

# PMAC211 Multi-channel power meter

Installation & Operation Manual V1.0



**Pilot**<sup>®</sup> 珠海派诺科技股份有限公司  
ZHUHAI PILOT TECHNOLOGY CO., LTD.



## **Danger and warning!**

- ◆ The device should be installed by qualified people
- ◆ The manufacturer shall not be held responsible for any accident caused by the failure to comply with the instructions in this manual.



## **Risks of electric shocks, burning, or explosion**

- ◆ This device can be installed and maintained only by qualified people.
- ◆ Before operating the device, isolate the voltage input and power supply and short-circuit the secondary windings of all current transformers.
- ◆ Use a reliable voltage measurement device to make sure voltage cut off.
- ◆ Put all mechanical parts, doors, or covers in their original positions before energizing the device.
- ◆ Always supply the device with the correct working voltage during its operation.

Failure to take these preventive measures could cause damage to equipment or injuries to people.

Note :

① What is the meter ID?

You can find the S/N on the meter house. As picture 1-1

The last two numbers is the meter's ID address. (But if the last two numbers are "00" , then use "100" as meter ID address)

For example: if the S/N number is 15023876, then the meter ID is 76

If the S/N number is 15033800, the the meter ID is 100.



picture 1-1

② Communication setting

8 data bit

1 stop bit

No parity

Baud rate: 9600bps (default)

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# 1. Product Information

PMAC211 Multi-channel power meter can be used for monitoring low voltage electronic parameter of multi circuits, energy consumption and alarm for parameter. One PMAC211 can maximum monitor 4 three phase circuit, small size to save space, RS485 port to communication, suitable for low voltage power distribution system and energy efficiency management etc..applications.

Products main function as below:

- ◆ Three phase AC voltage measurement
- ◆ Frequency measurement
- ◆ 3 phase current, 3 phase active power, 3 phase reactive power, 3 phase apparent power, 3 phase power factor, 3 phase active energy, 3 phase reactive energy for each circuit
- ◆ Total active power, total reactive power, total apparent power, total power factor, total active energy, total reactive energy for each circuit
- ◆ Over limit alarm for current, over/under limit alarm for voltage, LED light flash when alarm occurs
- ◆ One RS485 communication, MODBUS-RTU protocol

## 2. Technical Specification

### 2.1 Technical parameter

Parameter	Range	
Power supply	AC 85~265V , DC100~300V , Power loss≤2W	
Rated input voltage	3×220/380V 45Hz~65Hz	
Rated input current	Connection with standard external CT	
Insulating property	Power frequency withstand voltage	2000VAC
	Insulation resistance	≥ 100MΩ
	Impulse withstand voltage	6000V
IP index	IP52(front panel) , IP20 (case)	

### 2.2 Measuring range and accuracy

Item	Range	Accuracy	Resolution
Voltage	AC 0~500V	0.5%	0.1V
Current	AC 0~600A	Solid core: 0.5% Split core: 1.0%	0.1A
Active Power	Each phase: 0~216kW	Solid core: 1.0% Split core: 2.0%	0.1 W
Reactive Power	Each phase: 0~216kVar	Solid core: 2.0% Split core: 3.0%	0.1 Var
Power Factor	0 ~ 1.0	1.0%	0.001
Frequency	45 ~ 65 Hz	0.01Hz	0.01 Hz
Active Energy	0 ~ 99999999.9kWh	Solid core: 1.0% Split core: 2.0%	0.1 kWh
Reactive Energy	0 ~ 99999999.9KVarh	Solid core: 2.0% Split core: 3.0%	0.1 kvarh

## 2.3 Electromagnetic compatibility

Item	Standard	Level
Electrostatic discharge immunity	GB/T17626.2-2006 (IEC61000-4-2 : 2001)	Level 4
RF Electromagnetic field radiated immunity	GB/T17626.3-2006 (IEC61000-4-3 : 2002)	Level 4
Electrical fast transient pulse group immunity	GB/T17626.4-2008 (IEC61000-4-4 : 2006)	Level 4
Surge (impact) immunity	GB/T17626.5-2008 (IEC61000-4-5 : 2005)	Level 4
Radio frequency interference immunity	GB/T17626.6-2008 (IEC61000-4-6 : 2006)	Level 3
Electromagnetic emission limits	GB 9254-2008 (CISPR22 : 2006)	Pass

## 2.4 Working environment

Name	Parameter
Install environment	Indoor
Working temperature	-10℃ ~ +55℃
Limit working temperature	-20℃ ~ +55℃
Storage temperature	-40℃ ~ +70℃
Humidity	5% ~ 95%, non-condensing

### 3. Model Information

#### 3.1 Order Information

<b>PMAC211</b> - □ - □ ① ②		
<b>① Number of the circuit</b>		
<b>1</b>	1 Channel	
<b>4</b>	4 Channel	
<b>② Type of the current transformer</b>		
<b>A</b>	LACT-100C1	100A solid core CT ( 100A/100mA )
<b>B</b>	LACT-100K1	100A split core CT ( 100A/33.3mA )

#### 3.2 Accessory information

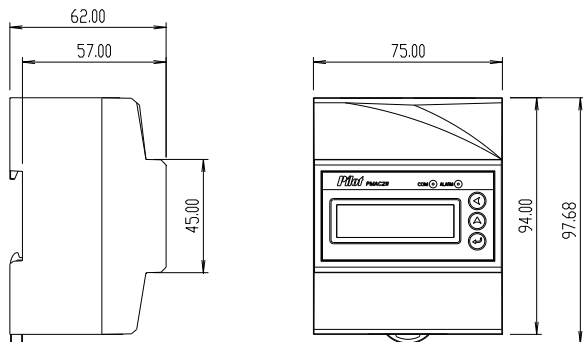
There are 2 kinds of current transformers, please refer to Chapter 4 for their appearance and dimension.



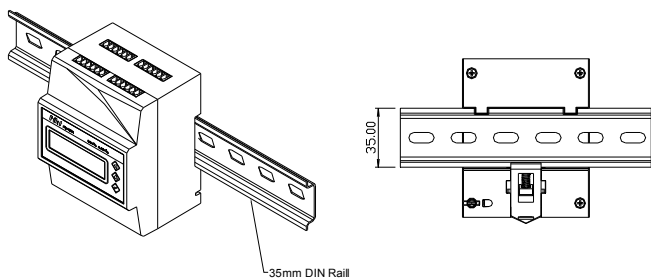
## 4. Product Installation

### 4.1 Dimension & Installation of main model

Unit : mm

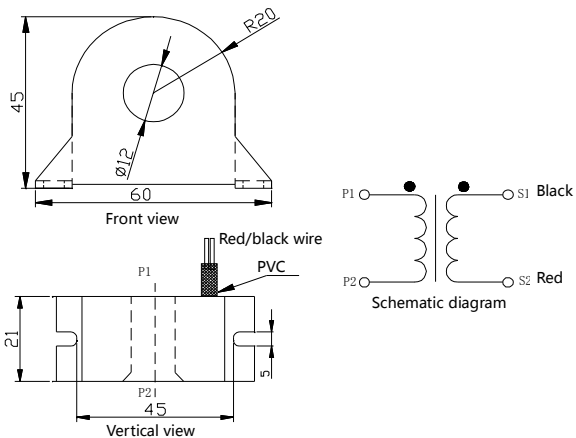


Picture 4.1 PMAC211 Dimension

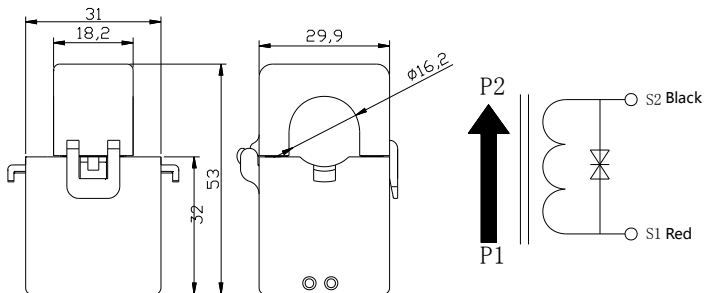


Picture 4.2 PMAC211 Installation

## 4.2 Dimension of Current Transformer



Picture 4.3 LACT-100C1 solid core CT dimension

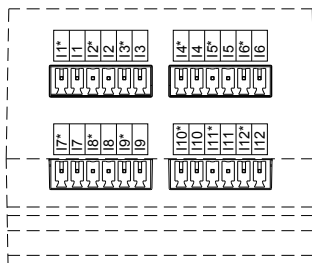


Picture 4.4 LACT-100K1 split core CT dimension

## 4.3 Terminal Definition

Upward View for bottom terminal			
Mark	Definition	Mark	Definition
L/+	Power supply Positive	VA	Phase A voltage
N/-	power supply negative	VB	Phase B voltage
NC	Null	VC	Phase C voltage
485-	RS485-	VN	Neutral Voltage
485+	RS485+		
SHLD	Communic-ation Shield		

**Top view for upper terminal**

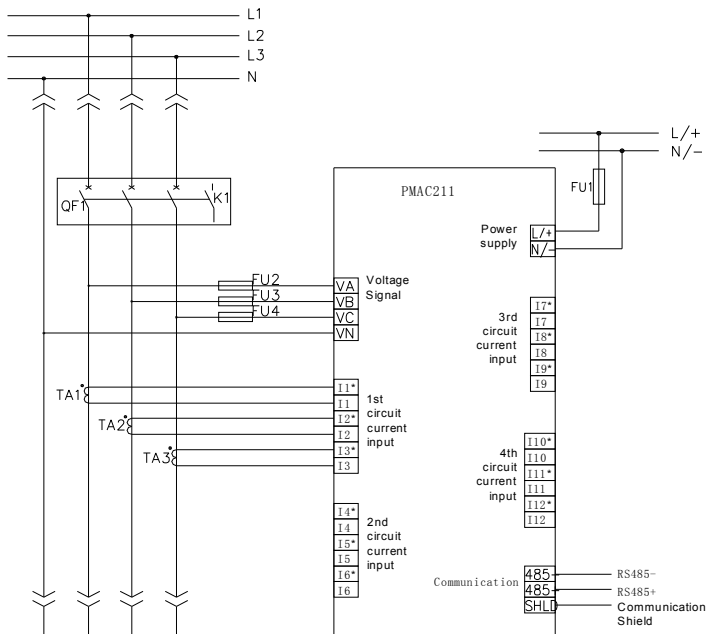


Mark	Definition	Mark	Definition
I1	1 <sup>st</sup> circuit phase A current output	I4	2 <sup>nd</sup> circuit phase A current output
I1*	1 <sup>st</sup> circuit phase A current input	I4*	2 <sup>nd</sup> circuit phase A current input
I2	1 <sup>st</sup> circuit phase B current output	I5	2 <sup>nd</sup> circuit phase B current output
I2*	1 <sup>st</sup> circuit phase B current input	I5*	2 <sup>nd</sup> circuit phase B current input
I3	1 <sup>st</sup> circuit phase C current output	I6	2 <sup>nd</sup> circuit phase C current output
I3*	1 <sup>st</sup> circuit phase C current input	I6*	2 <sup>nd</sup> circuit phase C current input

<b>Mark</b>	<b>Definition</b>	<b>Mark</b>	<b>Definition</b>
17	3 <sup>rd</sup> circuit phase A current output	I10	4 <sup>th</sup> circuit phase A current output
17*	3 <sup>rd</sup> circuit phase A current input	I10*	4 <sup>th</sup> circuit phase A current input
18	3 <sup>rd</sup> circuit phase B current output	I11	4 <sup>th</sup> circuit phase B current output
18*	3 <sup>rd</sup> circuit phase B current input	I11*	4 <sup>th</sup> circuit phase B current input
19	3 <sup>rd</sup> circuit phase C current output	I12	4 <sup>th</sup> circuit phase C current output
19*	3 <sup>rd</sup> circuit phase C current input	I12*	4 <sup>th</sup> circuit phase C current input

## 4.4 Typical wiring

PMAC211 support three phase 4 wires connection mode as below picture :

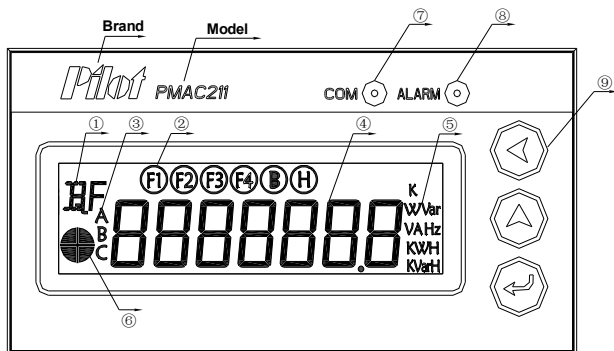


Note:

1. The no mark terminal is invalid
2. The main model can connect split core CT or sold core CT
3. Current input for 2<sup>nd</sup> , 3<sup>rd</sup> , 4<sup>th</sup> circuit is the same as 1<sup>st</sup> circuit current input

## 5. Display and operation

### 5.1 Introduction for display






Introduction for display :

- ① : Prompt for real -time data type
- ② : Prompt for circuit, for example: F1 means 1<sup>st</sup> circuit, F4 means 4<sup>th</sup> circuit
- ③ :3 phase prompt, for example: when display voltage data, display F1 and B prompt, means 1<sup>st</sup> circuit phase B voltage
- ④ : Real-time data display area
- ⑤ : Real-time data unit
- ⑥ : Distinguish alarm threshold value, when display upper hemicycle, means up per alarm, when display bottom hemicycle, means low alarm
- ⑦ : Communication indication light ;
- ⑧ : Alarm indication light ;
- ⑨ : Button ;

## 5.2 Button introduction

In different interface, there has different function for the same button.

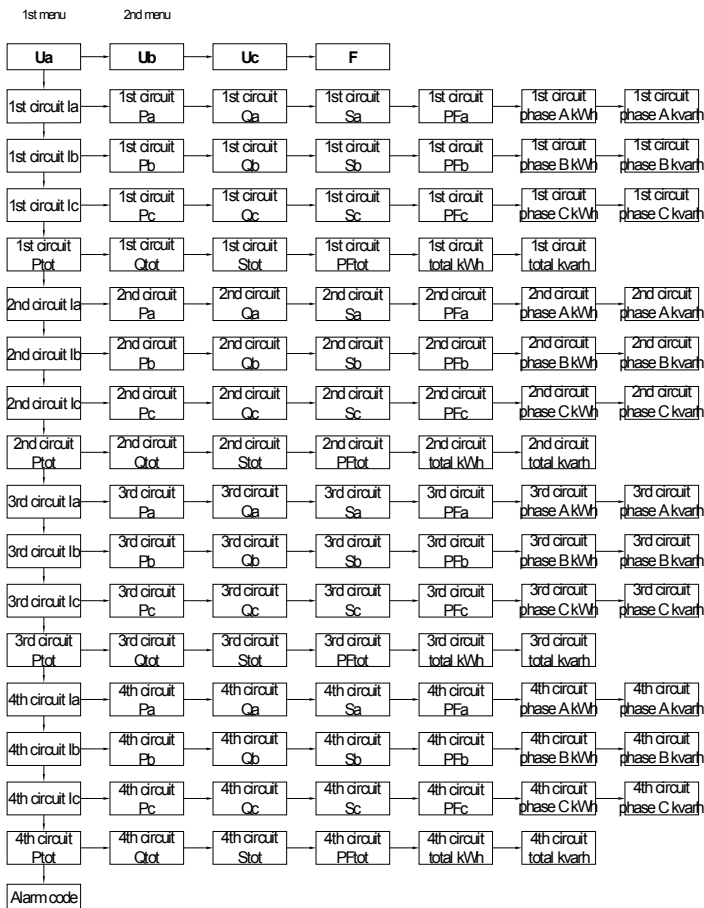
symbol	Definition	Real-time data interface	Configuration interface	
			Inquiry configuration	Modify configuration
	Left button	Turn page in 2nd menu	\	Move data bit
	Up button	Turn page in 1st menu	Turn to real-time data display interface	Plus 1 of the data bit
	Enter button	Enter configuration interface	Enter modify configuration interface	Confirm modification/back to inquiry configuration interface

## 5.3 Real-time data inquiry



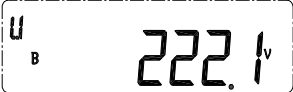




Real-time data follow with 1<sup>st</sup> menu, 2<sup>nd</sup> menu display format, the tree diagram of the menu as below:


1<sup>st</sup> row of real-time data menu tree diagram is 1<sup>st</sup> menu, each line is the 2<sup>nd</sup> menu corresponding of the 1<sup>st</sup> menu.











### Step to inquiry real-time data:



	<p>When power on, display as below:</p>  <p>Phase A voltage</p>
<p>Press  button continuously, you can see the data one after another</p>	 <p>Phase B voltage</p>  <p>Phase C voltage</p>  <p>Frequency</p>
<p>Press  button to enter into next menu</p>	 <p>1st circuit phase A current</p>



Press  button continuously, you can see the data one after another



$P_A$    <sup>W</sup>  
1st circuit phase A active power


$Q_A$    <sup>Var</sup>  
1st circuit phase A reactive power



$S_A$    <sup>VA</sup>  
1st circuit phase A apperant power


$PF_A$     
1st circuit phase A power factor



$E_A$    <sup>kWh</sup>  
1st circuit phase A active energy



$E_A$    <sup>kVarh</sup>  
1st circuit phase A reactive energy



Press  button to enter into next menu



$I_B$    <sup>A</sup>  
1st circuit phase B current



Press  button continuously, you can see the data one after another



$P_B$     
1st circuit phase B active power


$Q_B$     
1st circuit phase B reactive power



$S_B$     
1st circuit phase B apperant power





$PF_B$     
1st circuit phase B power factor

$E_B$     
1st circuit phase B active energy

$E_B$     
1st circuit phase B reactive energy

Press  button to enter into next menu

$I_C$     
1st circuit phase C current

<p>Press  button to enter into next menu</p>	 <p>1st circuit total active power</p>
<p>..... (other circuit data inquiry is the same as 1<sup>st</sup> circuit)</p>	
<p>Press  button to enter into next menu (when alarm occurs, the alarm indication light will flash once per 2s)</p>	 <p>No alarm</p> <p>Different alarm code means different type of alarm</p>

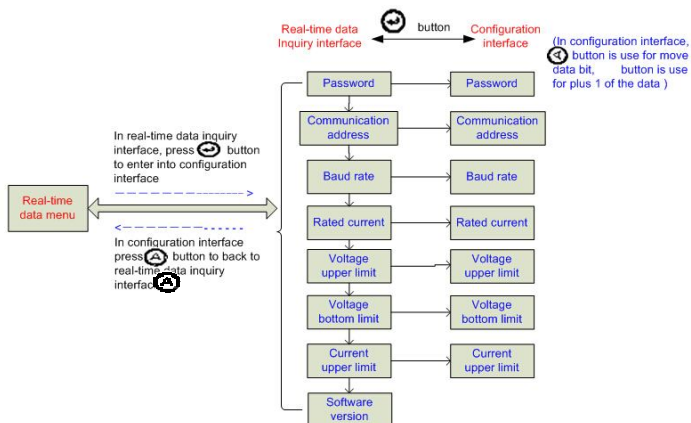
	<div> <p>A <span style="float: right;">10</span></p> <p>Voltage upper limit alarm</p> </div> <div> <p>A <span style="float: right;">20</span></p> <p>Voltage bottom limit alarm</p> </div> <div> <p>A <span style="float: right;">30</span></p> <p>Voltage upper &amp; bottom limit alarm</p> </div> <div> <p>A <span style="float: right;">40</span></p> <p>Current upper limit alarm</p> </div> <div> <p>A <span style="float: right;">50</span></p> <p>Voltage &amp; Current upper limit alarm</p> </div> <div> <p>A <span style="float: right;">60</span></p> <p>Voltage bottom limit &amp; Current upper limit alarm</p> </div> <div> <p>A <span style="float: right;">70</span></p> <p>Voltage upper / bottom limit &amp; Current upper limit alarm</p> </div>
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Other 1<sup>st</sup> menu and corresponding 2<sup>nd</sup> menu operate and display is the same as above description.

When there has no operation in 3 minutes, the display will automatically turn to Phase A voltage interface.

## 5.4 Parameter configuration

Below is the structure for parameter configuration interface , from real-time inquiry to parameter configuration interface:





































Parameter setting range:



Item	Data range	Illustration
Password	1	Initial value is 1
Communication address	1~247	Initial value is 1
Communication baud rate	4800bps or 9600bps	Initial value is 9600bps 0: 4800bps; 1: 9600bps;
Rated current	50~600A	Default 100A
Voltage upper limit	0~280.0V , 0 means alarm close	Alarm action: when the value larger than setting value Alarm return: 5s later after the action condition disappear
Voltage bottom limit	0~220.0V , 0 means alarm close	Alarm action: when the value smaller than setting value Alarm return: 5s later after the action condition disappear
Current upper limit	0~800.0A , 0 means alarm close	Alarm action: when the value larger than setting value Alarm return: 5s later after the action condition disappear



Step for parameter setting:

<ol style="list-style-type: none"> <li>1. In any real-time data inquiry interface, press  button, enter into configuration mode</li> <li>2. Press  button once, the single digit flash for enter password</li> <li>3. Press  button once, to change the single digit to 1 (default password is 1 )</li> </ol>	<p>Input password</p> 
<ol style="list-style-type: none"> <li>1. Press  button until it display A</li> <li>2. Press  button once, then the data bit flash</li> <li>3. Press  button once to modify value</li> <li>4. Press  button once to confirm the new value</li> </ol>	<p>Set communication address</p> 
<ol style="list-style-type: none"> <li>1. Press  button until it display b</li> <li>2. Press  button once , the value flash</li> <li>3. Press  button once to modify baud rate</li> <li>4. Press  button once to confirm the new baud rate</li> </ol>	<p>Set communication baud rate</p> 
<ol style="list-style-type: none"> <li>1. Press  button until it display I</li> <li>2. Press  button once , the value flash</li> </ol>	<p>Set rated current</p>

<ol style="list-style-type: none"> <li>3. Press  button once to modify baud rate</li> <li>4. Press  button once to confirm the new value</li> </ol>	
<ol style="list-style-type: none"> <li>1. Press  until it display U</li> <li>2. Press  button once , the value flash</li> <li>3. Press  button once to modify baud rate</li> <li>4. Press  button once to confirm the new value</li> </ol>	<p>Set voltage upper limit value</p> 
<ol style="list-style-type: none"> <li>1. Press  until it display U</li> <li>2. Press  button once , the value flash</li> <li>3. Press  button once to modify baud rate</li> <li>4. Press  button once to confirm the new value</li> </ol>	<p>Set voltage bottom limit value</p> 
<ol style="list-style-type: none"> <li>1. Press  until it display I</li> <li>2. Press  button once , the value flash</li> <li>3. Press  button once to modify baud rate</li> <li>4. Press  button once to confirm the new value</li> </ol> <p>Note: when display current upper limit alarm, it means 1<sup>st</sup> circuit phase A current upper limit, but after setting, it will sync</p>	<p>Set current upper limit value</p> 

<p>hronized updating all the three phase circuit current upper limit</p>	
<p>1. Press  button to enter software version interface ( read only)</p>	

**Note :**

When there is no operation in 3 minutes, the display will automatically turn to Phase A voltage interface.

## 6. MODBUS Protocol

PMAC211 provide one RS485 communication port, use MODBUS-RTU communication protocol.

8 data bit

1 stop bit

No parity

Please kindly refer to “PMAC211\_MODBUS protocol and register list” for more detail about the register list.

## 7. Failure recovery

Probably problem	Probably reason	Solution
Indication light no light on after input control power supply	Power supply don't connect well	<p>Check if the power supply terminal has input correct working voltage</p> <p>Check if the control power supply is burned</p>
Monitor incorrect value	Incorrect voltage value	<p>Check if VN connect is OK</p> <p>Check if the monitored voltage is mismatch of the device rated parameter</p>
	Incorrect current value	<p>Check if the monitored current is mismatch of the device rated parameter</p>
	Incorrect power value	<p>Check if set correct monitor mode</p> <p>Check if the phase sequene of corresponding voltage and current is correct or not</p> <p>Check if the terminal of current is correct</p>

Upper device can't communication with device	Incorrect communication address	Check if the setting address is correct according to the definition
	Incorrect communication baud rate	Check if the setting baud rate is correct according to the definition
	Communication link haven't connect with terminal resistance	Check if has input 120 $\Omega$ resistance
	Communication link been Interrupted	Check if the communication shield is connect well with earth
	Communication stop	Check if the communication cable is disconnect

## Note:

- PILOT reserves the right to modify this manual without prior notice in view of continued improvement.
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