Acrel[®]

Svitchoean Electrical Nodes Cloud for Wireles Temp. Monitoring

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

Ver. Date: Dec, 15th 2023

Acrel Co., Ltd.

No.253 Yulv Road, Jiading District, Shanghai, China

2023/12/15 Ver.



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0. Application Scenario

 (1) This wiressless temperature monitoring solution was majorly designed for monitoring and alarming the temperature of crucial electrical connection nodes in switchgear like busbar, power cable, cable&busbar connection, CB's fixed contact, CB's moving contact 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 caused 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 temperature 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

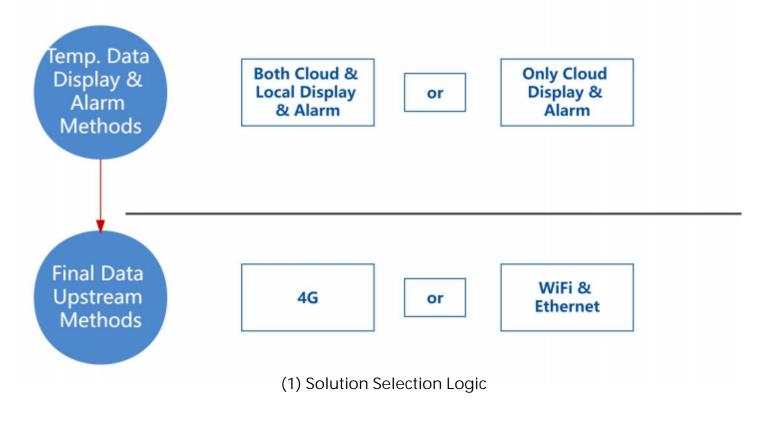


0. Solution Selection Logic

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 4 basic solutions [Cloud display&alarm here means computer or mobile accessed IoT system platform temperature for display and alarm]: (1) Switchgear 4G IoT Cloud&Local Wireless Temperature Monitoring Solution [with both Cloud&Local Temp. Display&Alarm, 4G based, AWT200-1E4S-4GHW+ARTM-Pn+ATE400] (2) Switchgear WiFi&Ethernet IoT Cloud&Local Wireless Temperature Monitoring Solution [with both Cloud&Local Temp. Display&Alarm, WiFi&Ethernet based, AWT200-1E4S-WiFi+ ARTM-Pn+ATE400]

(3) Switchgear 4G IoT Cloud Wireless Temperature Monitoring Solution [with only Cloud Temp. Display&Alarm, 4G based, AWT200-1E4S-4GHW+ATC600+ATE400]
(4) Switchgear IoT Cloud Wireless Temperature Monitoring Solution [with only Cloud Temp.

Display&Alarm, WiFi&Ethernet based, AWT200-1E4S-WiFi+ATC600+ATE400]





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 monitoring points for electrical connection nodes. Thus there will be 30 temperature monitoring points in total.

(3) The system voltage of switchgear will be 10kV. Network with stable 4G Comms.
(4) For all temperature monitoroing points, there will be current going through when it's in normal operation. [more than 5A, since starting current of ATE400 need to be more than 5A]

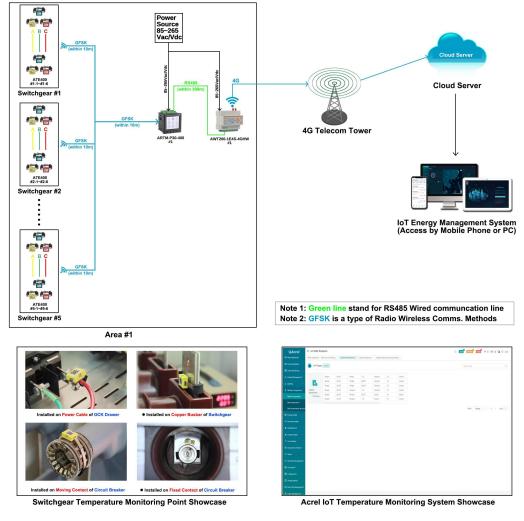
1. Devices Deployment [4G IoT Cloud&Local Wireless Temperature Monitoring Solution]

Area #1 - Switchgear #1 ~ #5:

- 1* AWT200-1E4S-4GHW IoT Gateway [For further uploading the data from ARTM-Pn to Acrel IoT Cloud System via 4G Comms.]

- 1* ARTM-P30-400 Wireless Temperature Transceiver and Display Unit [For collecting, displaying and alarming for all temperature data collected from ATE400]

- 30* ATE400 Wireless Temperature Sensor [For monitoring the temperature of electrical connection nodes and send the data to ARTM-P30-400 via GFSK wirelesss Comms.]



(1) Devices deployment plan Illustraton

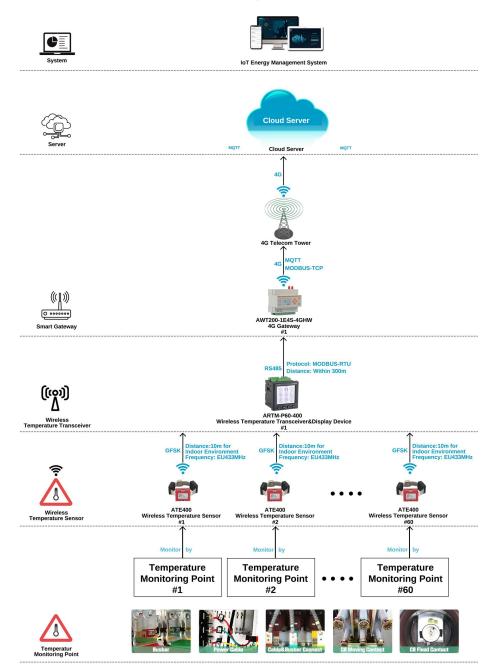


1. Comm. Structure & Logic [4G IoT Cloud&Local Wireless Temperature Monitoring Solution]

(1) Between ATE400 wireless temperature sensor and ARTM-P30-400 wireless temperature transceiver and display unit, we are using a radio wireless communications called GFSK. The communication distance is within 100m [when in open area] and is within 10m [when in indoor environment and penetrate 1 layer of metal cover of switchgear]. The communication protocol is self defined protocol. [1 pcs ARTM-Pn can support up to 60 pcs ATE400 if comms. distance allowed.]

(2) Between AWT200-1E4S-4GHW IoT Gateway and ARTM-Pn, the communication will be RS485 wired Comms. based on MODBUS-RTU protocol. The RS485 Comms. distance between these 2 devices was recommend to be within 300m when we are using 2x1.5mm² RVSP cable for RS485 connection wiring.

(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.





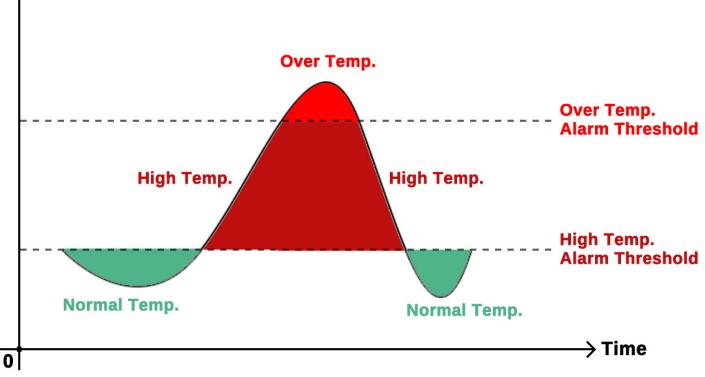
Value of Temperature ℃

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

ARTM-Pn Seires Wireless Tempearture Transceiver and Display Devices support 4 types of major temperature alarm logic. When any of the below alarm logic was set and triggered, it will give a DO output to other indication devices like buzzer or LED light.

(1) High Temperature Alarm: When temperature of certain monitoring node was higher than a certain preset threshold value, this will twigger high temperature alarm. And eventually, this will trigger 1st way DO alarm output of ARTM-Pn. [Normally, High Temperature Alarm was used as a pre-alarm for mentioning related person should 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. And once alarm was triggered, this will also trigger 2nd way DO alarm output of ARTM-Pn. [Normally, Over Temperature Alarm was 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

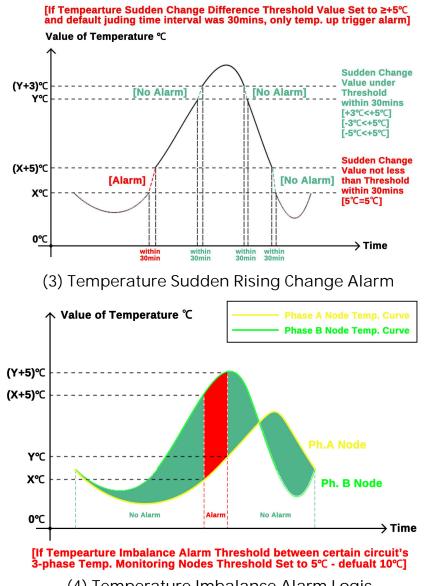


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(3) Temperature Sudden Rising Change Alarm: When during a certain period [within 30mins], if there was large temperature sudden change happened, then it will trigger temperature sudden change alarm. [like +10 temperature rising during 5 mins for example, also, this temperature sudden change alarm threshold value could be set by customer between 0~125

] Eventually, this will trigger 2nd way DO alarm output of ARTM-Pn. [Noted: This temperature sudden change alarm will only last for 5 mins at most once triggered.] (4) Temperature imbalance alarm between 3* temperature monitoring nodes of certain circuit 3-phase: When the temperature difference between 3 monitoring nodes of cetain circuit 3-phase [like between phase A&B&C temperature monitoring nodes of circuit #1] was larger than a certain preset threshold value [take 10 temperature difference between any 2 of phase A&B&C temperature monitoring nodes of circuit #1 for example] This will trigger temperature imbalance alarm and eventually trigger 2nd way DO alarm output of ARTM-Pn.



(4) Temperature Imbalance Alarm Logic



1. Cloud IoT Platform Temperature Alarm Function&Logic [4G IoT Cloud&Local Wireless Temp. 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.

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(1) Set the over/high temperature alarm rule

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(2) Receive and check alarm information



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

Model 1: ATE400 Wireless Temperature Sensor

- Temperature Measuring Range: -50 ~+125

- Measuring Accuracy: ±1

- Wireless Comms: GFSK Radio Comms. [self-defined protocol]

- GFSK Comms. Distance: 100m [open area] & 10m [indoor environment, penetrate 1 layer of metal cover of cover]

- Insulation Voltage: suitable for 35kV and below
- Max Working Current: up to 5000A
- Power Supply: CT Sensing Power [starting current >=5A]
- Lifespan: >= 10 years

Model 2: ARTM-Pxx-400 Wireless Temperature Transceiver and Display Unit

- Wireless Comms.: GFSK Radio Comms.
- GFSK Comms. Distance: 10m [indoor environment, penetrate 1 layer of metal cover of cover]
- Wired Comms.: 1-way RS485 [MODBUS-RTU protocol]
- Support: up to 60 pcs ATE series Wireless
- Temperature Sensors based on GFSK
- Alarm Function: High temperature Alarm, Temperature sudden change alarm and etc.
- I/O Function: 2-way DO output, 4-way DI input
- Power Supply: 85~265Vac or 100~300Vdc
- Working Temperature: -20 ~+55
- Working Humidity: <=95%

Model 3: AWT200-1E4S-4GHW IoT Smart Gateway

- Upstream Comms.: 4G&Ethernet Comms. [MQTT& MODBUS-TCP protocol]

- Downstream Comms.: RS485 [MODBUS-RTU protocol]
- Power Supply: 85~265Vac/Vdc
- Working Temperature: -20 ~+55
- Working Humidity: <=95%





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 a month Free Trial of Cloud IoT System		
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	r	4G Smart Gateway					
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	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		1	I	
	Wir	less Temperature Transceiver a	und Display Unit				
Overview Picture	USAGE&MODULE NAME	DESCRIPTION & SPECIFICATION	QUANTITY	FOB U	NIT PRICE (USD)	AMOUNT (USD)	
	Temperature Transceiver ARTM-Pn	Comms.: RS485 (MODBUS-RTU); GFSK [Wireless Comms. with Sensor] Support: Up to 60 ATE series Transceiver. Auxiliary Power Suppoly: 85~265Vac L-N Alarm Function: High temperature Alarm, Temperature sudden change alarm and etc HS Code: 9025191010	1 pcs		1	I	
		Wireless Temperature Se	nsor				
Overview Picture	USAGE&MODULE NAME	DESCRIPTION & SPECIFICATION	QUANTITY	FOB U	NIT PRICE (USD)	AMOUNT (USD)	
	Wireless Temperature Sens	Communication: GSFK (EU433 MHz) Measuring Range: -50℃~+125℃ Power Supply: CT sensing power supply (startin	ng 30 pcs				



2. Scenario Preset [WiFi&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 monitoring points for electrical connection nodes. Thus there will be 30 temperature monitoring points in total.

(3) The system voltage of switchgear will be 10kV. Network with stable WiFi or Ethernet
(4) For all temperature monitoroing points, there will be current going through when it's in normal operation. [more than 5A, since starting current of ATE400 need to be more than 5A]

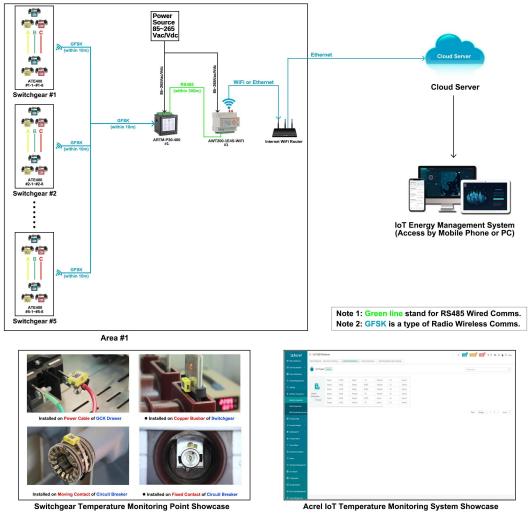
2. Devices Deployment [WiFi&Ethernet IoT Cloud&Local Wireless Temperature Monitoring Solution]

Area #1 - Switchgear #1 ~ #5:

- 1* AWT200-1E4S-WiFi IoT Gateway [For further uploading the data from ARTM-Pn to Acrel IoT Cloud System via WiFi or Ethernet Comms.]

- 1* ARTM-P30-400 Wireless Temperature Transceiver and Display Unit [For collecting, displaying and alarming for all temperature data collected from ATE400]

- 30* ATE400 Wireless Temperature Sensor [For monitoring the temperature of electrical connection nodes and send the data to ARTM-P30-400 via GFSK wirelesss Comms.]



(1) Devices deployment plan Illustraton

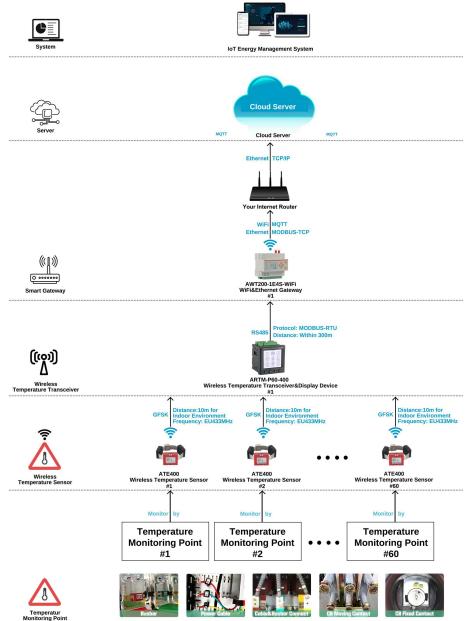


2. Comm. Structure&Logic [WiFi&Ethernet IoT Cloud&Local Wireless Temperature Monitoring Solution]

(1) Between ATE400 wireless temperature sensor and ARTM-P30-400 wireless temperature transceiver and display unit, we are using a radio wireless communications called GFSK. The communication distance is within 100m [when in open area] and is within 10m [when in indoor environment and penetrate 1 layer of metal cover of switchgear]. The communication protocol is self defined protocol. [1 pcs ARTM-Pn can support up to 60 pcs ATE400 if comms. distance allowed.]

(2) Between AWT200-1E4S-WiFi IoT Gateway and ARTM-Pn, the communication will be RS485 wired Comms. based on MODBUS-RTU protocol. The RS485 Comms. distance between these 2 devices was recommend to be within 300m when we are using 2x1.5mm² RVSP cable for RS485 connection wiring.

(3) Between AWT200-1E4S-WiFi IoT gateway and Acrel IoT system [final data upstream step], we are using either WiFi or Ethernet comms. methods based on either MQTT or MODBUS-TCP protocol.



(1) Communication Structure

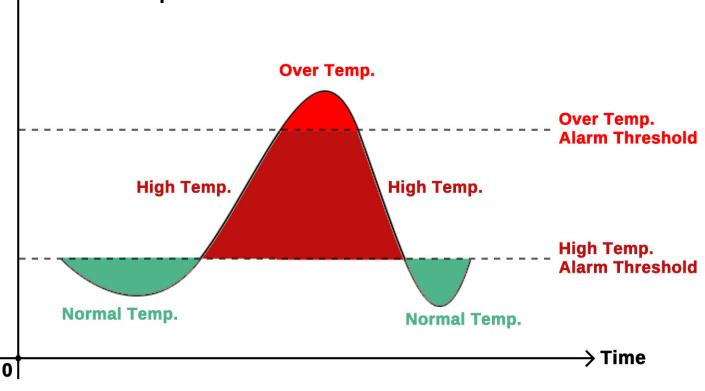


2. Devices Temp. Alarm Function&Logic [WiFi&Ethernet IoT Cloud&Local Wireless Temperature Monitoring Solution]

ARTM-Pn Seires Wireless Tempearture Transceiver and Display Devices support 4 types of major temperature alarm logic. When any of the below alarm logic was set and triggered, it will give a DO output to other indication devices like buzzer or LED light.

(1) High Temperature Alarm: When temperature of certain monitoring node was higher than a certain preset threshold value, this will twigger high temperature alarm. And eventually, this will trigger 1st way DO alarm output of ARTM-Pn. [Normally, High Temperature Alarm was used as a pre-alarm for mentioning related person should 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. And once alarm was triggered, this will also trigger 2nd way DO alarm output of ARTM-Pn. [Normally, Over Temperature Alarm was used for alarming the related person that there are severe temperature rising issue happened and need to be solved immediately]



\uparrow Value of Temperature $^{\circ}$

(1&2) High&Over Temperature Alarm

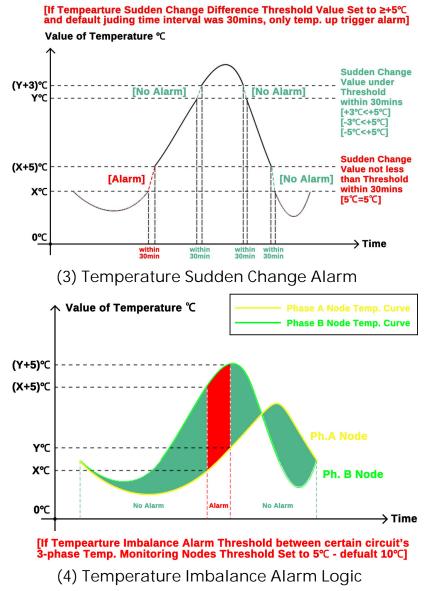


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] Eventually, this will trigger 2nd way DO alarm output of ARTM-Pn. [Noted: This temperature sudden change alarm will only last for 5 mins at most once triggered.] (4) Temperature imbalance alarm between 3* temperature monitoring nodes of certain circuit 3-phase: When the temperature difference between 3 monitoring nodes of cetain circuit 3-phase [like between phase A&B&C temperature monitoring nodes of circuit #1] was larger than a certain preset threshold value [take 10 temperature difference between any 2 of phase A&B&C temperature monitoring nodes of circuit #1 for example] This will trigger temperature imbalance alarm and eventually trigger 2nd way DO alarm output of ARTM-Pn.





2. Cloud IoT Platform Temperature Alarm Function&Logic [WiFi&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.

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(1) Set the over/high temperature alarm rule

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(2) Receive and check alarm information



2. Hardware Device Overview [WiFi&Ethernet Cloud&Local Wireless Temperature Monitoring Solution]

Model 1: ATE400 Wireless Temperature Sensor

- Temperature Measuring Range: -50 ~+125
- Measuring Accuracy: ±1

- Wireless Comms: GFSK Radio Comms. [self-defined protocol]

- GFSK Comms. Distance: 100m [open area] & 10m [indoor environment, penetrate 1 layer of metal cover of cover]

- Insulation Voltage: suitable for 35kV and below
- Max Working Current: up to 5000A
- Power Supply: CT Sensing Power [starting current >=5A]
- Lifespan: >= 10 years

Model 2: ARTM-Pxx-400 Wireless Temperature Transceiver and Display Unit

- Wireless Comms.: GFSK Radio Comms.
- GFSK Comms. Distance: 10m [indoor environment, penetrate 1 layer of metal cover of cover]
- Wired Comms.: 1-way RS485 [MODBUS-RTU protocol]
- Support: up to 60 pcs ATE series Wireless
- Temperature Sensors based on GFSK
- Alarm Function: High temperature Alarm, Temperature sudden change alarm and etc.
- I/O Function: 2-way DO output, 4-way DI input
- Power Supply: 85~265Vac or 100~300Vdc
- Working Temperature: -20 ~+55
- Working Humidity: <=95%

Model 3: AWT200-1E4S-WiFi IoT Smart Gateway

- Upstream Comms.: WiFi&Ethernet Comms. [MQTT& MODBUS-TCP protocol]

- Downstream Comms.: RS485 [MODBUS-RTU protocol]
- Power Supply: 85~265Vac/Vdc
- Working Temperature: -20 ~+55
- Working Humidity: <=95%





2. Overall Model Selection&Quoation [WiFi&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 month Free Trial of Cloud IoT 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.		\$0 (recommended in pilot projtect)		3-month Free Trail (Users don't need to rent a cloud server))		
			for mobile phone side and IoT WEB for PC side. data report of daily, monthly and annually yeay and period-on-period energy analysis.	\$xxx/Year (For 30 Poir (Price for Host Service (recommended in pilot pro	Only,	connected	Service for 1 monitoring points to the system 1 year ed to rent a cloud server)	
Acrel Cloud IoT Energy Manager	Acrel Cloud IoT Energy Management System		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.		\$xxxx/Permanent (Limitless Points) (Price for Buy-out Service Only,recommended in late projtect)		\$xxxx for Buy-out Service of itless monitoring points and a leed to be rent by users)	
			Cloud Server					
Name			Description	Server Renting Price (For Reference Only			Remark	
Cloud Server Cloud Server	Cloud Server Cloud Server Cloud Server Cloud Server Cloud Server 3.TT		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 hooting 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.				inver specs could support ings points connected to the system er: 8 core 16G m: windows server 2016)	
			WiFi&Ethernet Smart Gate	way				
Overview Picture	USAGE&MO	DULE NAME	DESCRIPTION & SPECIFICATION	QUANTITY	FOB U	NIT PRICE (USD)	AMOUNT (USD)	
	Smart C AWT200 -1	Gateway 1E4S-WiFi	Upstream: WiFi, 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	I	
		Wireles	s Temperature Transceiver an	d Display Unit				
Overview Picture	USAGE&MO	DULE NAME	DESCRIPTION & SPECIFICATION	QUANTITY	FOB U	NIT PRICE (USD)	AMOUNT (USD)	
		9 Transceiver M-Pn	Comms.: RS485 (MODBUS-RTU); GFSK [Wireless Comms. with Sensor] Support: Up to 60 ATE series Transceiver. Auxiliary Power Supoply: 85~265Vac L-N Alarm Function: High temperature Alarm, Temperature sudden change alarm and etc HS Code: 9025191010	1 pcs	1		1	
			Wireless Temperature Sen	sor				
Overview Picture	USAGE&MO	DULE NAME	DESCRIPTION & SPECIFICATION	QUANTITY	FOB U	NIT PRICE (USD)	AMOUNT (USD)	
		perature Sensor 2400	Communication: GSFK (EU433 MHz) Measuring Range: -50°C-+125°C Power Supply: CT sensing power supply (starting current>5A) HS Code: 9025191010	30 pcs		1	1	



3. 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 monitoring points for electrical connection nodes. Thus there will be 30 temperature monitoring points in total.

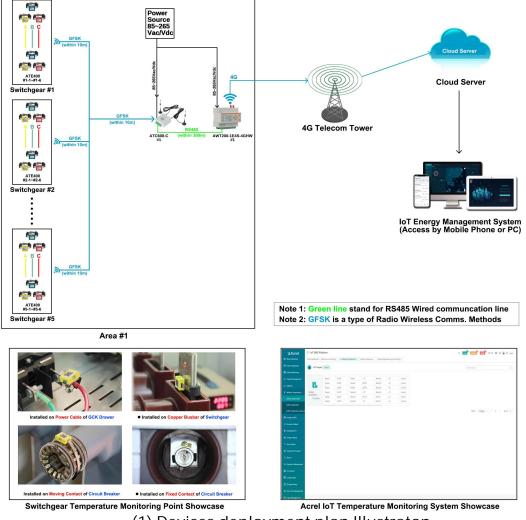
(3) The system voltage of switchgear will be 10kV. Network with stable 4G Comms.
(4) For all temperature monitoroing points, there will be current going through when it's in normal operation. [more than 5A, since starting current of ATE400 need to be more than 5A]

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

Area #1 - Switchgear #1 ~ #5:

- 1* AWT200-1E4S-4GHW IoT Gateway [For further uploading the data from ATC600-C to Acrel IoT Cloud System via 4G Comms.]

- 1* ATC600-C Wireless Temperature Transceiver [For collecting the temperature data from ATE400 via GFSK and further send to AWT200-1E4S-4GHW gateway via RS485]
- 30* ATE400 Wireless Temperature Sensor [For monitoring the temperature of electrical connection nodes and send the data to ATC600-C via GFSK wirelesss Comms.]



(1) Devices deployment plan Illustraton

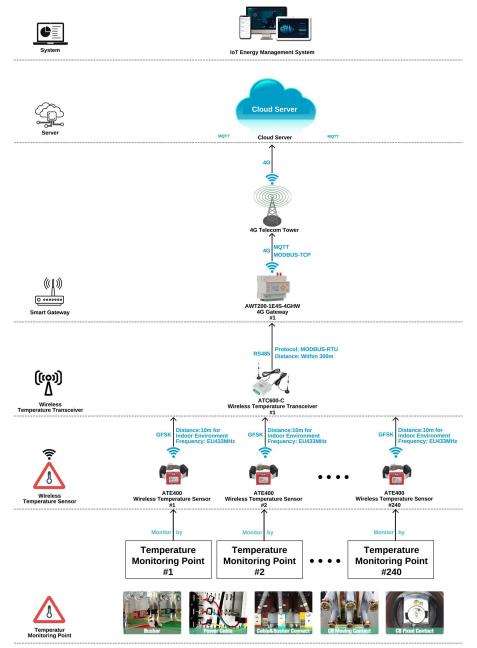


3. Comm. Structure & Logic [4G IoT Cloud Wireless Temperature Monitoring Solution]

(1) Between ATE400 wireless temperature sensor and ATC600-C wireless temperature transceiver, we are using a radio wireless communications called GFSK. The communication distance is within 100m [when in open area] and is within 10m [when in indoor environment and penetrate 1 layer of metal cover of switchgear]. The communication protocol is self defined protocol. [1 pcs ATC600-C can support up to 240 pcs ATE400 if Comms. distance allowed.]

(2) Between AWT200-1E4S-4GHW IoT Gateway and ATC600-C, the communication will be RS485 wired Comms. based on MODBUS-RTU protocol. The RS485 Comms. distance between these 2 devices was recommend to be within 300m when we are using 2x1.5mm² RVSP cable for RS485 connection wiring.

(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



3. 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.

Sacrel 🖬	■ IoT EMS Platform					Q Low 99+	Middle High	💴 🕁 🔐 🔐 👀	5 V
	Main Dashboard Meter Status × Cabinet temperature × • Meter Alarm	Rules ×							
	+ Add 2 Edit E Delete	IoT Project							
	Project name Regional location Energy type Pa	ra		_	Condition1	Threshold1	Condition2	Threshold2	Trigger event
		Add		×					
		* Project name	IoT Project	~					
		* Alarm types	Out-of-limit event	~					
		* Circuit name	Cabinet temperature	~					
Prepaid Meter Managemen				×					
Device Model Management		* Alarm level	High This field is required						
		* Event type	Overtemperature	~					
			This field is required						
		* Ele param	Temp1 This field is required	~					
		* Alarm delay time (Minute)	0						
		Time period setting	• Full time period O Custom time rang	je –					
		* Condition1	>=	~					
		* Threshold1	50						
Energy Topology		Condition2	>=	~					
Meter Alarm Rules		Threshold2	80						
Hierarchical Alarm Settings			O	Cancel					
							Total 0 15/j	iage 🗸 🤇 1	Go to 1

(1) Set the over/high temperature alarm rule

Sa Acrel	트 IoT EMS Platform Q 🛄 🐨 Made 🖤 Made 🐨 🖼 😤 😚 🚥
🖪 Power Monitoring 👋	Main Deshboard A Alarm Information -
℅ Prepaid Management ~	Event type: Undervoltage Overvoltage Overvoltage Overvoltage Overvoltage Overvoltage Overvoltage Overvoltage Residual Current Overleanperature Fault Smoke Electric arc Short circuit Blackout Londemperature Common Offline OTHER Ratio
🗅 Lighting 🛛 👻	Alarm level: High Middle Low Working order status: Untreated Distributed Processed
Wireless Temperature ~	Other options: Project name 🗸 - Choose 🗸 🖹 2022-01-01 ~ 2022-12-18 Detailed description Q Search 2 Read
🕮 Energy Quality 🛛 👋	Ø Export Ø AlDeal Distributed Distributed Processed
≫ Demand Analysis 🍸	
Distributed PV *	Image: State (1) Uternated 5000000000000000000000000000000000000
🕍 Energy Analysis 👋	nonmountal Debailed description: Temp2 is out of limit, setting/blue: <19, current/blue: 180, unit: "C
🕅 Area Analysis 🛛 🗡	2023-06-18 OB12:00 Untreated
😫 Department Analysis 🐃	E Gateway Id: Concut name: Temp & Hum Concut name: Temp & H
Ω Alarms ^	2023-06-18 073800 (Unterted
Alarm Information	A II Gateway id: Device model: A10600 🖻 Meter address: 🕑 Circuit name. Temp & Hum
Alarm Dispatch	Detailed description: Temp2 is out of limit, setting/dolue: >20, current/blue: 21.0, unit: "C
Alarm Handling	2023-08-19 065800 Untreame Device model: ATC600 El Meter address: © Circuit name: Temo & Hum
Operation Management	As satisway id: Deliver model: Al (460) Ed. Meter address U Circuit name: Temp & Hum enamoust Detailed description: Temp2 is out of limit, settingValue: >20, currentValue: 21.0, unit: *C
🕼 User Report 🛛 👋	2023-08-18 062900 Unreated
S Configuration Y	👔 🔯 Gatoway id: 👘 Device model: ATC600 🛛 Meter address: 🔮 Circuit name: Temp & Hum rinnepsize: Detailed description: Temp 2 is out of limit, setting/alue: >20, current/alue: 21.0, unit: "C
İ Storage Battery 🗠	2003-06-18 05:48:00 (Unstante) (B. Details
💥 Basic Data Management	E Gateway Id: Chicke model: ATC600 El Meter address:
System Setting ~	utimiseuz. Detailed description: Temp2 is out of limit, settingValue: \$(conditionEn), currentValue: 21.0, unit: °C
😰 Log In Management 👻	2023-08-18 05:08:00 Untreated
ttps://iot.acrel-eem.com/#/	A 🖾 Gateway ki: 💮 Device model: ATCSC0 🖾 Meter address: 💿 Circuit name: Temp & Hum

(2) Receive and check alarm information



Author: Iris Xia E-mail: Iris@acrel.cn Website: www.acrel.ng

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

Model 1: ATE400 Wireless Temperature Sensor

- Temperature Measuring Range: -50 ~+125
- Measuring Accuracy: ±1

- Wireless Comms: GFSK Radio Comms. [self-defined protocol]

- GFSK Comms. Distance: 100m [open area] & 10m [indoor environment, penetrate 1 layer of metal cover of cover]

- Insulation Voltage: suitable for 35kV and below
- Max Working Current: up to 5000A
- Power Supply: CT Sensing Power [starting current >=5A]
- Lifespan: >= 10 years

Model 2: ATC600-C Wireless Temperature Transceiver

- Wireless Comms.: GFSK Radio Comms. [self-defined protocol]

- GFSK Comms. Distance: 100m [open area] & 10m [indoor environment, penetrate 1 layer of metal cover of cover]

- Wired Comms.: 1-way RS485 [MODBUS-RTU protocol]
- Support: up to 240 pcs ATE series Wireless
- Temperature Sensors based on GFSK
- I/O Function: 2-way DO output
- Power Supply: 100~265Vac/Vdc
- Working Temperature: -20 ~ +55
- Working Humidity: <=95%

Model 3: AWT200-1E4S-4GHW IoT Smart Gateway

- Upstream Comms.: 4G&Ethernet Comms. [MQTT& MODBUS-TCP protocol]

- Downstream Comms.: RS485 [MODBUS-RTU protocol]
- Power Supply: 85~265Vac/Vdc
- Working Temperature: -20 ~+55
- Working Humidity: <=95%





3. Overall 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 aft month Free Trial of Cloud IoT System)		
	been sent to clou	t all the meters across the country whose data has d server through 4G,WiFi or Ethernet .	\$0 (recommended in pilot projtect)		3-month Free Trail (Users don't need to rent a cloud server))		
	3.Provide IoT AF 4.Generate energy	reading and data collection. PP for mobile phone side and IoT WEB for PC side. py data report of daily, monthly and annually on-yeay and period-on-period energy analysis.	\$xxx/Year (For 30 Points) (Price for Host Service Only, recommended in pilot projtect)		 (Users don't need to tent a cloud server)) \$xx to buy Hosting Service for 1 monitoring point connected to the system 1 year (Users don't need to rent a cloud server) 1-time charging of \$xxxx for Buy-out Service of permanent use (Limitless monitoring points and cloud server need to be rent by users) 		
Acrel Cloud IoT Energy Manager	nent System of the system and 6.Offer 3-month	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.		Points) ice projtect)			
		Cloud Server					
Name		Description	Server Renting Price (For Reference Only			Remark	
Cloud Server Cloud Server	Cloud. 2.Users of Cloud cloud server whe System. And if th our Cloud IoT Sy rent on Amazon a 3.The quotation C	2.Users of Cloud IoT Energy Management System only need to rent cloud server when they choose buy-out service of our Cloud IoT		ed Cloud	d Below cloud server specs could sup 1000~2000 monitoings points connecte system (Server: 8 core 16G Operation System: windows server 2		
		4G Smart Gateway					
Overview Picture	USAGE&MODULE NAME	DESCRIPTION & SPECIFICATION	QUANTITY	FOB U	NIT 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)	1 pcs		1	1	
		HS Code: 8517699000 Wireless Temperature Trans	ceiver				
Overview Picture	USAGE&MODULE NAME	DESCRIPTION & SPECIFICATION	QUANTITY	FOB U	NIT PRICE (USD)	AMOUNT (USD)	
	Temperature Transceiver ATC600-C	Upstream: RS485 (MODBUS-RTU) Downstream: GFSK (EU433 MHz) Support: Up to 240 ATE series wireless temperature sensors using GFSK communication. Power Supply: 100-265Vac HS Code: 9025191010	1 pcs	ſ		I	
		Wireless Temperature Sen	sor				
Overview Picture	USAGE&MODULE NAME	DESCRIPTION & SPECIFICATION	QUANTITY	FOB U	NIT PRICE (USD)	AMOUNT (USD)	
	Wireless Temperature Sensor ATE400	Communication: GSFK (EU433 MHz) Measuring Range: -50°C~+125°C Power Supply: CT sensing power supply (starting current>5A) HS Code: 9025191010	30 pcs		ſ	I	



4. 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.

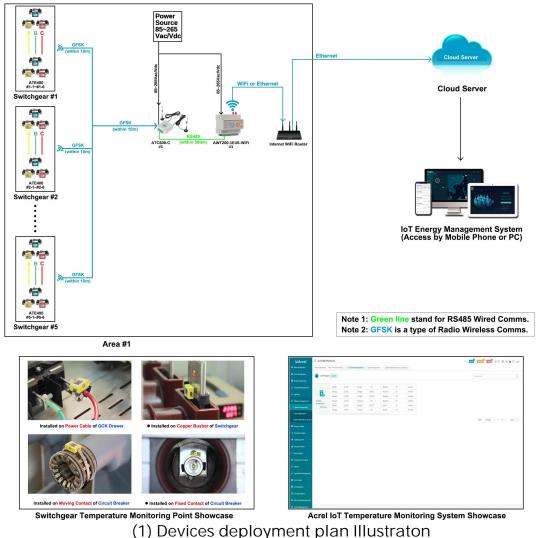
(3) The system voltage of switchgear will be 10kV. Network with stable WiFi or Ethernet
(4) For all temperature monitoroing points, there will be current going through when it's in normal operation. [more than 5A, since starting current of ATE400 need to be more than 5A]

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

Area #1 - Switchgear #1 ~ #5:

- 1* AWT200-1E4S-WiFi IoT Gateway [For further uploading the data from ATC600-C to Acrel IoT Cloud System via WiFi or Ethernet Comms.]

- 1* ATC600-C Wireless Temperature Transceiver [For collecting the temperature data from ATE400 via GFSK and further send to AWT200-1E4S-WiFi gateway via RS485]
- 30* ATE400 Wireless Temperature Sensor [For monitoring the temperature of electrical connection nodes and send the data to ATC600-C via GFSK wirelesss Comms.]



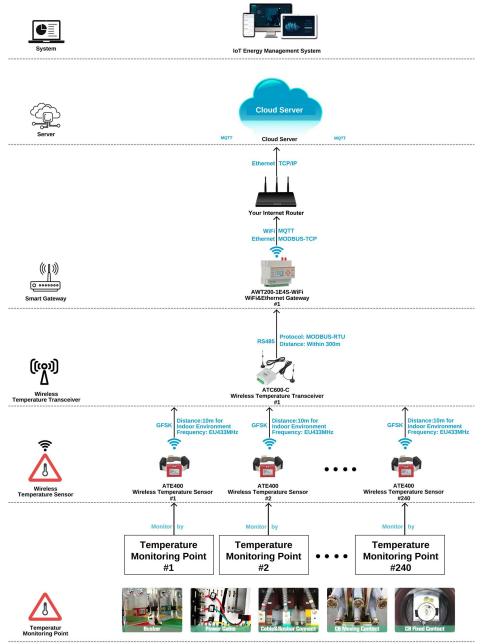


4. Comm. Structure & Logic [WiFi&Ethernet IoT Cloud Wireless Temperature Monitoring Solution]

(1) Between ATE400 wireless temperature sensor and ATC600-C wireless temperature transceiver, we are using a radio wireless communications called GFSK. The communication distance is within 100m [when in open area] and is within 10m [when in indoor environment and penetrate 1 layer of metal cover of switchgear]. The communication protocol is self defined protocol. [1 pcs ATC600-C can support up to 240 pcs ATE400 if Comms. distance allowed.]

(2) Between AWT200-1E4S-WiFi IoT Gateway and ATC600-C, the communication will be RS485 wired Comms. based on MODBUS-RTU protocol. The RS485 Comms. distance between these 2 devices was recommend to be within 300m when we are using 2x1.5mm² RVSP cable for RS485 connection wiring.

(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



4. 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.

Si Acrel	E IoT EMS Platform					Q Low	Middle High	🏧 🕸 🔐 🛤 👀	5 V
2% Basic Data Management	Main Dashboard Meter Status × Cabinet temperature × • Meter Alarm R	ules ×							
User Management	+ Add 🖉 Edit 😰 Delete	IoT Project							
Project Management	Project name Regional location Energy type Para				Condition1	Threshold1	Condition2	Threshold2	Trigger event
Gateway Management		Add		×					
Meter Management		* Project name	IoT Project	~					
Region Management		* Alarm types	Out-of-limit event	~					
Charge Plan		* Circuit name	Cabinet temperature	~					
Prepaid Meter Managemen				~					
Device Model Management		* Alarm level	High This field is required						
PV Settings		* Event type	Overtemperature	~					
		. Flater and	This field is required Temp1	~					
Parameters Management		* Ele param	This field is required	· ·					
StreetLight		* Alarm delay time (Minute)	0						
inverterManagement		Time period setting	• Full time period O Custor	n time range					
Energy Type		* Condition1	>=	~					
Project Topology		* Threshold1	50						
Energy Topology		Condition2	>=	~					
Meter Alarm Rules		Threshold2	80						
Alarm Reminder									
Hierarchical Alarm Settings				Ok Cancel					
Picture Management				_					
Alias Configuration									
Transformer							Total 0 15/	page V < 1	> Go to 1
Product Management									

(1) Set the over/high temperature alarm rule

Sa Acrel	트 IoT EMS Platform Q 🛄 🐨 Made 🖤 Made 🐨 🖼 😤 😚 🚥
🖪 Power Monitoring 👋	Main Deshboard A Alarm Information -
℅ Prepaid Management ~	Event type: Undervoltage Overvoltage Overvoltage Overvoltage Overvoltage Overvoltage Overvoltage Overvoltage Residual Current Overleanperature Fault Smoke Electric arc Short circuit Blackout Londemperature Common Offline OTHER Ratio
🗅 Lighting 🛛 👻	Alarm level: High Middle Low Working order status: Untreated Distributed Processed
Wireless Temperature ~	Other options: Project name 🗸 - Choose 🗸 🖹 2022-01-01 ~ 2022-12-18 Detailed description Q Search 2 Read
🕮 Energy Quality 🛛 👋	Ø Export Ø AlDeal Distributed Distributed Processed
≫ Demand Analysis 🍸	
Distributed PV *	Image: State (1) Uternated 5000000000000000000000000000000000000
🕍 Energy Analysis 👋	nonmountal Debailed description: Temp2 is out of limit, setting/blue: <19, current/blue: 180, unit: "C
🕅 Area Analysis 🛛 🗡	2023-06-18 OB12:00 Untreated
😫 Department Analysis 🐃	E Gateway Id: Concut name: Temp & Hum Concut name: Temp & H
Ω Alarms ^	2023-06-18 073800 (Unterted
Alarm Information	A II Gateway id: Device model: A10600 🖻 Meter address: 🕑 Circuit name. Temp & Hum
Alarm Dispatch	Detailed description: Temp2 is out of limit, setting/dolue: >20, current/blue: 21.0, unit: "C
Alarm Handling	2023-08-19 065800 Untreame Device model: ATC600 El Meter address: © Circuit name: Temo & Hum
Operation Management	As satisway id: Deliver model: Al (460) Ed. Meter address U Circuit name: Temp & Hum enamoust Detailed description: Temp2 is out of limit, settingValue: >20, currentValue: 21.0, unit: *C
🕼 User Report 🛛 👋	2023-08-18 062900 Unreated
S Configuration Y	👔 🔯 Gatoway id: 👘 Device model: ATC600 🛛 Meter address: 🔮 Circuit name: Temp & Hum rinnepsize: Detailed description: Temp 2 is out of limit, setting/alue: >20, current/alue: 21.0, unit: "C
İ Storage Battery 🗠	2003-06-18 05:48:00 (Unstante) (B. Details
💥 Basic Data Management	E Gateway Id: Chicke model: ATC600 El Meter address:
System Setting ~	utimiseuz. Detailed description: Temp2 is out of limit, settingValue: \$(conditionEn), currentValue: 21.0, unit: °C
😰 Log In Management 👻	2023-08-18 05:08:00 Untreated
ttps://iot.acrel-eem.com/#/	A 🖾 Gateway ki: 💮 Device model: ATCSC0 🖾 Meter address: 💿 Circuit name: Temp & Hum

(2) Receive and check alarm information



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

Model 1: ATE400 Wireless Temperature Sensor

- Temperature Measuring Range: -50 ~+125
- Measuring Accuracy: ±1

- Wireless Comms: GFSK Radio Comms. [self-defined protocol]

- GFSK Comms. Distance: 100m [open area] & 10m [indoor environment, penetrate 1 layer of metal cover of cover]

- Insulation Voltage: suitable for 35kV and below
- Max Working Current: up to 5000A
- Power Supply: CT Sensing Power [starting current >=5A]
- Lifespan: >= 10 years

Model 2: ATC600-C Wireless Temperature Transceiver

- Wireless Comms.: GFSK Radio Comms. [self-defined protocol]

- GFSK Comms. Distance: 100m [open area] & 10m [indoor environment, penetrate 1 layer of metal cover of cover]

- Wired Comms.: 1-way RS485 [MODBUS-RTU protocol]
- Support: up to 240 pcs ATE series Wireless

Temperature Sensors based on GFSK

- I/O Function: 2-way DO output
- Power Supply: 100~265Vac/Vdc
- Working Temperature: -20 ~ +55
- Working Humidity: <=95%

Model 3: AWT200-1E4S-WiFi IoT Smart Gateway

- Upstream Comms.: WiFi&Ethernet Comms. [MQTT& MODBUS-TCP protocol]

- Downstream Comms.: RS485 [MODBUS-RTU protocol]
- Power Supply: 85~265Vac/Vdc
- Working Temperature: -20 ~+55
- Working Humidity: <=95%





4. Overall 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.

			0 / 0 <i>ľ</i>					
			System Software					
Name			Description	System Price		Remark (Choose Host Service or Buy-out Service after 3 month Free Trial of Cloud IoT System)		
	be	System support all the meters across the country whose data has een sent to cloud server through 4G,WiFi or Ethernet .		\$0 (recommended in pilot projtect)		3-month Free Trail (Users don't need to rent a cloud server))		
	3.	Provide IoT APP	ding and data collection. for mobile phone side and IoT WEB for PC side. lata report of daily, monthly and annually	\$xxx/Year (For 30 Poin (Price for Host Service 0	Only,	connected	Service for 1 monitoring points to the system 1 year ed to rent a cloud server)	
Acrel Cloud IoT Energy Manager	Acrel Cloud IoT Energy Management System		yeay and period-on-period energy analysis. arm function to ensure a stable operation rotect your property. trial of system with full technical support or pilot project.	recommended in pilot projtect) \$xxxx/Permanent (Limitless Points) (Price for Buy-out Service Only, recommended in late projtect)		1-time charging of permanent use (Lin	\$xxxx for Buy-out Service of itless monitoring points and a need to be rent by users)	
			Cloud Server					
Name			Description	Server Renting Price (For Reference Only			Remark	
Cloud Server Cloud Server	C C C S O O T F T S S	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		1000~2000 monito (Serv	erver specs could support bings points connected to the system er: 8 core 16G m: windows server 2016)	
			WiFi Smart Gateway					
Overview Picture	USAGE&MODU	ULE NAME	DESCRIPTION & SPECIFICATION	QUANTITY	FOB U	NIT PRICE (USD)	AMOUNT (USD)	
	Smart Ga AWT200-1E		Upstream: WiFi, 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		1	1	
			Wireless Temperature Trans	ceiver	1			
Overview Picture	USAGE&MODU	ULE NAME	DESCRIPTION & SPECIFICATION	QUANTITY	FOB U	NIT PRICE (USD)	AMOUNT (USD)	
	Temperature T ATC60		Upstream: RS485 (MODBUS-RTU) Downstream: GFSK (EU433 MHz) Support: Up 0 240 ATE series wireless temperature sensors using GFSK communication. Power Supply: 100-265Vac HS Code: 9025191010	1 pcs	1		1	
			Wireless Temperature Sen	sor				
Overview Picture	USAGE&MODU	ULE NAME	DESCRIPTION & SPECIFICATION	QUANTITY	FOB U	NIT PRICE (USD)	AMOUNT (USD)	
	Wireless Temper ATE4		Communication: GSFK (EU433 MHz) Measuring Range: -50°C~+125°C Power Supply: CT sensing power supply (starting current>5A) HS Code: 9025191010	30 pcs		I	1	



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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



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

Wireless Temperature Sensor

Wireless Temperature Transceiver and Display Unit

(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



Cloud Wireless Temperature Monitoring Solution [Local&Cloud, IoT]

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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]

(2) Applied Product Combination:

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

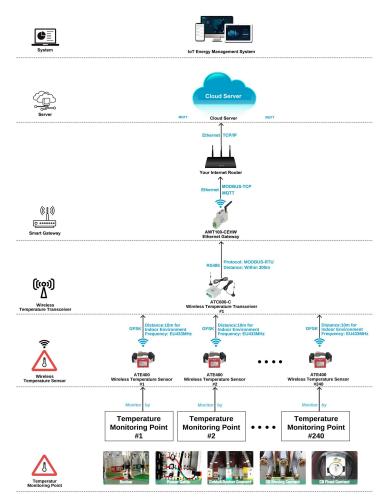


Wireless Temperature Sensor



Wireless Temperature Transceiver

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



(2) Site Picture Gallery

(2) Solution Overall Structure