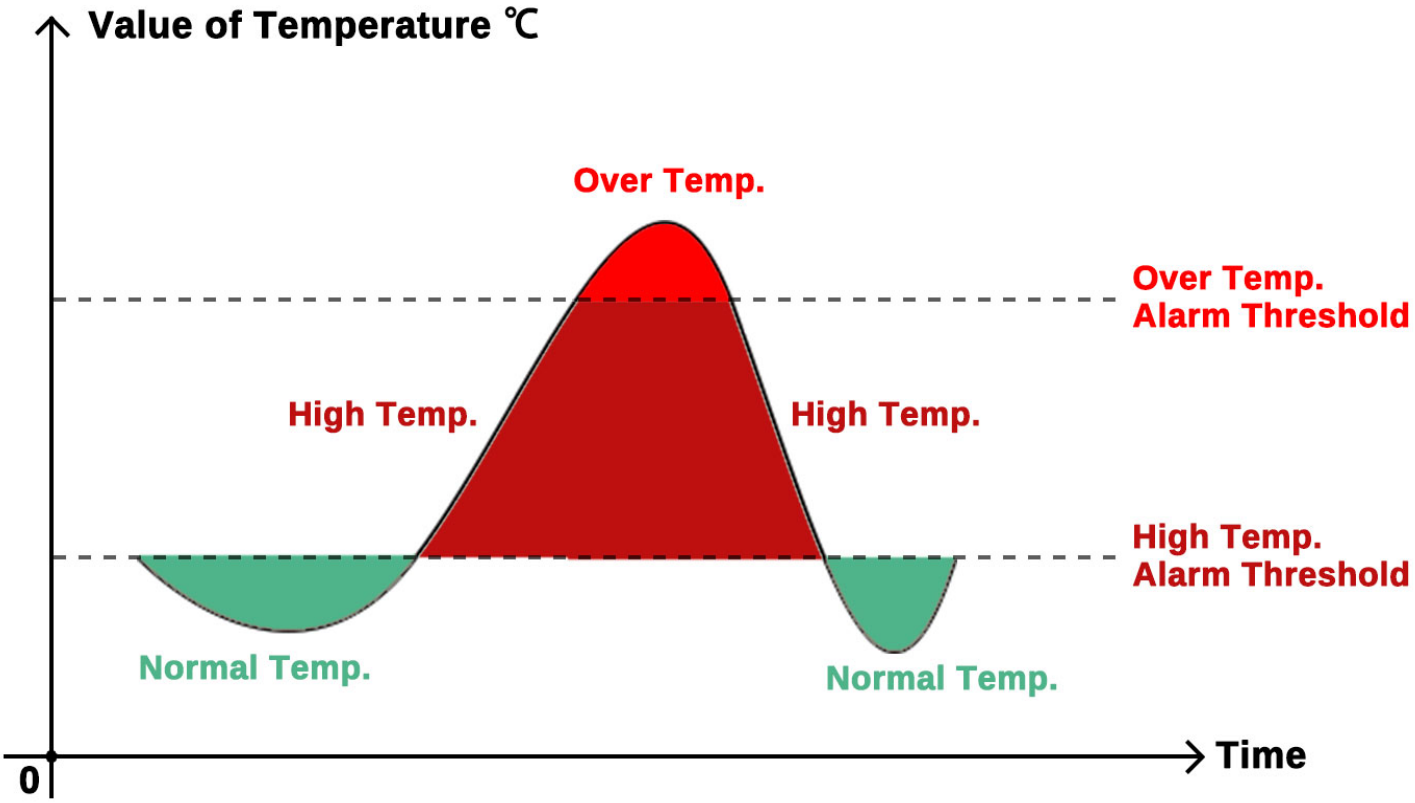
1. Local Device Temperature Alarm Function&Logic [4G IoT Cloud&Local Wireless Temperature Monitoring Solution]

ATP Seires Tempearture Display Devices support 2 types of major temperature alarm logic. When any of the below alarm logic was set and triggered, it will alarm the buzzer up.

(1) High Temperature Alarm: When temperature of certain monitoring node was higher than a certain preset threshold value, this will twigger high temperature alarm. [Normally used as a pre-alarm for mentioning related person to take care of temperature rising issue in monitoring places]

(2) Over Temperature Alarm: Similar like high temperature alarm, but over temperature alarm normally will be preset a higher alarm threshold. [Normally used for alarming the related person that there are severe temperature rising issue happened and need to be solved immediately]



(1&2) High&Over Temperature Alarm

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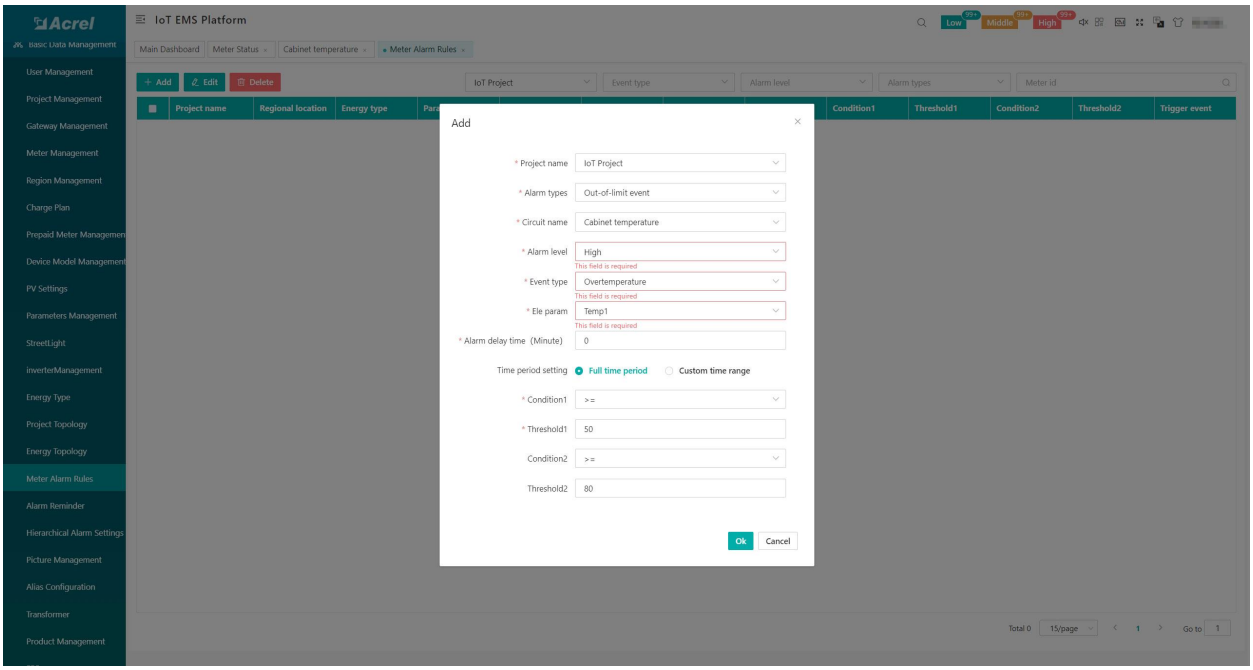
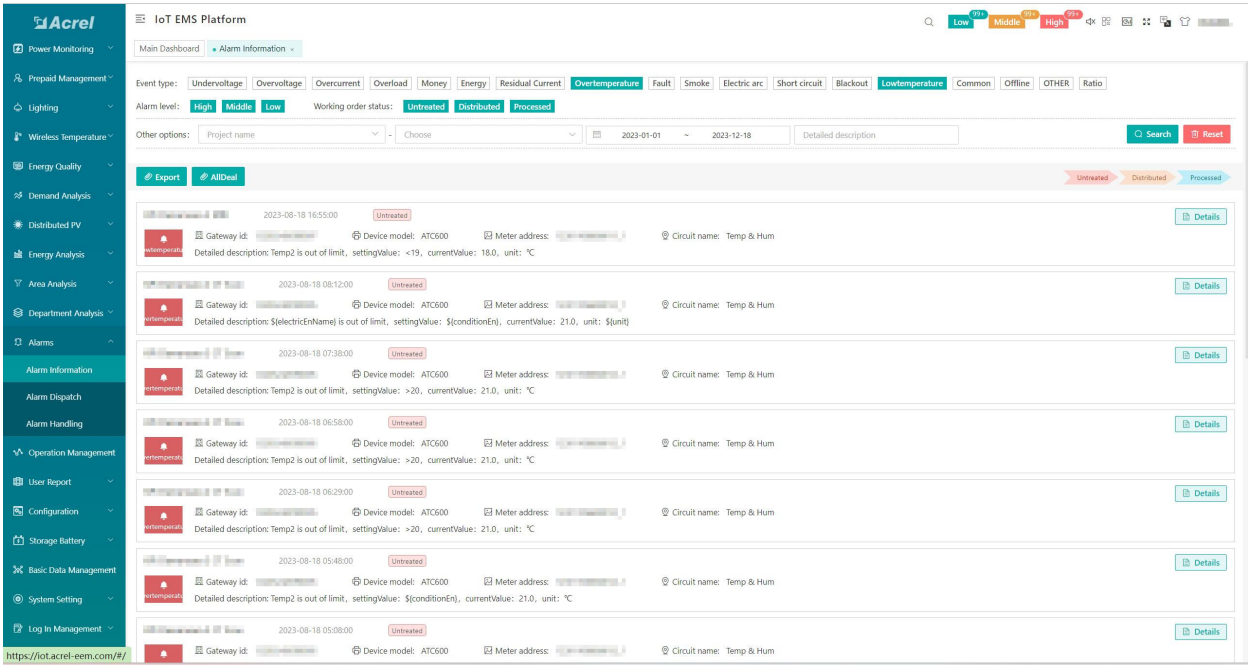
1. Cloud IoT Platform Temperature Alarm Function&Logic [4G IoT Cloud&Local Wireless Temperature Monitoring Solution]

Once the temperature data was collected by Acrel IoT Cloud System Platform. We could also do the high/over temperature alarm rule setting on cloud system and receive the high/over temperature alarm warning information via WEB/APP/SMS/E-mail. [SMS/E-mail warning will be only supported when using buy-out service of Acrel IoT System.]

(1) High/Over Temperature Alarm: First we set the high/over temperature alarm rule on platform, then once the monitoring temperature was higher/lower than a certain preset threshold value, this will trigger the alarm and send the alarm warning information via assigned WEB/APP/SMS/E-mail.



(1) Set the over/high temperature alarm rule



(2) Receive and check alarm information

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1. Hardware Devices Overview [4G IoT Cloud&Local Wireless Temperature Monitoring Solution]

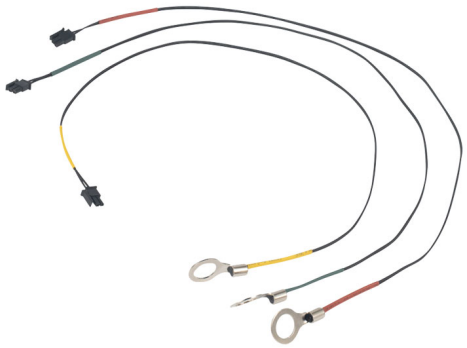
Model 1: ATE300M Multi-channel Wireless Temperature Sensor

LoRa Wireless | 6-Channel Temp. | Temperature Sensor | -40℃~+140℃

- Temperature Measuring Range: -40℃~+140℃ [±1℃]
- Monitoring: Up to 6-channel Temperature
- Wireless Comms [Upstream]: LoRa Radio Comms. [433~510MHz, self-defined protocol]
- LoRa Comms. Distance: within 100m [when in indoor environment, penetrate 1 layer of metal cover of switchboard/switchgear]
- Sampling Frequency: 1~240s
- Power Supply: 85~265Vac/Vdc
- Installation: DIN-rail/Strap-tied

Model 1: TPSNT503F415FAL1200 NTC Thermistor

NTC Thermistor | 2-wire | Temperature Sensor | -40℃~+140℃



- Temperature Measuring Range: -40℃~+140℃ [±1℃]
- Type: 2-wire NTC termistor
- Cable Length: 1.2m [0.5m optional, model will be TPSNT503F4150FAL500-03 NTC Thermistor]
- Probe Aperture Hole Size: φ12mm [diameter]
- Applicaiton: paired with ATE300M for temperature signal input
- Installation: Strap-tied/Screw-fixed

Model 2: ATC600-M Wireless Temperature Transceiver

Temp. Transceiver | Up to 240 Sensors | GFSK Wireless | 1-way RS485

- Wireless Comms. [Downstream]: LoRa Radio Comms. [433~510MHz,self-defined protocol]
- LoRa Comms. Distance: within 100m [when in indoor environment, penetrate 1 layer of metal cover of switchboard/switchgear]
- Wired Comms. [Upstream]: 1-way RS485 [MODBUS-RTU protocol]
- Support: up to 240 pcs ATE300M Wireless Temperature Sensors based on LoRa
- Power Supply: 100~265Vac/Vdc
- Working Temperature: -20℃～+55 ℃
- Working Humidity: <=95%

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1. Hardware Devices Overview [4G IoT Cloud&Local Wireless Temperature Monitoring Solution]

Model 4: ATP007 Temp. Display&Alarm Touch Screen

Touch Screen | 2-way RS485 | Temp. Display | 1-way Ethernet

- Comms.: 2-way RS485 [one for upstream, one for downstream, MODBUS-RTU]; 1-way Ethernet [for upstream, MODBUS-TCP]
- Support: Display the temperature data of up to 240 pcs temperature monitoring points.
- Alarm: High-tempearture alarm, over-temperature alarm.
- Power Supply: 24Vdc [±10%]; consumption 15W
- Screen Size: 7 inchs [10 inchs option available, module ATP010]
- Working Temperature: -10℃～+55 ℃
- Working Humidity: <=95%

Input Range | Output Range | 100~240Vac/Vdc | 24Vdc

Model 5: KDYA-DG30-24K Power Supply Module

- Rated Input Range: 100~240Vac/Vdc
- Rated Outpu Range: 24Vdc
- Application: paired with ATP007 for power supply input

IoT Gateway | 4G Upstream | MQTT&MODBUS | RS485 Downstream

Model 6: AWT200-1E4S-4GHW IoT Smart Gateway

- Upstream Comms.: 4G&Ethernet Comms. [MQTT& MODBUS-TCP protocol]
- Downstream Comms.: 4-way RS485 [MODBUS-RTU protocol]
- Power Supply: 85~265Vac/Vdc
- Working Temperature: -20℃～+55 ℃
- Working Humidity: <=95%

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1. Overall Model Selection&Quoation [4G IoT Cloud&Local Wireless Temperature Monitoring Solution]

(1) This Quotation doesn't include freight charge. To gain a complete quotation, please refer the actual quantity that you want to request for the actual order, once we receiving it. We will issue a Official Proforma Invoice with Acrel Stamps on it for later procedure.

System Software

Name	Description	System Price	Remark (Choose Host Service or Buy-out Service after 3-month Free Trial of **Cloud IoT System**)
 **Acrel Cloud IoT Energy Management System**	1.System support all the meters across the country whose data has been sent to cloud server through **4G,WiFi or Ethernet**. 2.Remote meter reading and data collection. 3.Provide **IoT APP** for **mobile phone** side and **IoT WEB** for **PC** side. 4.Generate energy data report of daily, monthly and annually period with year-on-yeay and period-on-period energy analysis. 5.Provide various alarm function to ensure a stable operation of the system and protect your property. 6.Offer 3-month free trial of system with full technical support as for a test phase or pilot project.	$0 (recommended in pilot project)	3-month Free Trail (Users don't need to rent a cloud server))
		$xxx/Year (For 30 Points) (Price for Host Service Only, recommended in pilot project)	$xx to buy Hosting Service for 1 monitoring points connected to the system 1 year (Users don't need to rent a cloud server)
		$xxxx/Permanent (Limitless Points) (Price for Buy-out Service Only,recommended in late project)	1-time charging of $xxxx for Buy-out Service of permanent use (Limitless monitoring points and a cloud server need to be rent by users)

Cloud Server

Name	Description	Server Renting Price (For Reference Only)	Remark
 Cloud Server	1.Cloud Server could be rent on the cloud server provider like Amazon Cloud. 2.Users of **Cloud IoT Energy Management System** only need to rent cloud server when they choose **buy-out** service of our **Cloud IoT System**. And if they are using **hosting service** or **3-month free trial** of our Cloud IoT System, we will use our own cloud server which has been rent on Amazon so that users don't need to rent a cloud server. 3.The quotation of Cloud Server is only a reference price that we have rent on Amazon Cloud.	According to Specs of Rented Cloud Server	Below cloud server specs could support 1000~2000 monitoings points connected to the system (Server：8 core 16G Operation System：windows server 2016)

Smart IoT Gateway

Overview Picture	USAGE&MODULE NAME	DESCRIPTION & SPECIFICATION	QUANTITY	FOB UNIT PRICE (USD)	AMOUNT (USD)
	Smart Gateway **AWT200-1E4S-4GHW**	**Upstream:** 4G, Ethernet [MQTT, MODBUS, etc] **Downstream:** RS485 (MODBUS-RTU) **Support:** up to **80~100** RS485 Devices within 400m using RS485 Wired Communication **Adjustment:** Via RJ45 or RS485 Port. **Power Supply:** 85~265Vac/Vdc (via power adpter) **HS Code:** 8517699000	1 pcs	/	/

Local Temperature Display&Alarm Device

	Touch Screen **ATP007**	**Comms.:** 2-way RS485 (MODBUS-RTU); 1-way Ethernet [MODBUS-TCP] **Support:** Up to 240 ATE series Transceiver. **Auxiliary Power Supoply**: 24Vdc **HS Code:** 8471609000	1 pcs	/	/
	Power Supply Module **KDYA-DG30-24K**	**Application:** Paired with ATP007Kt for 85~265Vac Power Supply Input **Input:** 85~265Vac **Output:** 24Vdc **HS Code:** 8504409999	1 pcs	/	/

Wireless Temperature Transceiver

Overview Picture	USAGE&MODULE NAME	DESCRIPTION & SPECIFICATION	QUANTITY	FOB UNIT PRICE (USD)	AMOUNT (USD)
	Temperature Transceiver **ATC600-M**	**Upstream:** RS485 (MODBUS-RTU) **Downstream:** LoRa (433~510 MHz) **Support:** Up to 240 ATE300M series wireless temperature sensors using LoRa communication. **Power Supply:** 100~265Vac **HS Code:** 9025191010	1 pcs	/	/

Wireless Temperature Sensor

Overview Picture	USAGE&MODULE NAME	DESCRIPTION & SPECIFICATION	QUANTITY	FOB UNIT PRICE (USD)	AMOUNT (USD)
	Temperature Sensor **ATE300M**	**Communication:** LoRa Wireless (433~510MHz) **Monitoring:** Up to 6-channel Temperature **Measuring Range:** -40℃~+140℃ [via NTC Thermistor] **Power Supply:** 85~265Vac/Vdc **HS Code:** 9025191010	5 pcs	/	/
	NTC Thermistor **TPSNT503F415FAL1200**	**Temperature Measuring Range:** -40℃~+140℃ [±1℃] **Type:** 2-wire NTC termistor **Cable Length:** 1.2m **Probe Aperture Hole Size:** φ12mm [diameter] **Installation:** Strap-tied/Screw-fixed **HS Code:** 8533400000	30 pcs	/	/

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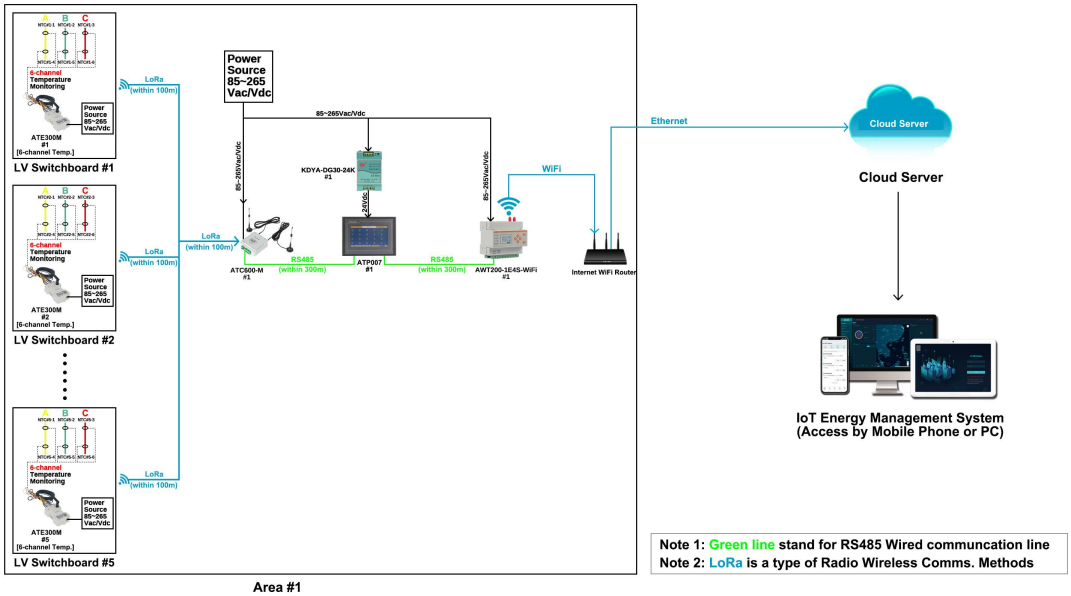
2. Scenario Preset [WiFi IoT Cloud&Local Wireless Temperature Monitoring Solution]

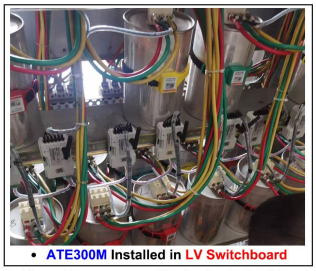
(1) The target was to monitor and alarm the temperature of 5 switchgears deployed in a single room. Both IoT cloud & local display and alarm of temperature was requested.
(2) Each switchgear require 6 temperature moniotoring points for electrical connection nodes. Thus there will be 30 temperature monitoring points in total.
(3) The system voltage of switchgear will be 0.4kV. Network with stable WiFi Comms.

2. Devices Deployment [WiFi IoT Cloud&Local Wireless Temperature Monitoring Solution]

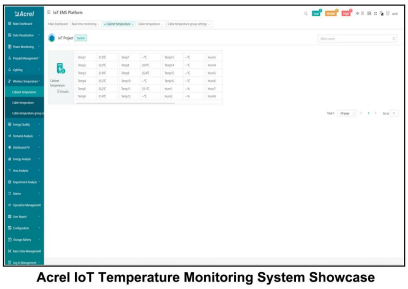
Area #1 - LV Switchboard #1 ~ #5:
- 1* AWT200-1E4S-WiFi IoT Gateway [For further uploading the data from ATP007 to Acrel IoT Cloud System via WiFi Comms.]
- 1* ATP007 Temperature Display Touchscreen [For local display and alarm of all temperature data and further upload the data to upstream IoT gateway]
- 1* ATC600-M Wireless Temperature Transciever [For collecting the temperature data from ATE300M wireless temp. sensors and further upload the data to ATP007]
- 5* ATE300M Multi-channel Wireless Temperature Sensor [For monitoring up to 6-channel temperature of electrical connection nodes and send the data to ATC600-M via LoRa wirelesss Comms.]
- 30* TPSNT503F415FAL1200 NTC Thermistor [Paired with ATE300M for temp. signal input]
- 1* KDYA-DG30-24K Power Supply Module [Paired with ATP007 for 85~265Vac/Vdc Power Supply input]



Area #1



Switchboard Temperature Monitoring Point Showcase


Acrel IoT Temperature Monitoring System Showcase

(1) Devices deployment plan Illustraton

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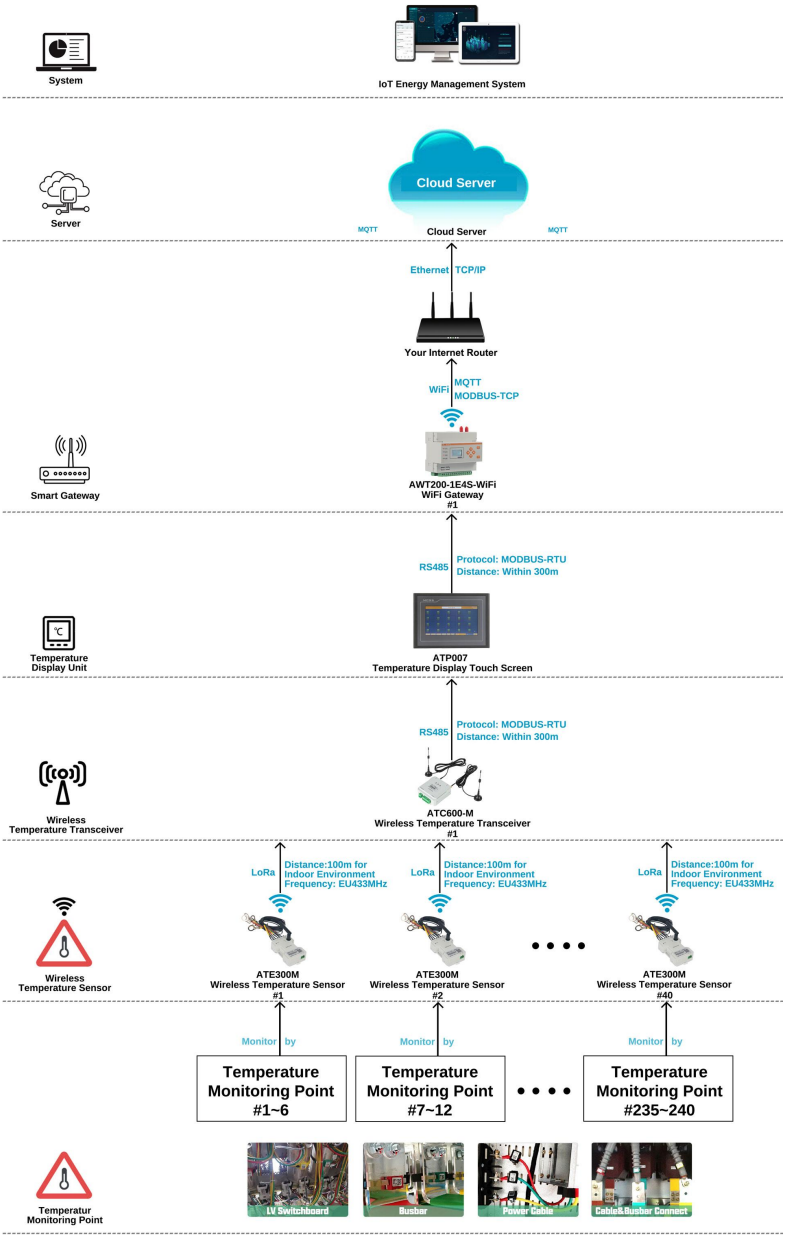
2. Comms. Structure & Logic [WiFi IoT Cloud&Local Wireless Temperature Monitoring Solution]

(1) Between ATE300M wireless temperature sensor and ATC600-M wireless temperature transceiver, we are using a radio wireless communications called LoRa. The communication distance is within 100m [when in indoor environment and penetrate 1 layer of metal cover of switchgear]. The communication protocol is self defined protocol. [1 ATC600-M can support up to 240 pcs ATE300M if comms. distance allowed.]

(2) Between ATP007 smart touch screen and ATC600-M wierless temperature transceiver. and between ATP007 touch screen and AWT200-1E4S-WiFi IoT gateway, we are both using common RS485 communications based on MODBUS-RTU protocol. Although for this RS485 communication, it's wired comms. But normally these devices were always installed closedly to each other, so that remain the most part of communication structure still wireless. [1 pcs ATP007 can support and display the temp. data of up to 240 points]

(3) Between AWT200-1E4S-WIFi IoT gateway and Acrel IoT system, we are using WiFi comms. methods based on either MQTT or MODBUS-TCP protocol.



(1) Communication Structure

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2. Local Device Temperature Alarm Function&Logic [WiFi IoT Cloud&Local Wireless Temperature Monitoring Solution]

ATP Seires Tempearture Display Devices support 2 types of major temperature alarm logic. When any of the below alarm logic was set and triggered, it will alarm the buzzer up.

(1) High Temperature Alarm: When temperature of certain monitoring node was higher than a certain preset threshold value, this will twigger high temperature alarm. [Normally used as a pre-alarm for mentioning related person to take care of temperature rising issue in monitoring places]

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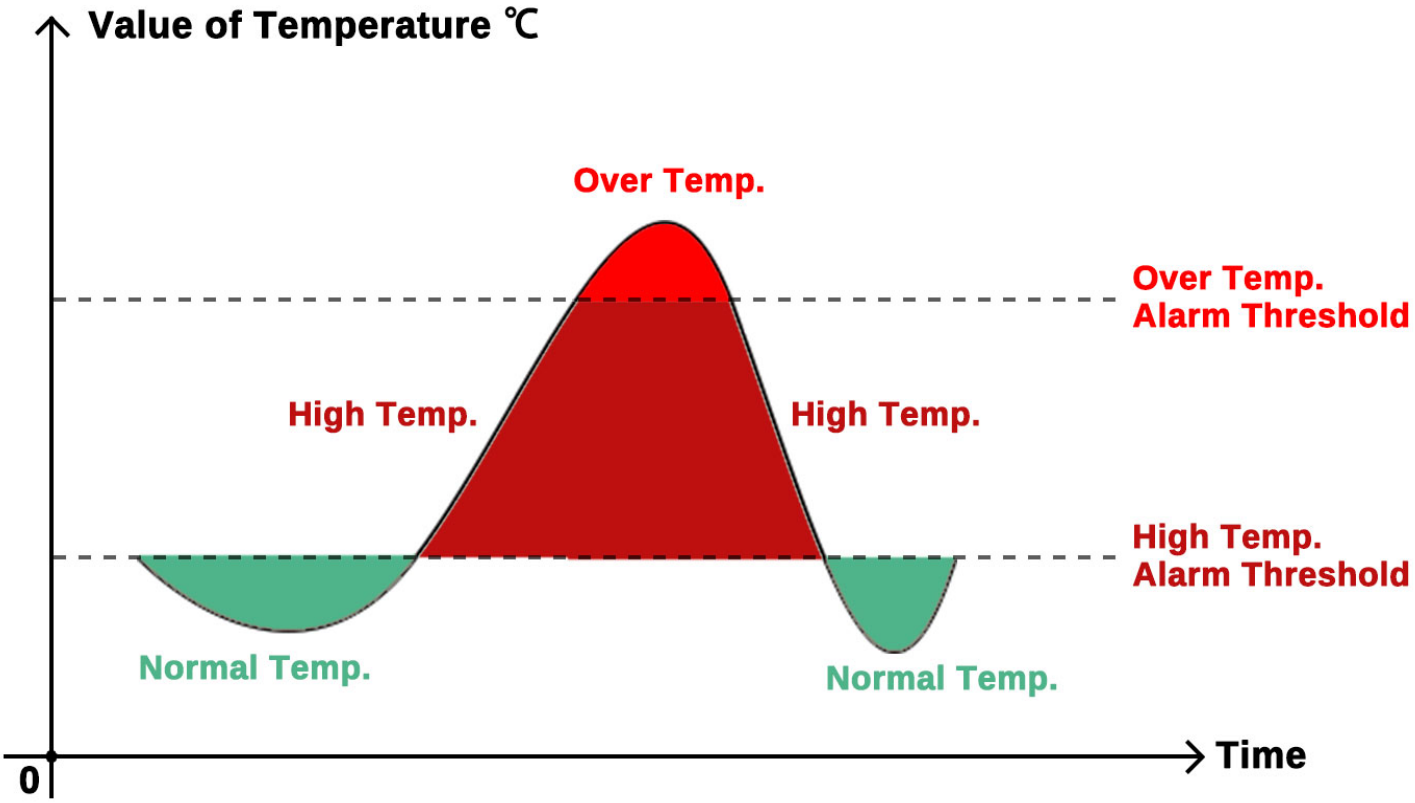
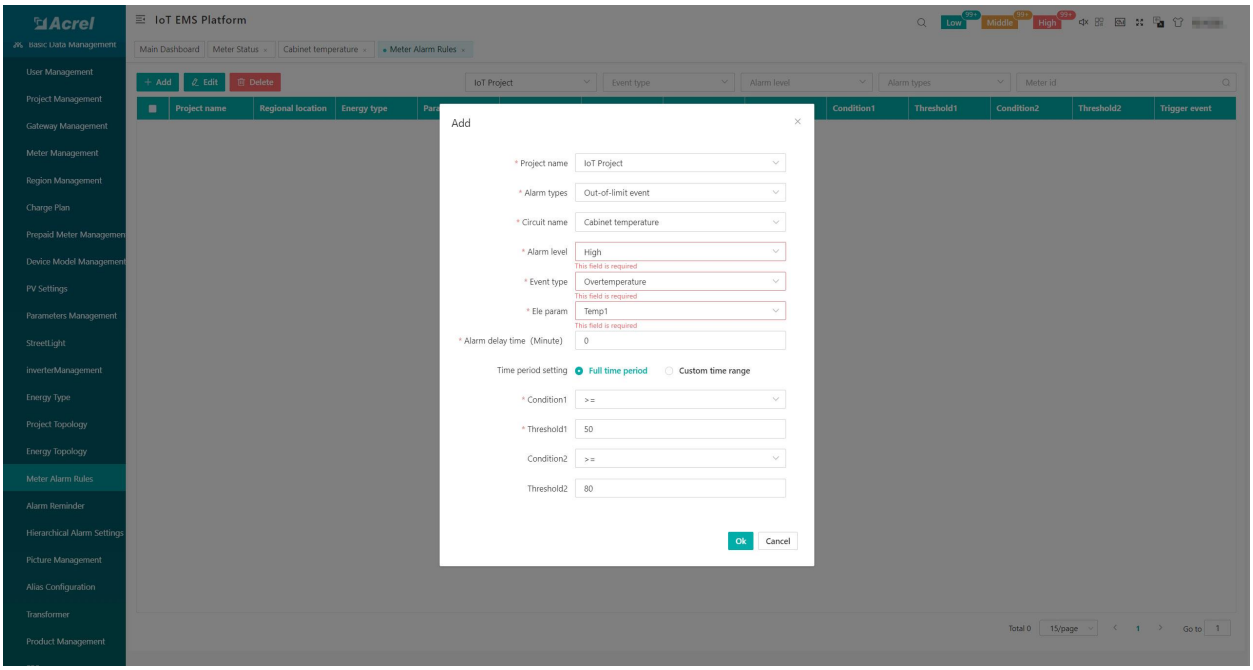


(1&2) High&Over Temperature Alarm

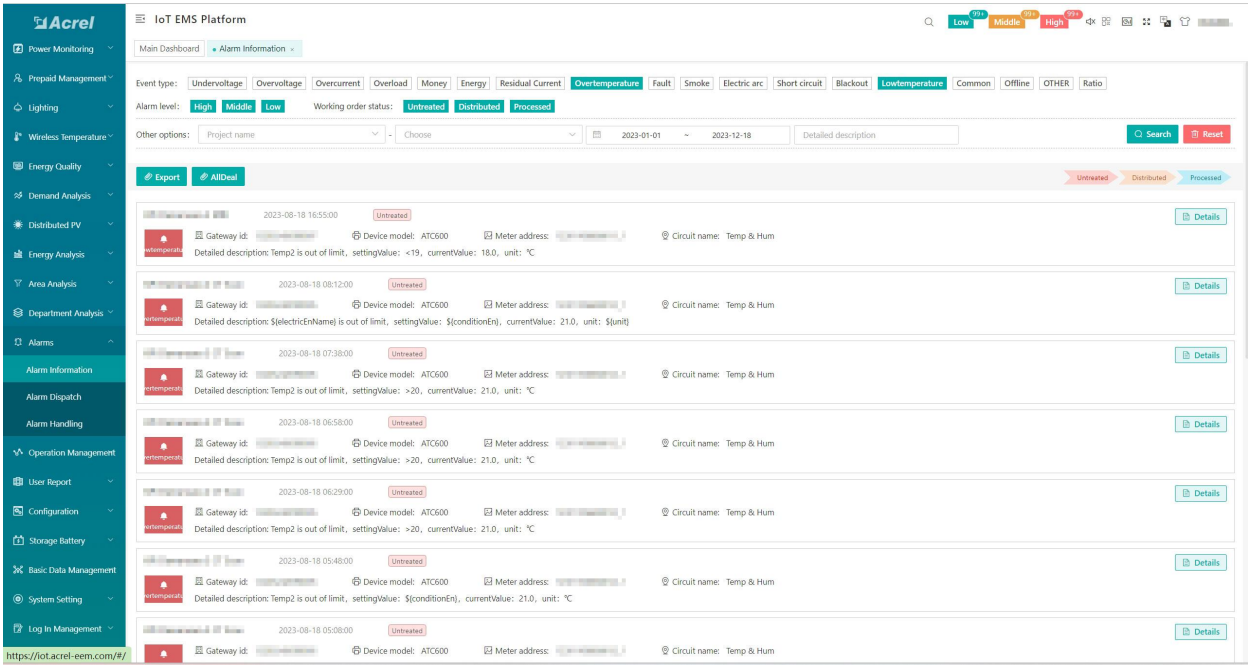
2. Cloud IoT Platform Temperature Alarm Function&Logic [WiFi IoT Cloud&Local Wireless Temperature Monitoring Solution]

Once the temperature data was collected by Acrel IoT Cloud System Platform. We could also do the high/over temperature alarm rule setting on cloud system and receive the high/over temperature alarm warning information via WEB/APP/SMS/E-mail. [SMS/E-mail warning will be only supported when using buy-out service of Acrel IoT System.]

(1) High/Over Temperature Alarm: First we set the high/over temperature alarm rule on platform, then once the monitoring temperature was higher/lower than a certain preset threshold value, this will trigger the alarm and send the alarm warning information via assigned WEB/APP/SMS/E-mail.



(1) Set the over/high temperature alarm rule



(2) Receive and check alarm information

2. Hardware Devices Overview [WiFi IoT Cloud&Local Wireless Temperature Monitoring Solution]

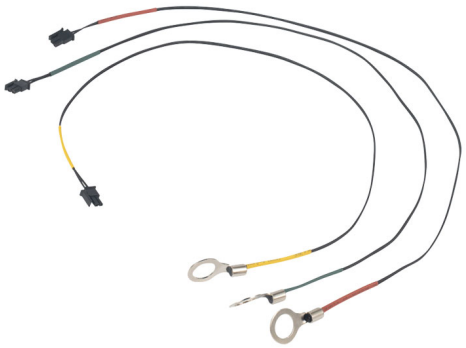
Model 1: ATE300M Multi-channel Wireless Temperature Sensor

LoRa Wireless | 6-Channel Temp.
Temperature Sensor | -40℃~+140℃

- Temperature Measuring Range: -40℃~+140℃ [±1℃]
- Monitoring: Up to 6-channel Temperature
- Wireless Comms [Upstream]: LoRa Radio Comms. [433~510MHz, self-defined protocol]
- LoRa Comms. Distance: within 100m [when in indoor environment, penetrate 1 layer of metal cover of switchboard/switchgear]
- Sampling Frequency: 1~240s
- Power Supply: 85~265Vac/Vdc
- Installation: DIN-rail/Strap-tied

Model 1: TPSNT503F415FAL1200 NTC Thermistor

NTC Thermistor | 2-wire
Temperature Sensor | -40℃~+140℃



- Temperature Measuring Range: -40℃~+140℃ [±1℃]
- Type: 2-wire NTC termistor
- Cable Length: 1.2m [0.5m optional, model will be TPSNT503F4150FAL500-03 NTC Thermistor]
- Probe Aperture Hole Size: φ12mm [diameter]
- Applicaiton: paired with ATE300M for temperature signal input
- Installation: Strap-tied/Screw-fixed

Model 2: ATC600-M Wireless Temperature Transceiver

Temp. Transceiver | Up to 240 Sensors
GFSK Wireless | 1-way RS485

- Wireless Comms. [Downstream]: LoRa Radio Comms. [433~510MHz,self-defined protocol]
- LoRa Comms. Distance: within 100m [when in indoor environment, penetrate 1 layer of metal cover of switchboard/switchgear]
- Wired Comms. [Upstream]: 1-way RS485 [MODBUS-RTU protocol]
- Support: up to 240 pcs ATE300M Wireless Temperature Sensors based on LoRa
- Power Supply: 100~265Vac/Vdc
- Working Temperature: -20℃～+55℃
- Working Humidity: <=95%

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2. Hardware Devices Overview [WiFi IoT Cloud&Local Wireless Temperature Monitoring Solution]

Model 4: ATP007 Temp. Display&Alarm Touch Screen

Touch Screen | 2-way RS485 | Temp. Display | 1-way Ethernet

- Comms.: 2-way RS485 [one for upstream, one for downstream, MODBUS-RTU]; 1-way Ethernet [for upstream, MODBUS-TCP]
- Support: Display the temperature data of up to 240 pcs temperature monitoring points.
- Alarm: High-tempearture alarm, over-temperature alarm.
- Power Supply: 24Vdc [±10%]; consumption 15W
- Screen Size: 7 inchs [10 inchs option available, module ATP010]
- Working Temperature: -10℃～+55 ℃
- Working Humidity: <=95%

Input Range | Output Range | 100~240Vac/Vdc | 24Vdc

Model 5: KDYA-DG30-24K Power Supply Module

- Rated Input Range: 100~240Vac/Vdc
- Rated Outpu Range: 24Vdc
- Application: paired with ATP007 for power supply input

IoT Gateway | WiFi&Ethernet | MQTT&MODBUS | RS485 Downstream

Model 6: AWT200-1E4S-WiFi IoT Smart Gateway

- Upstream Comms.: WiFi&Ethernet Comms. [MQTT& MODBUS-TCP protocol]
- Downstream Comms.: 4-way RS485 [MODBUS-RTU protocol]
- Power Supply: 85~265Vac/Vdc
- Working Temperature: -20℃～+55 ℃
- Working Humidity: <=95%

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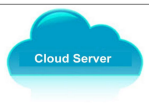
2. Model Selection&Quoation [WiFi IoT Cloud&Local Wireless Temperature Monitoring Solution]

(1) This Quotation doesn't include freight charge. To gain a complete quotation, please refer the actual quantity that you want to request for the actual order, once we receiving it. We will issue a Official Proforma Invoice with Acrel Stamps on it for later procedure.

System Software

Name	Description	System Price	Remark (Choose Host Service or Buy-out Service after 3-month Free Trial of **Cloud IoT System**)
 **Acrel Cloud IoT Energy Management System**	1.System support all the meters across the country whose data has been sent to cloud server through **4G,WiFi or Ethernet**. 2.Remote meter reading and data collection. 3.Provide **IoT APP** for **mobile phone** side and **IoT WEB** for **PC** side. 4.Generate energy data report of daily, monthly and annually period with year-on-yeay and period-on-period energy analysis. 5.Provide various alarm function to ensure a stable operation of the system and protect your property. 6.Offer 3-month free trial of system with full technical support as for a test phase or pilot project.	$0 (recommended in pilot projtect)	3-month Free Trail (Users don't need to rent a cloud server))
		$xxx/Year (For 30 Points) (Price for Host Service Only, recommended in pilot projtect)	$xx to buy Hosting Service for 1 monitoring points connected to the system 1 year (Users don't need to rent a cloud server)
		$xxxx/Permanent (Limitless Points) (Price for Buy-out Service Only,recommended in late projtect)	1-time charging of $xxxx for Buy-out Service of permanent use (Limitless monitoring points and a cloud server need to be rent by users)

Cloud Server

Name	Description	Server Renting Price (For Reference Only)	Remark
 Cloud Server	1.Cloud Server could be rent on the cloud server provider like Amazon Cloud. 2.Users of **Cloud IoT Energy Management System** only need to rent cloud server when they choose **buy-out** service of our **Cloud IoT System**. And if they are using **hosting service** or **3-month free trial** of our Cloud IoT System, we will use our own cloud server which has been rent on Amazon so that users don't need to rent a cloud server. 3.The quotation of Cloud Server is only a reference price that we have rent on Amazon Cloud.	According to Specs of Rented Cloud Server	Below cloud server specs could support 1000~2000 monitoings points connected to the system (Server：8 core 16G Operation System：windows server 2016)

Smart IoT Gateway

Overview Picture	USAGE&MODULE NAME	DESCRIPTION & SPECIFICATION	QUANTITY	FOB UNIT PRICE (USD)	AMOUNT (USD)
	Smart Gateway **AWT200-1E4S-WIFi**	**Upstream:** WiFi, Ethernet [MQTT, MODBUS, etc] **Downstream:** RS485 (MODBUS-RTU) **Support:** up to **80~100** Energy Meters within 400m using RS485 Wired Communication **Adjustment:** Via RJ45 or RS485 Port. **Power Supply:** 12~24Vdc (Default) **HS Code:** 8517699000	1 pcs	/	/

Local Temperature Display&Alarm Device

	Touch Screen **ATP007**	**Comms.:** 2-way RS485 (MODBUS-RTU); 1-way Ethernet [MODBUS-TCP] **Support:** Up to 240 ATE series Transceiver. **Auxiliary Power Supoply**: 24Vdc **HS Code:** 8471609000	1 pcs	/	/
	Power Supply Module **KDYA-DG30-24K**	**Application:** Paired with ATP007Kt for 85~265Vac Power Supply Input **Input:** 85~265Vac **Output:** 24Vdc **HS Code:** 8504409999	pcs	/	/

Wireless Temperature Transceiver

Overview Picture	USAGE&MODULE NAME	DESCRIPTION & SPECIFICATION	QUANTITY	FOB UNIT PRICE (USD)	AMOUNT (USD)
	Temperature Transceiver **ATC600-M**	**Upstream:** RS485 (MODBUS-RTU) **Downstream:** LoRa (433~510 MHz) **Support:** Up to 240 ATE300M series wireless temperature sensors using LoRa communication. **Power Supply:** 100~265Vac **HS Code:** 9025191010	1 pcs	/	/

Wireless Temperature Sensor

Overview Picture	USAGE&MODULE NAME	DESCRIPTION & SPECIFICATION	QUANTITY	FOB UNIT PRICE (USD)	AMOUNT (USD)
	Temperature Sensor **ATE300M**	**Communication:** LoRa Wireless (433~510MHz) **Monitoring:** Up to 6-channel Temperature **Measuring Range:** -40℃~+140℃ [via NTC Thermistor] **Power Supply:** 85~265Vac/Vdc **HS Code:** 9025191010	5 pcs	/	/
	NTC Thermistor **TPSNT503F415FAL1200**	**Temperature Measuring Range:** -40℃~+140℃ [±1℃] **Type:** 2-wire NTC termistor **Cable Length:** 1.2m **Probe Aperture Hole Size:** φ12mm [diameter] **Installation:** Strap-tied/Screw-fixed **HS Code:** 8533400000	30 pcs	/	/

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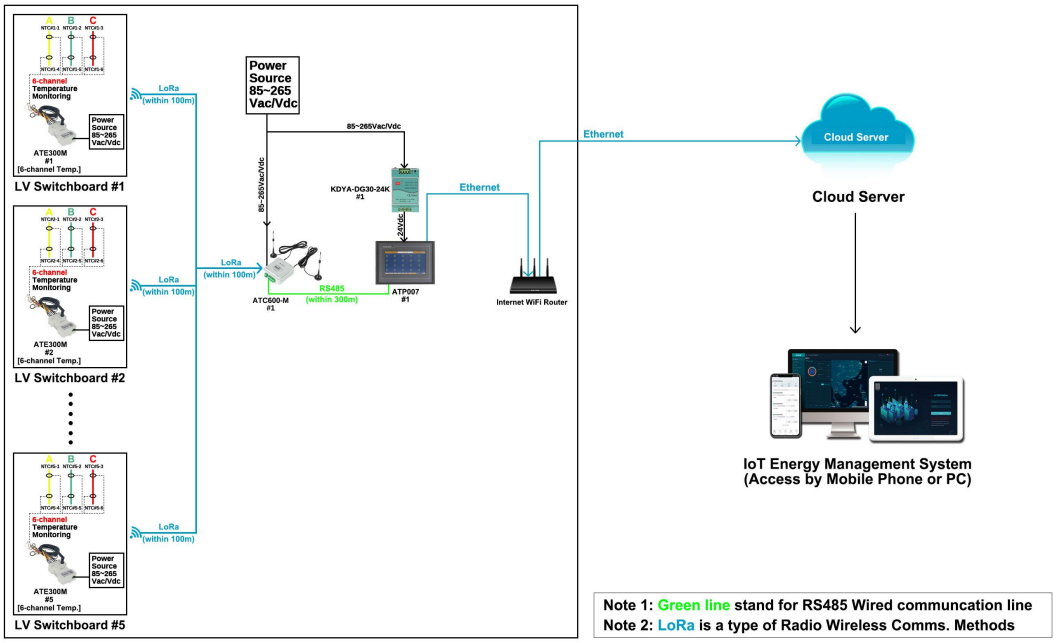
3. Scenario Preset [Ethernet IoT Cloud&Local Wireless Temperature Monitoring Solution]

(1) The target was to monitor and alarm the temperature of 5 switchgears deployed in a single room. Both IoT cloud & local display and alarm of temperature was requested.
(2) Each switchgear require 6 temperature moniotoring points for electrical connection nodes. Thus there will be 30 temperature monitoring points in total.
(3) System voltage of switchgear will be 0.4kV. Network with stable Ethernet Comms.

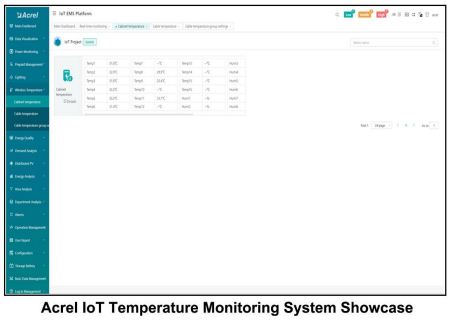
3. Devices Deployment [Ethernet IoT Cloud&Local Wireless Temperature Monitoring Solution]

Area #1 - LV Switchboard #1 ~ #5:
- 1* ATP007 Temperature Display Touchscreen [For local display and alarm for all temperature data and further upload the data to Acrel Cloud IoT System via Ethernet]
- 1* ATC600-M Wireless Temperature Transciever [For collecting the temperature data from ATE300M wireless temp. sensors and further upload the data to ATP007]
- 5* ATE300M Multi-channel Wireless Temperature Sensor [For monitoring up to 6-channel temperature of electrical connection nodes and send the data to ATC600-M via LoRa wirelesss Comms.]
- 30* TPSNT503F415FAL1200 NTC Thermistor [Paired with ATE300M for temp. signal input]
- 1* KDYA-DG30-24K Power Supply Module [Paired with ATP007 for 85~265Vac/Vdc Power Supply input]



Area #1


• ATE300M Installed in LV Switchboard
Switchboard Temperature Monitoring Point Showcase


Acrel IoT Temperature Monitoring System Showcase

(1) Devices deployment plan Illustraton

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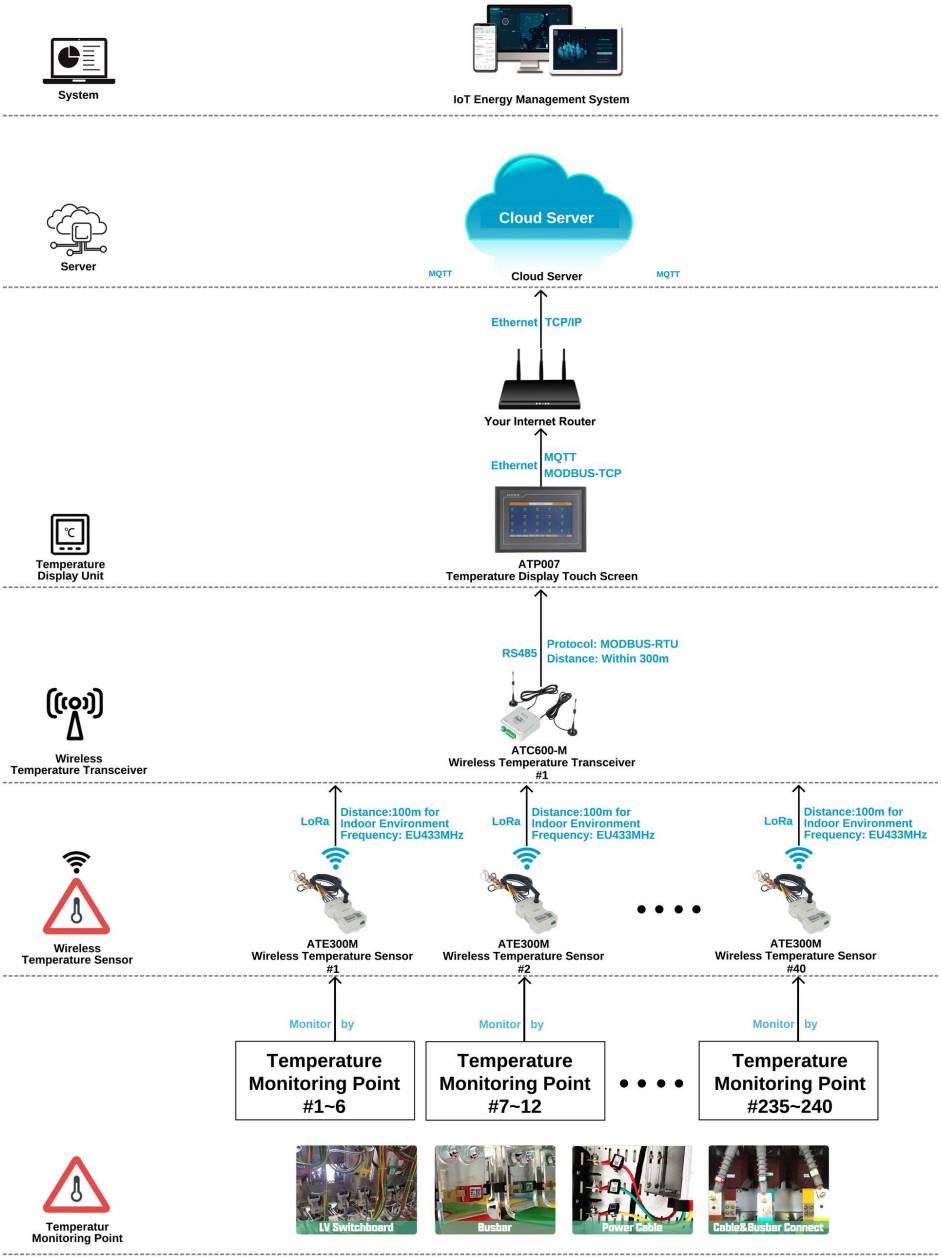
3. Comms. Structure & Logic [Ethernet IoT Cloud&Local Wireless Temperature Monitoring Solution]

(1) Between ATE300M wireless temperature sensor and ATC600-M wireless temperature transceiver, we are using a radio wireless communications called LoRa. The communication distance is within 100m [when in indoor environment and penetrate 1 layer of metal cover of switchgear]. The communication protocol is self defined protocol. [1 ATC600-M can support up to 240 pcs ATE300M if comms. distance allowed.]
(2) Between ATP007 smart touch screen and ATC600-M wierless temperature transceiver. We are using common RS485 communications based on MODBUS-RTU protocol. Although for this RS485 communication, it's wired comms. But normally these devices were always installed closedly to each other, so that remain the most part of communication structure still wireless. [1 pcs ATP007 can support and display the temp. data of up to 240 points]
(3) Between ATP007 smart touch screen and Acrel IoT system, we are using Ethernet comms. methods based on either MQTT or MODBUS-TCP protocol.



(1) Communication Structure

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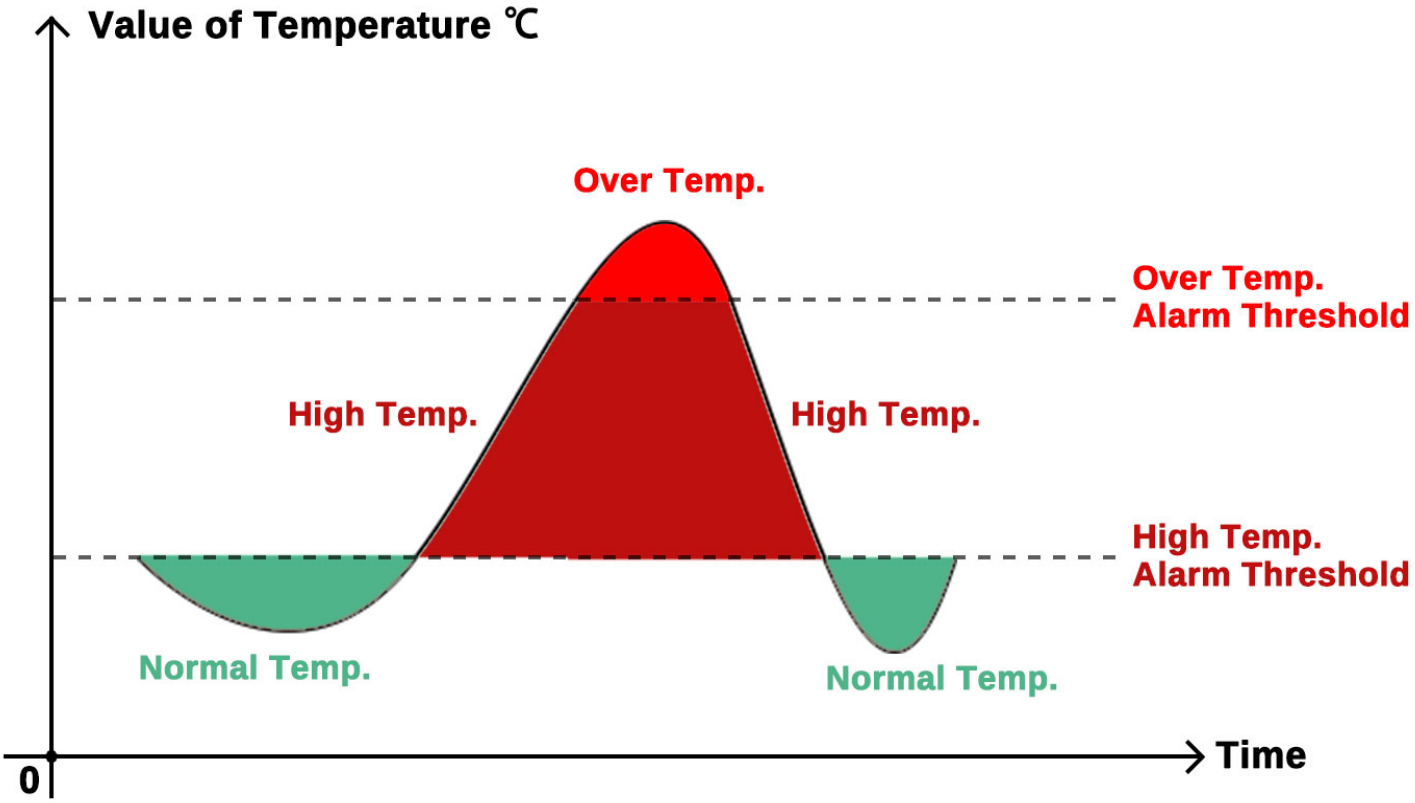
3. Local Device Temperature Alarm Function&Logic [Ethernet IoT Cloud&Local Wireless Temperature Monitoring Solution]

ATP Seires Tempearture Display Devices support 2 types of major temperature alarm logic. When any of the below alarm logic was set and triggered, it will alarm the buzzer up.

(1) High Temperature Alarm: When temperature of certain monitoring node was higher than a certain preset threshold value, this will twigger high temperature alarm. [Normally used as a pre-alarm for mentioning related person to take care of temperature rising issue in monitoring places]

(2) Over Temperature Alarm: Similar like high temperature alarm, but over temperature alarm normally will be preset a higher alarm threshold. [Normally used for alarming the related person that there are severe temperature rising issue happened and need to be solved immediately]

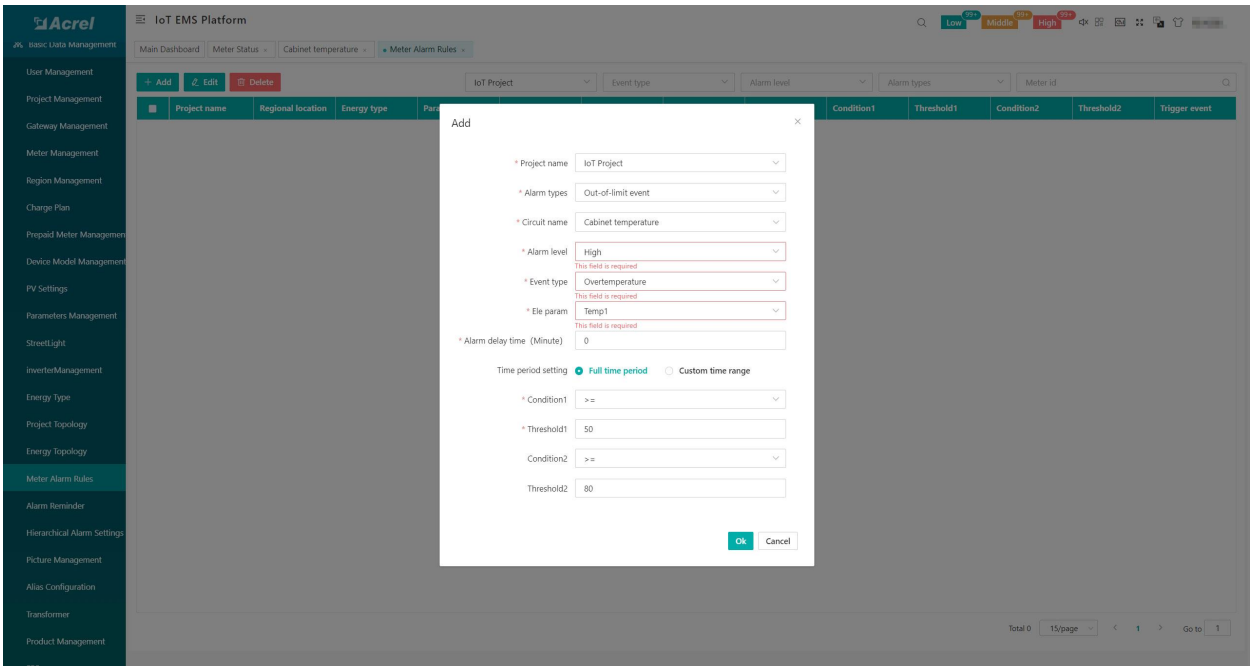


(1&2) High&Over Temperature Alarm

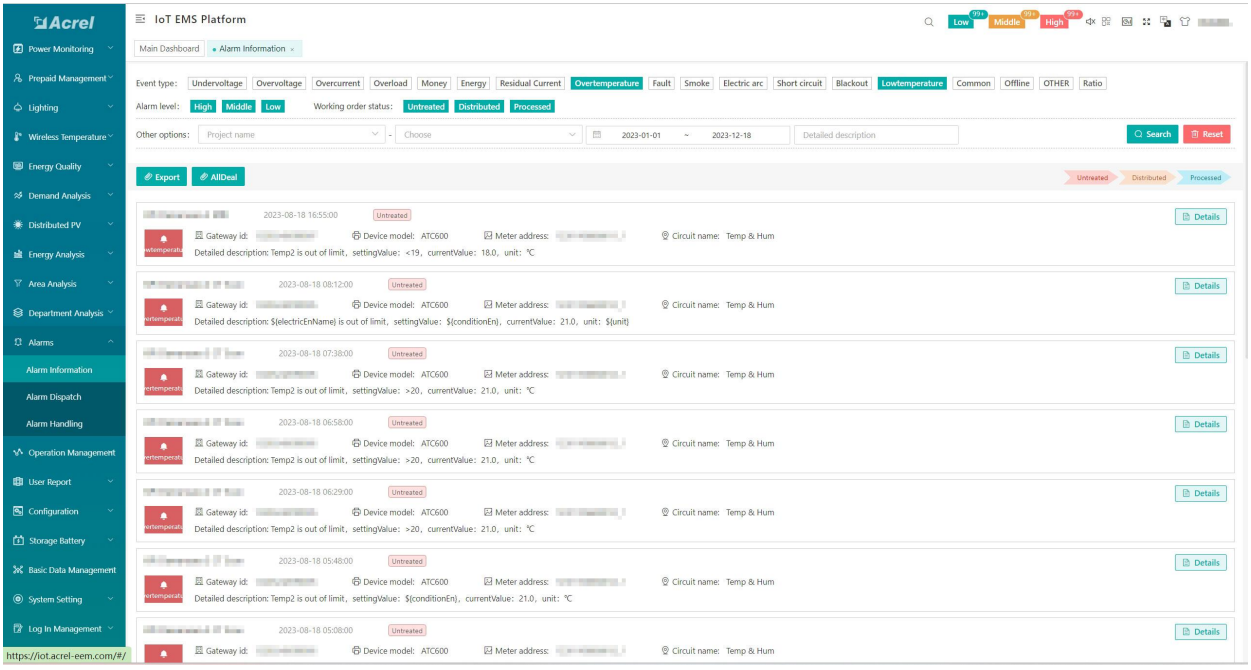
3. Cloud IoT Platform Temperature Alarm Function&Logic [Ethernet IoT Cloud&Local Wireless Temperature Monitoring Solution]

Once the temperature data was collected by Acrel IoT Cloud System Platform. We could also do the high/over temperature alarm rule setting on cloud system and receive the high/over temperature alarm warning information via WEB/APP/SMS/E-mail. [SMS/E-mail warning will be only supported when using buy-out service of Acrel IoT System.]

(1) High/Over Temperature Alarm: First we set the high/over temperature alarm rule on platform, then once the monitoring temperature was higher/lower than a certain preset threshold value, this will trigger the alarm and send the alarm warning information via assigned WEB/APP/SMS/E-mail.



(1) Set the over/high temperature alarm rule



(2) Receive and check alarm information

3. Hardware Devices Overview [Ethernet IoT Cloud&Local Wireless Temperature Monitoring Solution]

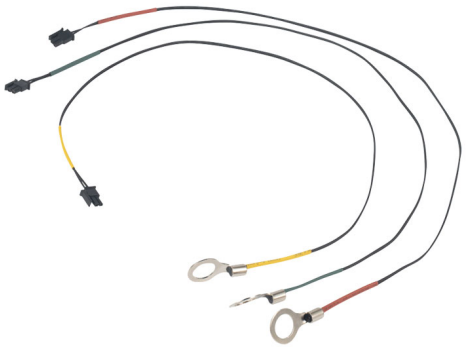
Model 1: ATE300M Multi-channel Wireless Temperature Sensor

LoRa Wireless | 6-Channel Temp.
Temperature Sensor | -40℃~+140℃

- Temperature Measuring Range: -40℃~+140℃ [±1℃]
- Monitoring: Up to 6-channel Temperature
- Wireless Comms [Upstream]: LoRa Radio Comms. [433~510MHz, self-defined protocol]
- LoRa Comms. Distance: within 100m [when in indoor environment, penetrate 1 layer of metal cover of switchboard/switchgear]
- Sampling Frequency: 1~240s
- Power Supply: 85~265Vac/Vdc
- Installation: DIN-rail/Strap-tied

Model 1: TPSNT503F415FAL1200 NTC Thermistor

NTC Thermistor | 2-wire
Temperature Sensor | -40℃~+140℃



- Temperature Measuring Range: -40℃~+140℃ [±1℃]
- Type: 2-wire NTC termistor
- Cable Length: 1.2m [0.5m optional, model will be TPSNT503F4150FAL500-03 NTC Thermistor]
- Probe Aperture Hole Size: φ12mm [diameter]
- Applicaiton: paired with ATE300M for temperature signal input
- Installation: Strap-tied/Screw-fixed

Model 2: ATC600-M Wireless Temperature Transceiver

Temp. Transceiver | Up to 240 Sensors
GFSK Wireless | 1-way RS485

- Wireless Comms. [Downstream]: LoRa Radio Comms. [433~510MHz,self-defined protocol]
- LoRa Comms. Distance: within 100m [when in indoor environment, penetrate 1 layer of metal cover of switchboard/switchgear]
- Wired Comms. [Upstream]: 1-way RS485 [MODBUS-RTU protocol]
- Support: up to 240 pcs ATE300M Wireless Temperature Sensors based on LoRa
- Power Supply: 100~265Vac/Vdc
- Working Temperature: -20℃～+55℃
- Working Humidity: <=95%

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3. Hardware Devices Overview [Ethernet IoT Cloud&Local Wireless Temperature Monitoring Solution]

Model 4: ATP007 Temp. Display&Alarm Touch Screen

Touch Screen | 2-way RS485
Temp. Display | 1-way Ethernet

- Comms.: 2-way RS485 [one for upstream, one for downstream, MODBUS-RTU]; 1-way Ethernet [for upstream, MODBUS-TCP]
- Support: Display the temperature data of up to 240 pcs temperature monitoring points.
- Alarm: High-tempearture alarm, over-temperature alarm.
- Power Supply: 24Vdc [±10%]; consumption 15W
- Screen Size: 7 inchs [10 inchs option available, module ATP010]
- Working Temperature: -10℃～+55 ℃
- Working Humidity: <=95%

Input Range | Output Range
100~240Vac/Vdc | 24Vdc

Model 5: KDYA-DG30-24K Power Supply Module

- Rated Input Range: 100~240Vac/Vdc
- Rated Outpu Range: 24Vdc
- Application: paired with ATP007 for power supply input

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3. Model Selection&Quoation [Ethernet IoT Cloud&Local Wireless Temperature Monitoring Solution]

(1) This Quotation doesn't include freight charge. To gain a complete quotation, please refer the actual quantity that you want to request for the actual order, once we receiving it. We will issue a Official Proforma Invoice with Acrel Stamps on it for later procedure.

System Software

Name	Description	System Price	Remark (Choose Host Service or Buy-out Service after 3-month Free Trial of **Cloud IoT System**)
 **Acrel Cloud IoT Energy Management System**	1.System support all the meters across the country whose data has been sent to cloud server through **4G,WiFi or Ethernet**. 2.Remote meter reading and data collection. 3.Provide **IoT APP** for **mobile phone** side and **IoT WEB** for **PC** side. 4.Generate energy data report of daily, monthly and annually period with year-on-yeay and period-on-period energy analysis. 5.Provide various alarm function to ensure a stable operation of the system and protect your property. 6.Offer 3-month free trial of system with full technical support as for a test phase or pilot project.	$0 (recommended in pilot project)	3-month Free Trail (Users don't need to rent a cloud server))
		$xxx/Year (For 30 Points) (Price for Host Service Only, recommended in pilot project)	$xx to buy Hosting Service for 1 monitoring points connected to the system 1 year (Users don't need to rent a cloud server)
		$xxxx/Permanent (Limitless Points) (Price for Buy-out Service Only,recommended in late project)	1-time charging of $xxxx for Buy-out Service of permanent use (Limitless monitoring points and a cloud server need to be rent by users)

Cloud Server

Name	Description	Server Renting Price (For Reference Only)	Remark
 Cloud Server	1.Cloud Server could be rent on the cloud server provider like Amazon Cloud. 2.Users of **Cloud IoT Energy Management System** only need to rent cloud server when they choose **buy-out** service of our **Cloud IoT System**. And if they are using **hosting service** or **3-month free trial** of our Cloud IoT System, we will use our own cloud server which has been rent on Amazon so that users don't need to rent a cloud server. 3.The quotation of Cloud Server is only a reference price that we have rent on Amazon Cloud.	According to Specs of Rented Cloud Server	Below cloud server specs could support 1000~2000 monitoings points connected to the system (Server：8 core 16G Operation System：windows server 2016)

Local Temperature Display&Alarm Device

	Touch Screen **ATP007**	**Comms.:** 2-way RS485 (MODBUS-RTU); 1-way Ethernet [MODBUS-TCP] **Support:** Up to 240 ATE series Transceiver. **Auxiliary Power Supoply**: 24Vdc **HS Code:** 8471609000	1 pcs	/	/
	Power Supply Module **KDYA-DG30-24K**	**Application:** Paired with ATP007Kt for 85~265Vac Power Supply Input **Input:** 85~265Vac **Output:** 24Vdc **HS Code:** 8504409999	1 pcs	/	/

Wireless Temperature Transceiver

Overview Picture	USAGE&MODULE NAME	DESCRIPTION & SPECIFICATION	QUANTITY	FOB UNIT PRICE (USD)	AMOUNT (USD)
	Temperature Transceiver **ATC600-M**	**Upstream:** RS485 (MODBUS-RTU) **Downstream:** LoRa (433~510 MHz) **Support:** Up to 240 ATE300M series wireless temperature sensors using LoRa communication. **Power Supply:** 100~265Vac **HS Code:** 9025191010	1 pcs	/	/

Wireless Temperature Sensor

Overview Picture	USAGE&MODULE NAME	DESCRIPTION & SPECIFICATION	QUANTITY	FOB UNIT PRICE (USD)	AMOUNT (USD)
	Temperature Sensor **ATE300M**	**Communication:** LoRa Wireless (433~510MHz) **Monitoring:** Up to 6-channel Temperature **Measuring Range:** -40℃~+140℃ [via NTC Thermistor] **Power Supply:** 85~265Vac/Vdc **HS Code:** 9025191010	5 pcs	/	/
	NTC Thermistor **TPSNT503F415FAL1200**	**Temperature Measuring Range:** -40℃~+140℃ [±1℃] **Type:** 2-wire NTC termistor **Cable Length:** 1.2m **Probe Aperture Hole Size:** φ12mm [diameter] **Installation:** Strap-tied/Screw-fixed **HS Code:** 8533400000	30 pcs	/	/

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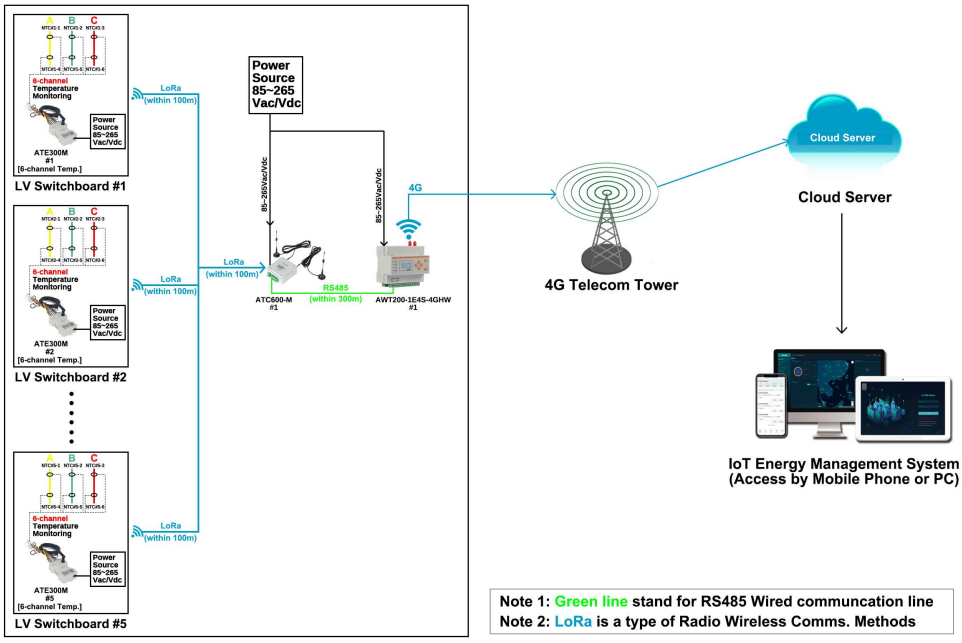
4. Scenario Preset [4G IoT Cloud Wireless Temperature Monitoring Solution]

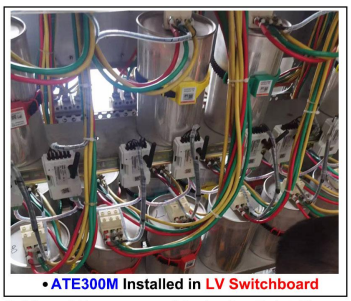
(1) The target was to monitor and alarm the temperature of 5 switchgears deployed in a single room. Only IoT cloud display and alarm of temperature was requested.
(2) Each switchgear require 6 temperature moniotoring points for electrical connection nodes. Thus there will be 30 temperature monitoring points in total.
(3) The system voltage of switchgear will be 0.4kV. Network with stable 4G Comms.

4. Devices Deployment [4G IoT Cloud Wireless Temperature Monitoring Solution]

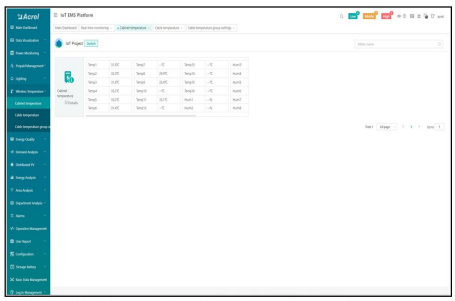
Area #1 - LV Switchboard #1 ~ #5:
- 1* AWT200-1E4S-4GHW IoT Gateway [For further uploading the data from ATC600-M to Acrel IoT Cloud System via 4G Comms.]
- 1* ATC600-M Wireless Temperature Transciever [For collecting temperature data from ATE300M wireless temp. sensors and further uploading data to AWT200-1E4S-4GHW]
- 5* ATE300M Multi-channel Wireless Temperature Sensor [For monitoring up to 6-channel temperature of electrical connection nodes and send the data to ATC600-M via LoRa wirelesss Comms.]
- 30* TPSNT503F415FAL1200 NTC Thermistor [Paired with ATE300M for temp. signal input]
- 1* KDYA-DG30-24K Power Supply Module [Paired with ATP007 for 85~265Vac/Vdc Power Supply input]



Area #1



Switchboard Temperature Monitoring Point Showcase


Acrel IoT Temperature Monitoring System Showcase

(1) Devices deployment plan Illustraton

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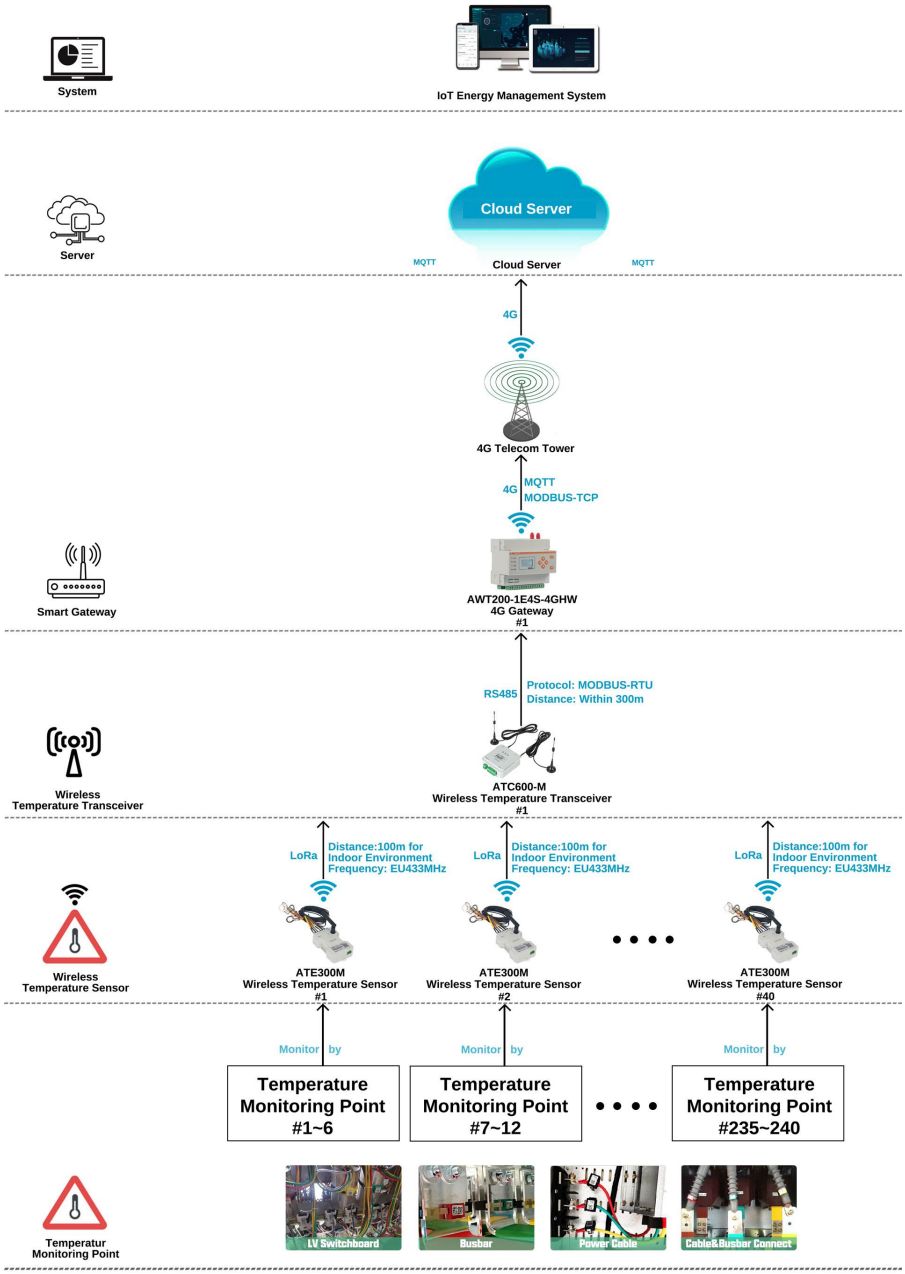
4. Comms. Structure & Logic [4G IoT Cloud Wireless Temperature Monitoring Solution]

(1) Between ATE300M wireless temperature sensor and ATC600-M wireless temperature transceiver, we are using a radio wireless communications called LoRa. The communication distance is within 100m [when in indoor environment and penetrate 1 layer of metal cover of switchgear]. The communication protocol is self defined protocol. [1 ATC600-M can support up to 240 pcs ATE300M if comms. distance allowed.]
(2) Between ATP007 touch screen and AWT200-1E4S-4GHW IoT gateway, we are using common RS485 communications based on MODBUS-RTU protocol. Although for this RS485 communication, it's wired comms. But normally these devices were always installed closedly to each other, so that remain the most part of communication structure still wireless. [1 pcs ATP007 can support and display the temp. data of up to 240 points]
(3) Between AWT200-1E4S-4GHW IoT gateway and Acrel IoT system, we are using 4G comms. methods based on either MQTT or MODBUS-TCP protocol.

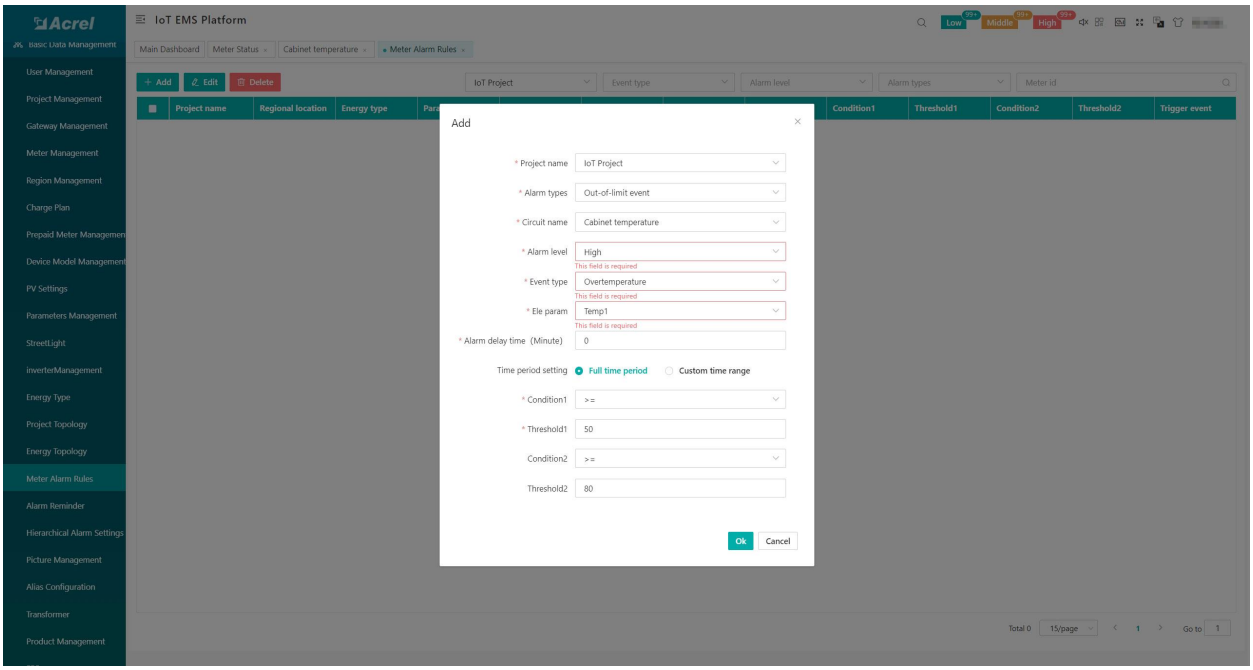


(1) Communication Structure

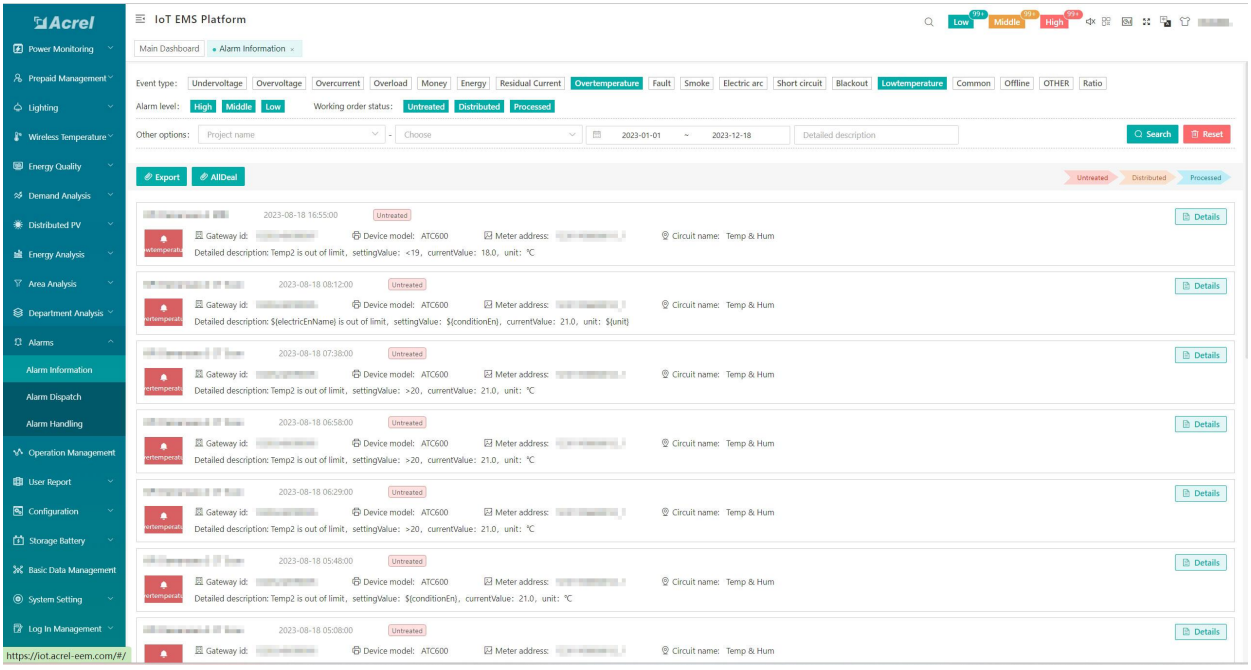
4. Cloud IoT Platform Temperature Alarm Function&Logic [4G IoT Cloud Wireless Temperature Monitoring Solution]

Once the temperature data was collected by Acrel IoT Cloud System Platform. We could also do the high/over temperature alarm rule setting on cloud system and receive the high/over temperature alarm warning information via WEB/APP/SMS/E-mail. [SMS/E-mail warning will be only supported when using buy-out service of Acrel IoT System.]

(1) High/Over Temperature Alarm: First we set the high/over temperature alarm rule on platform, then once the monitoring temperature was higher/lower than a certain preset threshold value, this will trigger the alarm and send the alarm warning information via assigned WEB/APP/SMS/E-mail.



(1) Set the over/high temperature alarm rule



(2) Receive and check alarm information

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4. Hardware Devices Overview [4G IoT Cloud Wireless Temperature Monitoring Solution]

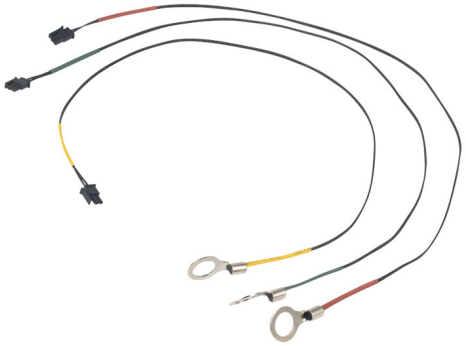
Model 1: ATE300M Multi-channel Wireless Temperature Sensor

LoRa Wireless | 6-Channel Temp.
Temperature Sensor | -40℃~+140℃

- Temperature Measuring Range: -40℃~+140℃ [±1℃]
- Monitoring: Up to 6-channel Temperature
- Wireless Comms [Upstream]: LoRa Radio Comms. [433~510MHz, self-defined protocol]
- LoRa Comms. Distance: within 100m [when in indoor environment, penetrate 1 layer of metal cover of switchboard/switchgear]
- Sampling Frequency: 1~240s
- Power Supply: 85~265Vac/Vdc
- Installation: DIN-rail/Strap-tied

Model 1: TPSNT503F415FAL1200 NTC Thermistor

NTC Thermistor | 2-wire
Temperature Sensor | -40℃~+140℃



- Temperature Measuring Range: -40℃~+140℃ [±1℃]
- Type: 2-wire NTC termistor
- Cable Length: 1.2m [0.5m optional, model will be TPSNT503F4150FAL500-03 NTC Thermistor]
- Probe Aperture Hole Size: φ12mm [diameter]
- Applicaiton: paired with ATE300M for temperature signal input
- Installation: Strap-tied/Screw-fixed

Model 2: ATC600-M Wireless Temperature Transceiver

Temp. Transceiver | Up to 240 Sensors
GFSK Wireless | 1-way RS485

- Wireless Comms. [Downstream]: LoRa Radio Comms. [433~510MHz,self-defined protocol]
- LoRa Comms. Distance: within 100m [when in indoor environment, penetrate 1 layer of metal cover of switchboard/switchgear]
- Wired Comms. [Upstream]: 1-way RS485 [MODBUS-RTU protocol]
- Support: up to 240 pcs ATE300M Wireless Temperature Sensors based on LoRa
- Power Supply: 100~265Vac/Vdc
- Working Temperature: -20℃～+55℃
- Working Humidity: <=95%

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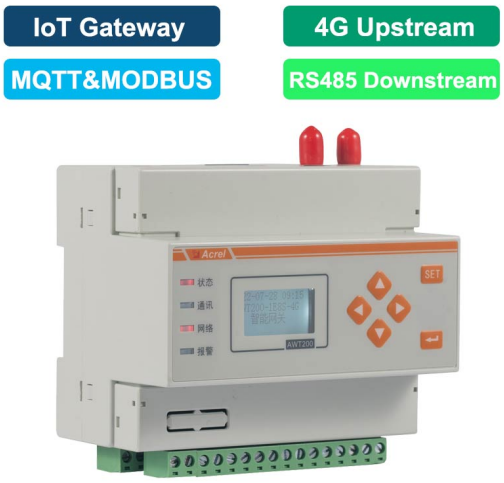
4. Hardware Devices Overview [4G IoT Cloud Wireless Temperature Monitoring Solution]

Model 4: AWT200-1E4S-4GHW IoT Smart Gateway

- Upstream Comms.: 4G&Ethernet Comms. [MQTT& MODBUS-TCP protocol]
- Downstream Comms.: 4-way RS485 [MODBUS-RTU protocol]
- Power Supply: 85~265Vac/Vdc
- Working Temperature: -20℃～+55 ℃
- Working Humidity: <=95%



4. Model Selection&Quoation [4G IoT Cloud Wireless Temperature Monitoring Solution]

(1) This Quotation doesn't include freight charge. To gain a complete quotation, please refer the actual quantity that you want to request for the actual order, once we receiving it. We will issue a Official Proforma Invoice with Acrel Stamps on it for later procedure.

System Software

Name	Description	System Price	Remark (Choose Host Service or Buy-out Service after 3-month Free Trial of **Cloud IoT System**)
 **Acrel Cloud IoT Energy Management System**	1.System support all the meters across the country whose data has been sent to cloud server through **4G,WiFi or Ethernet**. 2.Remote meter reading and data collection. 3.Provide **IoT APP** for **mobile phone** side and **IoT WEB** for **PC** side. 4.Generate energy data report of daily, monthly and annually period with year-on-yeay and period-on-period energy analysis. 5.Provide various alarm function to ensure a stable operation of the system and protect your property. 6.Offer 3-month free trial of system with full technical support as for a test phase or pilot project.	$0 (recommended in pilot projtect)	3-month Free Trail (Users don't need to rent a cloud server))
		$xxx/Year (For 30 Points) (Price for Host Service Only, recommended in pilot projtect)	$xx to buy Hosting Service for 1 monitoring points connected to the system 1 year (Users don't need to rent a cloud server)
		$xxxx/Permanent (Limitless Points) (Price for Buy-out Service Only,recommended in late projtect)	1-time charging of $xxxx for Buy-out Service of permanent use (Limitless monitoring points and a cloud server need to be rent by users)

Cloud Server

Name	Description	Server Renting Price (For Reference Only)	Remark
 Cloud Server	1.Cloud Server could be rent on the cloud server provider like Amazon Cloud. 2.Users of **Cloud IoT Energy Management System** only need to rent cloud server when they choose **buy-out** service of our **Cloud IoT System**. And if they are using **hosting service** or **3-month free trial** of our Cloud IoT System, we will use our own cloud server which has been rent on Amazon so that users don't need to rent a cloud server. 3.The quotation of Cloud Server is only a reference price that we have rent on Amazon Cloud.	According to Specs of Rented Cloud Server	Below cloud server specs could support 1000~2000 monitoings points connected to the system (Server：8 core 16G Operation System：windows server 2016)

Smart IoT Gateway

Overview Picture	USAGE&MODULE NAME	DESCRIPTION & SPECIFICATION	QUANTITY	FOB UNIT PRICE (USD)	AMOUNT (USD)
	Smart Gateway **AWT200-1E4S-4GHW**	**Upstream:** 4G, Ethernet [MQTT, MODBUS, etc] **Downstream:** RS485 (MODBUS-RTU) **Support:** up to **80~100** RS485 Devices within 400m using RS485 Wired Communication **Adjustment:** Via RJ45 or RS485 Port. **Power Supply:** 85~265Vac/Vdc (via power adpter) **HS Code:** 8517699000	1 pcs	/	/

Wireless Temperature Transceiver

Overview Picture	USAGE&MODULE NAME	DESCRIPTION & SPECIFICATION	QUANTITY	FOB UNIT PRICE (USD)	AMOUNT (USD)
	Temperature Transceiver **ATC600-M**	**Upstream:** RS485 (MODBUS-RTU) **Downstream:** LoRa (433~510 MHz) **Support:** Up to 240 ATE300M series wireless temperature sensors using LoRa communication. **Power Supply:** 100~265Vac **HS Code:** 9025191010	1 pcs	/	/

Wireless Temperature Sensor

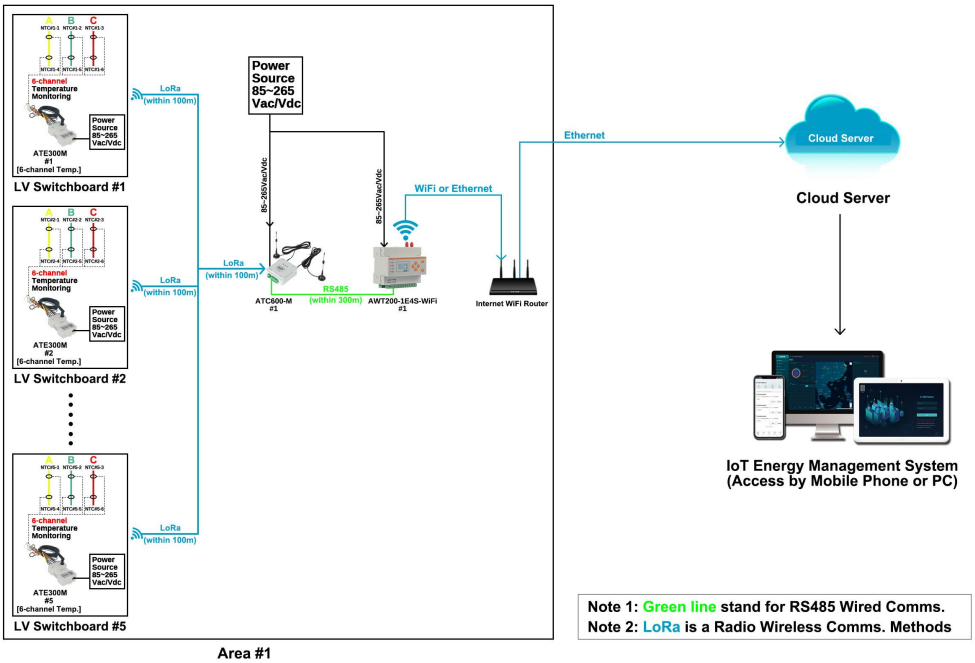
Overview Picture	USAGE&MODULE NAME	DESCRIPTION & SPECIFICATION	QUANTITY	FOB UNIT PRICE (USD)	AMOUNT (USD)
	Temperature Sensor **ATE300M**	**Communication:** LoRa Wireless (433~510MHz) **Monitoring:** Up to 6-channel Temperature **Measuring Range:** -40℃~+140℃ [via NTC Thermistor] **Power Supply:** 85~265Vac/Vdc **HS Code:** 9025191010	5 pcs	/	/
	NTC Thermistor **TPSNT503F415FAL1200**	**Temperature Measuring Range:** -40℃~+140℃ [±1℃] **Type:** 2-wire NTC termistor **Cable Length:** 1.2m **Probe Aperture Hole Size:** φ12mm [diameter] **Installation:** Strap-tied/Screw-fixed **HS Code:** 8533400000	30 pcs	/	/

5. Scenario Preset [WiFi&Ethernet IoT Cloud Wireless Temperature Monitoring Solution]

(1) The target was to monitor and alarm the temperature of 5 switchgears deployed in a single room. Only IoT cloud display and alarm of temperature was requested.
(2) Each switchgear require 6 temperature moniotoring points for electrical connection nodes. Thus there will be 30 temperature monitoring points in total.
(3) The system voltage of switchgear will be 0.4kV. Network with WiFi or Ethernet.

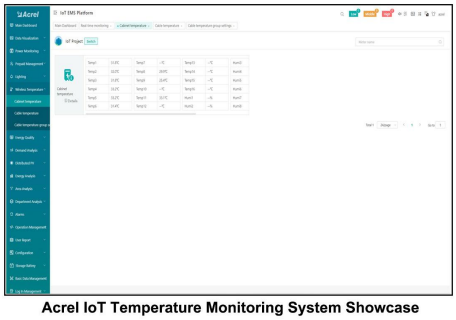
5. Devices Deployment [WiFi&Ethernet IoT Cloud Wireless Temperature Monitoring Solution]

Area #1 - LV Switchboard #1 ~ #5:
- 1* AWT200-1E4S-WiFi IoT Gateway [For further uploading the data from ATC600-M to Acrel IoT Cloud System via WiFi or Ethernet Comms.]
- 1* ATC600-M Wireless Temperature Transciever [For collecting temperature data from ATE300M wireless temp. sensors and further uploading data to AWT200-1E4S-WiFi]
- 5* ATE300M Multi-channel Wireless Temperature Sensor [For monitoring up to 6-channel temperature of electrical connection nodes and send the data to ATC600-M via LoRa wirelesss Comms.]
- 30* TPSNT503F415FAL1200 NTC Thermistor [Paired with ATE300M for temp. signal input]
- 1* KDYA-DG30-24K Power Supply Module [Paired with ATP007 for 85~265Vac/Vdc Power Supply input]



Area #1

Switchboard Temperature Monitoring Point Showcase

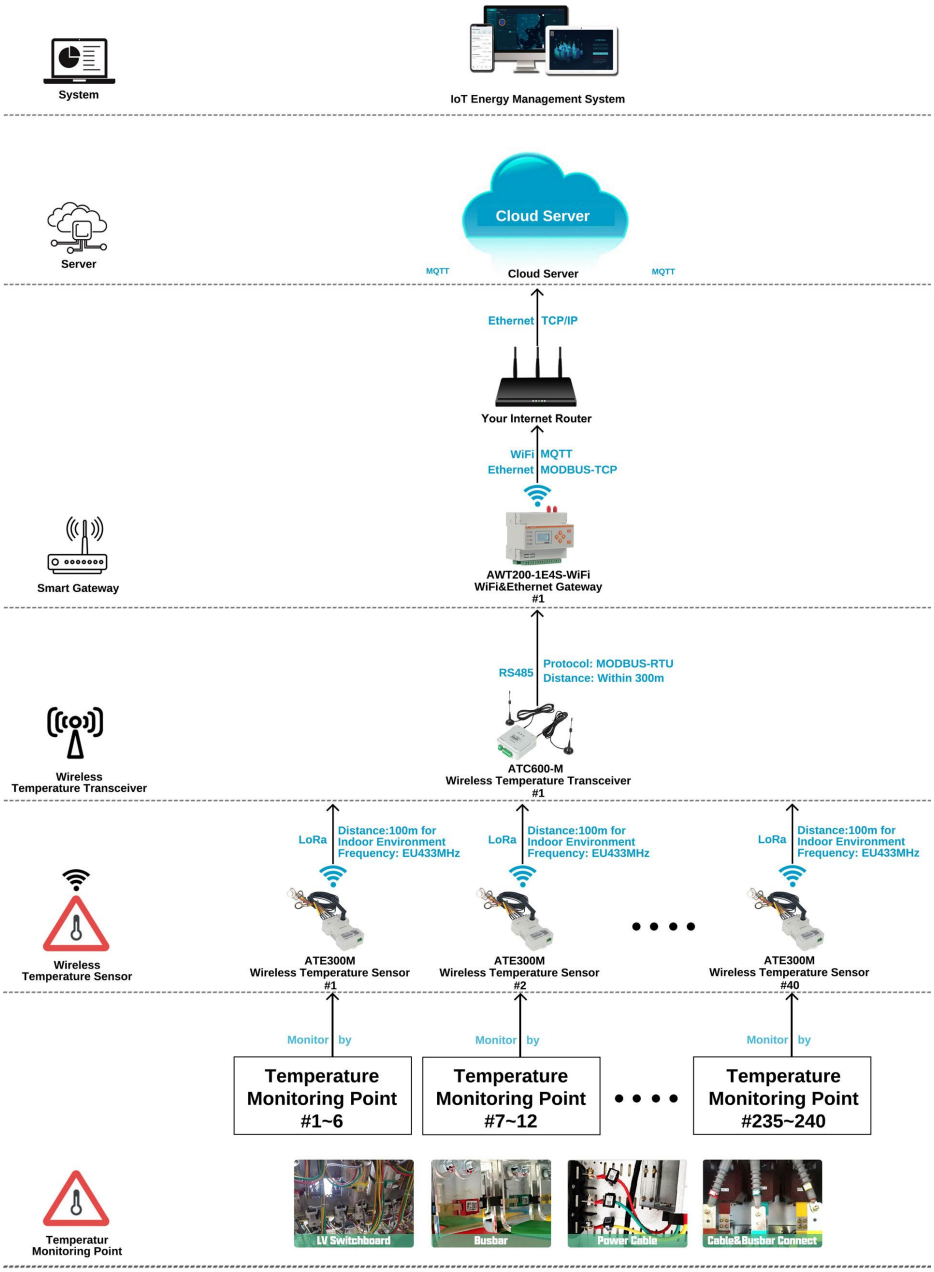


Acrel IoT Temperature Monitoring System Showcase

(1) Devices deployment plan Illustraton

5. Comms. Structure & Logic [WiFi&Ethernet IoT Cloud Wireless Temperature Monitoring Solution]

(1) Between ATE300M wireless temperature sensor and ATC600-M wireless temperature transceiver, we are using a radio wireless communications called LoRa. The communication distance is within 100m [when in indoor environment and penetrate 1 layer of metal cover of switchgear]. The communication protocol is self defined protocol. [1 ATC600-M can support up to 240 pcs ATE300M if comms. distance allowed.]
(2) Between ATP007 touch screen and AWT200-1E4S-WiFi IoT gateway, we are using common RS485 communications based on MODBUS-RTU protocol. Although for this RS485 communication, it's wired comms. But normally these devices were always installed closely to each other, so that remain the most part of communication structure still wireless. [1 pcs ATP007 can support and display the temp. data of up to 240 points]
(3) Between AWT200-1E4S-WiFi IoT gateway and Acrel IoT system, we are using either WiFi or Ethernet comms. methods based on either MQTT or MODBUS-TCP protocol.

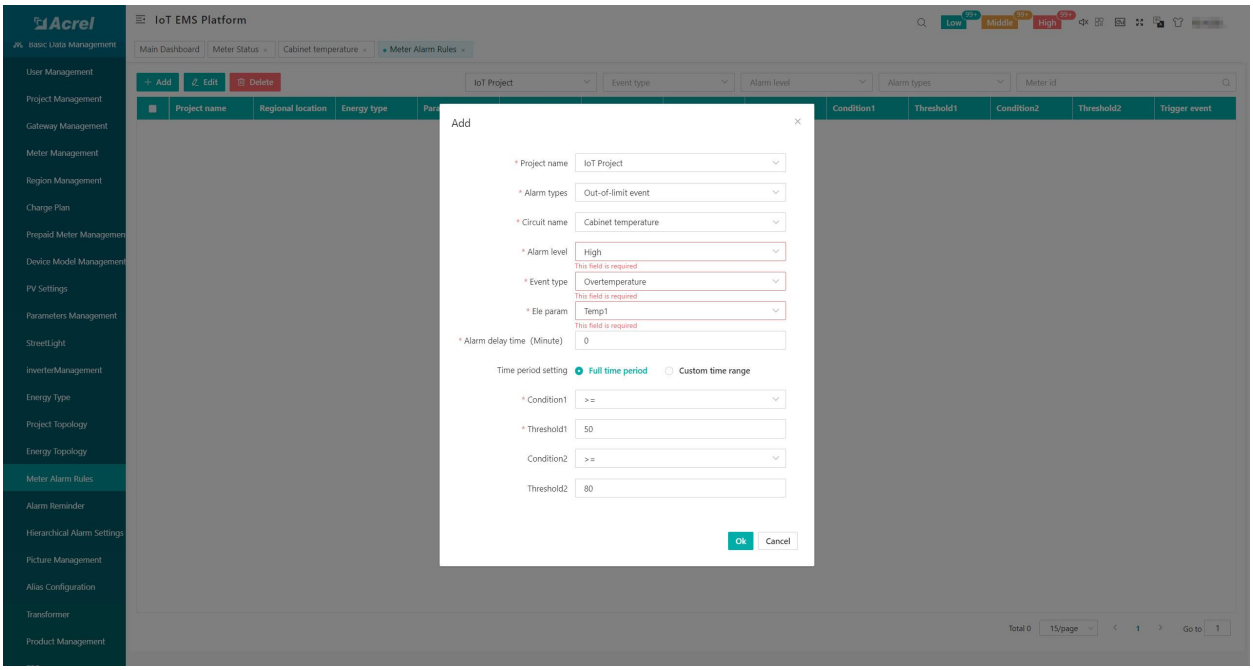


(1) Communication Structure

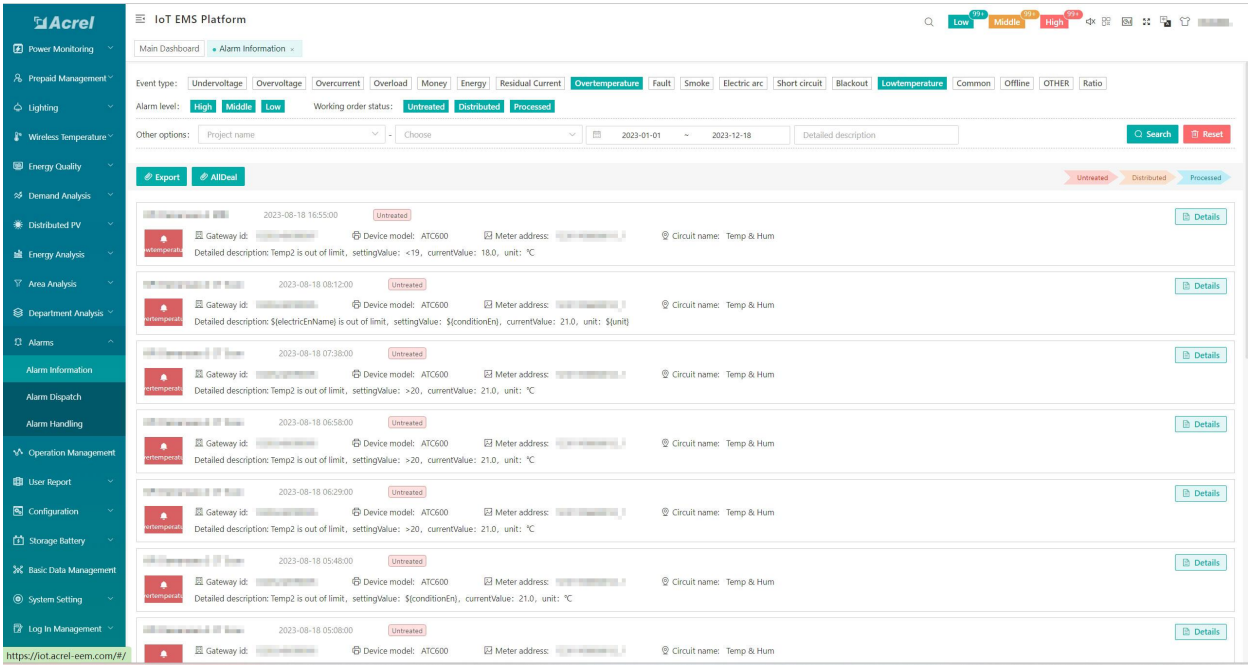
5. Cloud IoT Platform Temperature Alarm Function&Logic [WiFi&Ethernet IoT Cloud Wireless Temperature Monitoring Solution]

Once the temperature data was collected by Acrel IoT Cloud System Platform. We could also do the high/over temperature alarm rule setting on cloud system and receive the high/over temperature alarm warning information via WEB/APP/SMS/E-mail. [SMS/E-mail warning will be only supported when using buy-out service of Acrel IoT System.]

(1) High/Over Temperature Alarm: First we set the high/over temperature alarm rule on platform, then once the monitoring temperature was higher/lower than a certain preset threshold value, this will trigger the alarm and send the alarm warning information via assigned WEB/APP/SMS/E-mail.



(1) Set the over/high temperature alarm rule



(2) Receive and check alarm information

5. Hardware Devices Overview [WiFi&Ethernet IoT Cloud Wireless Temperature Monitoring Solution]

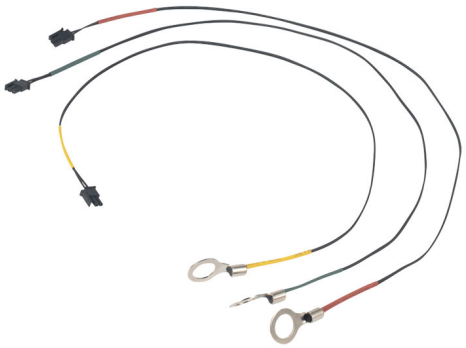
Model 1: ATE300M Multi-channel Wireless Temperature Sensor

LoRa Wireless | 6-Channel Temp. | Temperature Sensor | -40℃~+140℃

- Temperature Measuring Range: -40℃~+140℃ [±1℃]
- Monitoring: Up to 6-channel Temperature
- Wireless Comms [Upstream]: LoRa Radio Comms. [433~510MHz, self-defined protocol]
- LoRa Comms. Distance: within 100m [when in indoor environment, penetrate 1 layer of metal cover of switchboard/switchgear]
- Sampling Frequency: 1~240s
- Power Supply: 85~265Vac/Vdc
- Installation: DIN-rail/Strap-tied

Model 1: TPSNT503F415FAL1200 NTC Thermistor

NTC Thermistor | 2-wire | Temperature Sensor | -40℃~+140℃



- Temperature Measuring Range: -40℃~+140℃ [±1℃]
- Type: 2-wire NTC termistor
- Cable Length: 1.2m [0.5m optional, model will be TPSNT503F4150FAL500-03 NTC Thermistor]
- Probe Aperture Hole Size: φ12mm [diameter]
- Applicaiton: paired with ATE300M for temperature signal input
- Installation: Strap-tied/Screw-fixed

Model 2: ATC600-M Wireless Temperature Transceiver

Temp. Transceiver | Up to 240 Sensors | GFSK Wireless | 1-way RS485

- Wireless Comms. [Downstream]: LoRa Radio Comms. [433~510MHz,self-defined protocol]
- LoRa Comms. Distance: within 100m [when in indoor environment, penetrate 1 layer of metal cover of switchboard/switchgear]
- Wired Comms. [Upstream]: 1-way RS485 [MODBUS-RTU protocol]
- Support: up to 240 pcs ATE300M Wireless Temperature Sensors based on LoRa
- Power Supply: 100~265Vac/Vdc
- Working Temperature: -20℃～+55℃
- Working Humidity: <=95%

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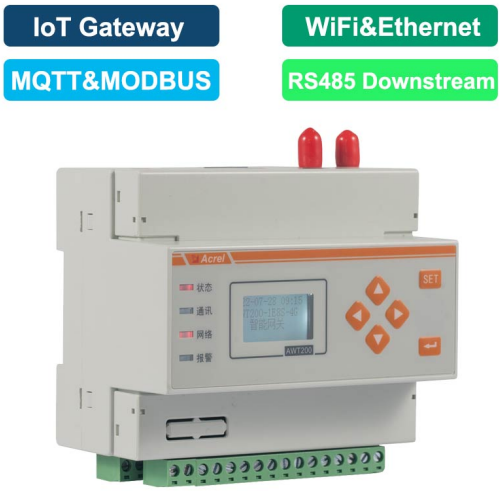
WB:www.acrel-electric.ke

5. Hardware Devices Overview [WiFi&Ethernet IoT Cloud Wireless Temperature Monitoring Solution]



Model 4: AWT200-1E4S-WiFi IoT Smart Gateway

- Upstream Comms.: WiFi&Ethernet Comms. [MQTT& MODBUS-TCP protocol]
- Downstream Comms.: 4-way RS485 [MODBUS-RTU protocol]
- Power Supply: 85~265Vac/Vdc
- Working Temperature: -20℃～+55 ℃
- Working Humidity: <=95%

5. Model Selection&Quoation [WiFi&Ethernet IoT Cloud Wireless Temperature Monitoring Solution]

(1) This Quotation doesn't include freight charge. To gain a complete quotation, please refer the actual quantity that you want to request for the actual order, once we receiving it. We will issue a Official Proforma Invoice with Acrel Stamps on it for later procedure.

System Software

Name	Description	System Price	Remark (Choose Host Service or Buy-out Service after 3-month Free Trial of **Cloud IoT System**)
 **Acrel Cloud IoT Energy Management System**	1.System support all the meters across the country whose data has been sent to cloud server through **4G,WiFi or Ethernet**. 2.Remote meter reading and data collection. 3.Provide **IoT APP** for **mobile phone** side and **IoT WEB** for **PC** side. 4.Generate energy data report of daily, monthly and annually period with year-on-yeay and period-on-period energy analysis. 5.Provide various alarm function to ensure a stable operation of the system and protect your property. 6.Offer 3-month free trial of system with full technical support as for a test phase or pilot project.	$0 (recommended in pilot projtect)	3-month Free Trail (Users don't need to rent a cloud server))
		$xxx/Year (For 30 Points) (Price for Host Service Only, recommended in pilot projtect)	$xx to buy Hosting Service for 1 monitoring points connected to the system 1 year (Users don't need to rent a cloud server)
		$xxxx/Permanent (Limitless Points) (Price for Buy-out Service Only,recommended in late projtect)	1-time charging of $xxxx for Buy-out Service of permanent use (Limitless monitoring points and a cloud server need to be rent by users)

Cloud Server

Name	Description	Server Renting Price (For Reference Only)	Remark
 Cloud Server	1.Cloud Server could be rent on the cloud server provider like Amazon Cloud. 2.Users of **Cloud IoT Energy Management System** only need to rent cloud server when they choose **buy-out** service of our **Cloud IoT System**. And if they are using **hosting service** or **3-month free trial** of our Cloud IoT System, we will use our own cloud server which has been rent on Amazon so that users don't need to rent a cloud server. 3.The quotation of Cloud Server is only a reference price that we have rent on Amazon Cloud.	According to Specs of Rented Cloud Server	Below cloud server specs could support 1000~2000 monitoings points connected to the system (Server：8 core 16G Operation System：windows server 2016)

Smart IoT Gateway

Overview Picture	USAGE&MODULE NAME	DESCRIPTION & SPECIFICATION	QUANTITY	FOB UNIT PRICE (USD)	AMOUNT (USD)
	Smart Gateway **AWT200-1E4S-4GHW**	**Upstream:** 4G, Ethernet [MQTT, MODBUS, etc] **Downstream:** RS485 (MODBUS-RTU) **Support:** up to **80~100** RS485 Devices within 400m using RS485 Wired Communication **Adjustment:** Via RJ45 or RS485 Port. **Power Supply:** 85~265Vac/Vdc (via power adpter) **HS Code:** 8517699000	1 pcs	/	/

Wireless Temperature Transceiver

Overview Picture	USAGE&MODULE NAME	DESCRIPTION & SPECIFICATION	QUANTITY	FOB UNIT PRICE (USD)	AMOUNT (USD)
	Temperature Transceiver **ATC600-M**	**Upstream:** RS485 (MODBUS-RTU) **Downstream:** LoRa (433~510 MHz) **Support:** Up to 240 ATE300M series wireless temperature sensors using LoRa communication. **Power Supply:** 100~265Vac **HS Code:** 9025191010	1 pcs	/	/

Wireless Temperature Sensor

Overview Picture	USAGE&MODULE NAME	DESCRIPTION & SPECIFICATION	QUANTITY	FOB UNIT PRICE (USD)	AMOUNT (USD)
	Temperature Sensor **ATE300M**	**Communication:** LoRa Wireless (433~510MHz) **Monitoring:** Up to 6-channel Temperature **Measuring Range:** -40℃~+140℃ [via NTC Thermistor] **Power Supply:** 85~265Vac/Vdc **HS Code:** 9025191010	5 pcs	/	/
	NTC Thermistor **TPSNT503F415FAL1200**	**Temperature Measuring Range:** -40℃~+140℃ [±1℃] **Type:** 2-wire NTC termistor **Cable Length:** 1.2m **Probe Aperture Hole Size:** φ12mm [diameter] **Installation:** Strap-tied/Screw-fixed **HS Code:** 8533400000	30 pcs	/	/

5. Project Sample #1 - Italy Enel Green Power Project

(1) Project Overview:

· **Customer:** SEL S.P.A [Switchgear Complete set factory]
· **Country:** Italy
· **Project Aim:** Integrate Acrel wireless temperature monitoring devices with switchgear s produced by SEL S.P.A for adding satety feature to their switchgear products.
· **Project Amount:** About 400.000 USD

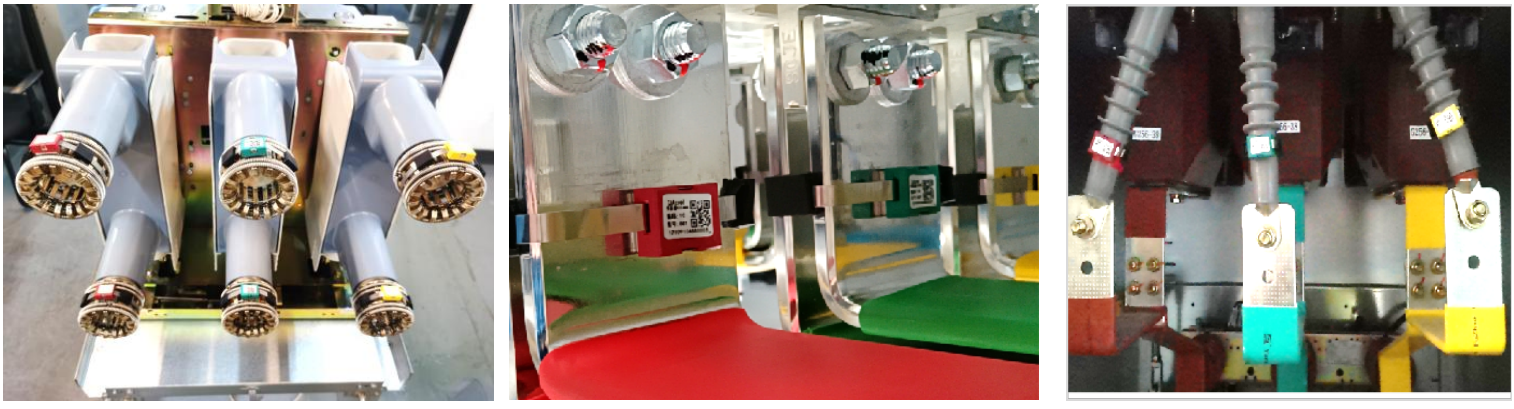
SEL MADE IN ITALY

(1) Customer: SEL S.P.A [Switchgear Complete set factory]

(1) Project Aim: Switchgear Wireless Temperature Monitoring

(2) Applied Product Combination:

- ARTM-P30-400 Wireless Temperature Transceiver and Display Unit
[For collecting, displaying and alarming for all temperature data collected from ATE400]
- ATE400 Wireless Temperature Sensor
[For monitoring the temperature of electrical connection nodes and send the data to ARTM -P30-400 via GFSK wirelesss Comms.]



(2) Site Installation Picture

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5. Project Sample #2 - Vietnam Lotte Mart Project

(1) Project Overview:

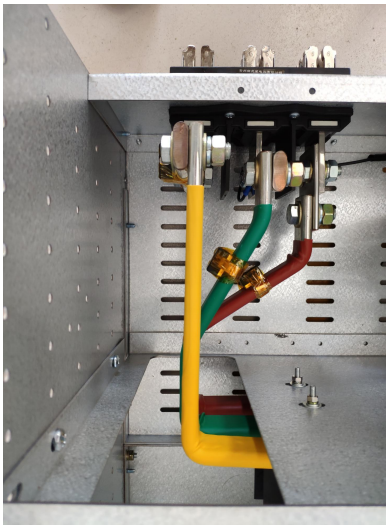
· **Customer:** V.T.E.C.H Electrical Technology Co., Ltd , EPC [Party A]
· **Country:** Vietnam
· **Project Aim:** Client use Acrel complete Cloud Wireless Temperature Monitoring Solution for monitoring and alarming electric cabinet in Lotte Mart to ensure electricity safety.
· **Project Amount:** About 100.000 USD

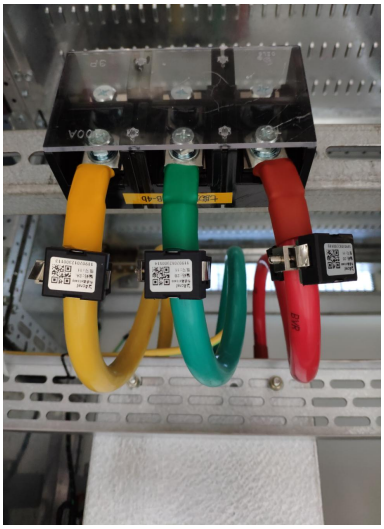
(1) Customer: V.T.E.C.H Electrical Technology Co., Ltd , EPC [Party A]

(1) Project Aim: Online IoT based Wireless Temperature Monitoring&Alarming

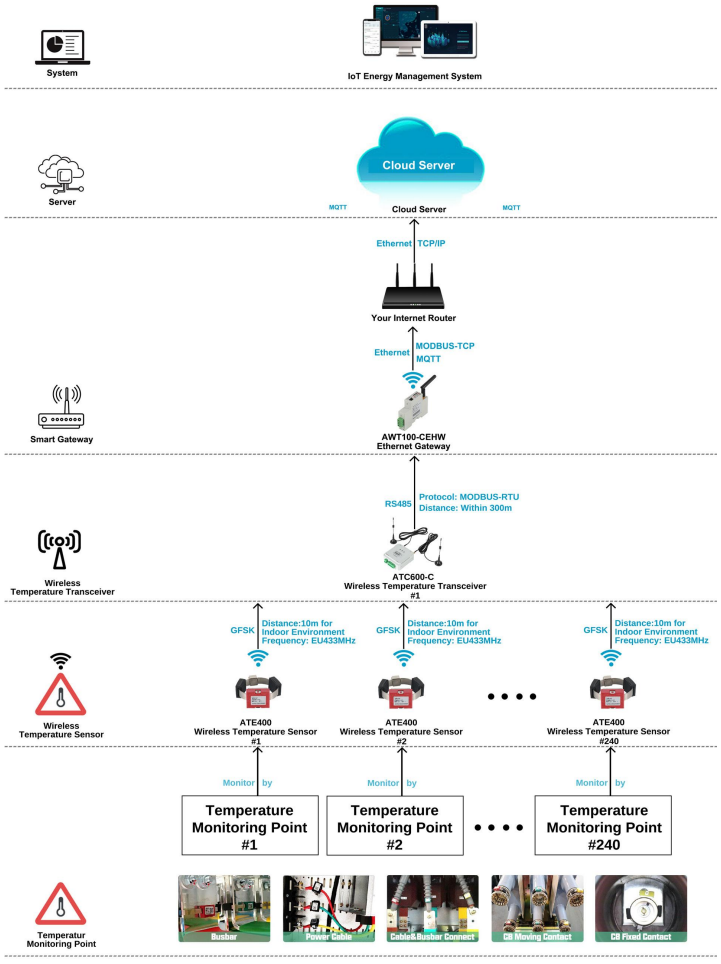
(2) Applied Product Combination:

- AWT100-CEHW Ethernet IoT Gateway
- AWT100-POW Power Supply Module
- ATC600-C Wireless Temperature Transceiver
- ATE400 Wireless Temperature Sensor





(2) Site Picture Gallery



(2) Solution Overall Structure