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Multi-functional Power Meter DPM-C510 Series Operation Manual



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Revision History

Version	Revision	Date
1 st	The first version was published.	2021/11/15
2 nd	Add model DPM-C510E.	2022/6/23

Multi-functional Power Meter

DPM-C510 Series Operation Manual

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Chapter 1 Product Introduction

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1.1 Preface

Thank you for choosing our multifunction power meter, model DPM-C510 and DPM-C510E. This manual provides specification, installation and operation instructions for the DPM-C510 series model power meter, which is an obvious choice for any application in terms of power monitoring and control.

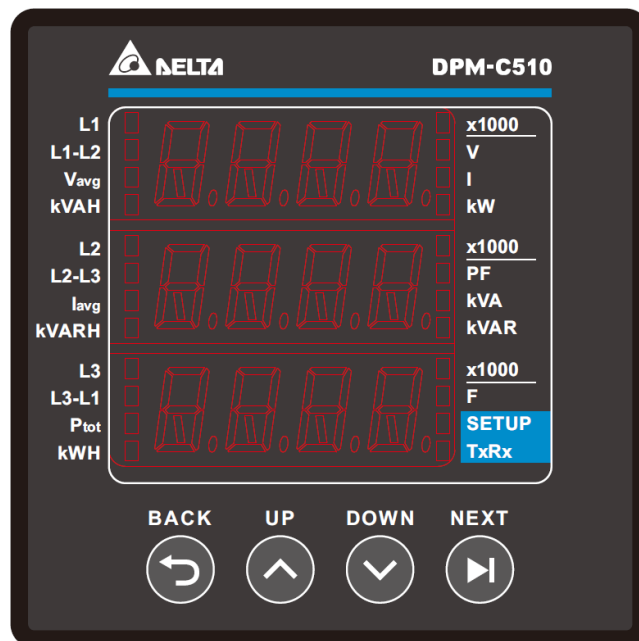
Before using the meter, read this manual carefully to ensure proper use of this meter. Please observe and follow the notes below prior to finish reading this manual.

- The installation environment must be free of water vapor, corrosive and flammable gas.
- Follow the instructions on the diagram in this manual for wiring the device.
- Grounding must be performed correctly and properly according to provisions for related electric work regulations currently effective in the country.
- Do not disassemble the meter or alter its wiring when the power is on.
- When the power is on, do not touch the terminal area to avoid electric shock.

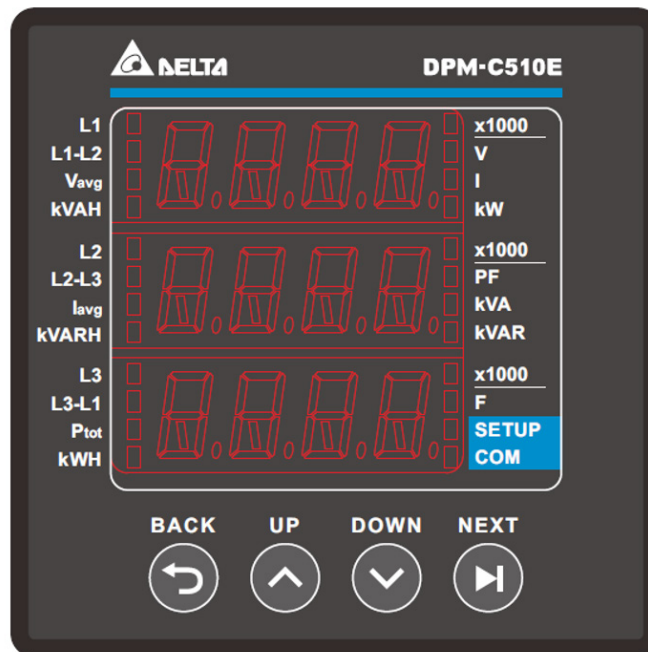
If you still experience issues when using the device, please contact your distributor or our customer service center. As the product is updated and improved, changes to the specifications will be included in the newest version of the manual which you can get by contacting your distributor or downloading it from the Delta Electronics website (<http://www.delta.com.tw/ia/>).

1.2 Overview

The DPM-C510 model is equipped with a large LED display that displays up to three lines of information.



The DPM-C510E model is equipped with a large LED display that displays up to three lines of information.



1.3 Safety Precautions

● Installation Notes



- Install the power meter according to instructions on the manual. Use appropriate personal protective equipment (PPE) and follow safe electrical work practices.
- Only qualified electrical workers should install this equipment. Such work should be performed only after reading the entire set of installation instructions.
- Operate the power meter according to instructions on the manual. Neglecting fundamental installation requirements may lead to personal injury as well as damage to electrical equipment or other property.
- This equipment should be installed in a suitable insulated and fireproof enclosure.

● Operation Notes



- DO NOT work alone.
- Before performing visual inspections, tests, or maintenance on this equipment, disconnect all electric power sources.
- Always use a properly rated voltage sensing device to confirm that power is off.
- Replace all devices, doors and covers before turning on power to this equipment.
- Carefully inspect the work area for tools and objects that may have been left inside the equipment.

● Operation Notes



- Never short the secondary of a Power Transformer (PT).
- Never open circuit a Current Transformer (CT)
- Ensure that the CT secondary winding is fixed securely on the equipment. It may damage the equipment if the secondary winding becomes loose during operation.
- When used with CTs, make sure the CTs are UL2808 listed in America and Canada as well as meeting the accuracy specifications for IEC61869-2 class or accepted by authority having jurisdiction (AHJ) in other areas.

● Wiring Notes



- When the measured current is higher than the rated specification for the device, consider using an external current transformer (CT).
- When the measured voltage is higher than the rated specification for the device, consider using an external potential transformer (PT) (line voltage: 35 to 690V AC L-L or phase voltage: 20 to 400V AC L-N).
- Connect only one cord to one plug on the quick connector.
- For the device is accidentally unplugged, check the connecting cord and restart.

● Maintenance and Inspection Notes



- While cleaning the equipment, be sure to unplug all external power sources first. Use a dry cloth to clean the equipment's exterior. DO NOT open the equipment or touch the wiring inside to prevent personal injury as well as damage to electrical equipment or other property. DO NOT use aerosol sprays, solvents, or abrasives.

Chapter 2 Product Specifications

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2.1 Electrical Characteristics

Measurement Accuracy					
Electrical Quantity	Voltage/ Current	$\pm 0.5 \%$	Electrical Energy	Real power	$\pm 0.5 \%$
	Real power	$\pm 0.5 \%$		Reactive power	$\pm 2 \%$
Power factor		$\pm 1 \%$	Reactive power		$\pm 2 \%$
Frequency Accuracy		$\pm 1 \%$	Apparent power		$\pm 2 \%$

Input		
Wiring Methods	1PH2W, 1 CT	3PH3W, Δ connection, 3 CT, 2 PT
	1PH3W, 2 CT	3PH4W, Y connection, 3 CT, No PT
	3PH3W, Δ connection, 3 CT, No PT	3PH4W, Y connection, 3 CT, 3 PT
	3PH3W, Δ connection, 2 CT, No PT	3PH4W, Y connection, 2 CT, 3 PT
Rated Voltage	Line voltage: 80–690 VAC (L-L) Phase voltage: 50–400 VAC (L-N)	
Rated Current	Nominal: 1 A / 5 A	
Measure Current	20mA to 6A	
Start Current	20mA*	
Frequency	50/60 Hz	
CAT Rating	Measuring Category: CAT III	
Power	Operating range	80-265 VAC
Frequency	Operating frequency	50/60 Hz
Communication	RS-485 port	Modbus-RTU
	(Only applied to C510 model)	Baud rate 9600 / 19200 / 38400 bps
	Ethernet	Modbus TCP / DHCP
	(Only applied to C510E model)	10 / 100 Mbps
Mechanical Characteristics	Dimension (W x H x D)	96 x 96 x 91.8 mm
	IP Degree of Protection	IP52 (front display), IP20 (meter body)
Environment	Ambient operating temperature	-20~+50°C (-4~+122°F)
	Storage temperature	-30~+60°C (-22~+140°F)
	Relative Humidity	5–95% RH
	Altitude	Below 2000 meters

*Accuracy of measurements guaranteed according to IEC62053-22, accurate range starts from 50mA.

Display	
Screen Type	LED
Backlight	Red light

Electromagnetic Compatibility	
Electrostatic Discharge	IEC 61000-4-2
Immunity to Radiated Fields	IEC 61000-4-3
Immunity to Fast Transients	IEC 61000-4-4
Immunity to Impulse Waves	IEC 61000-4-5
Conducted Immunity	IEC 61000-4-6
Immunity to Magnetic Fields	IEC 61000-4-8
Immunity to Voltage Dips	IEC 61000-4-11
Radiated Emissions	FCC Part 15 Class A, EN55011 Class A
Conducted Emissions	FCC Part 15 Class A, EN55011 Class A
Harmonics	IEC 61000-3-2
Flicker	IEC 61000-3-3

Safety	
EU Safety	CE, as per IEC 61010-1 2nd Edition
US Safety	cULus as per CAN/CSA-C22.2 NO. 61010-1, ISA-82.02.01 (IEC61010-1 MOD), UL 61010-1

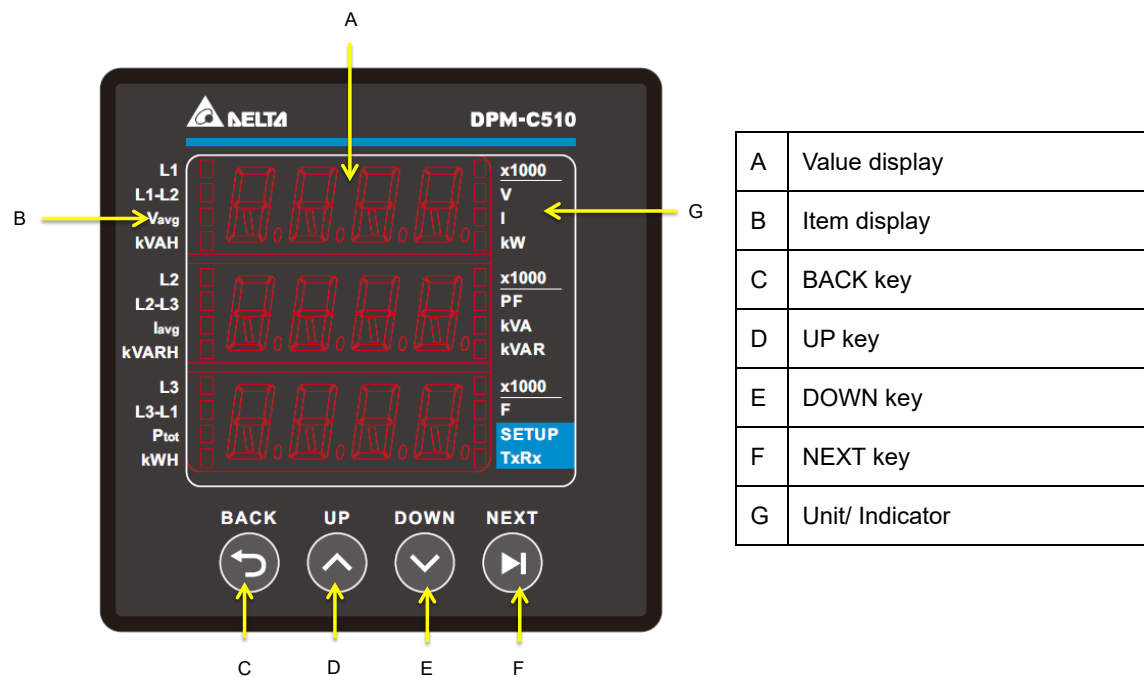
2.2 Communications Specifications

Communications (Only applied to C510 model)	
RS-485	Modbus-RTU
Baud rate	9600 / 19200 / 38400 bps

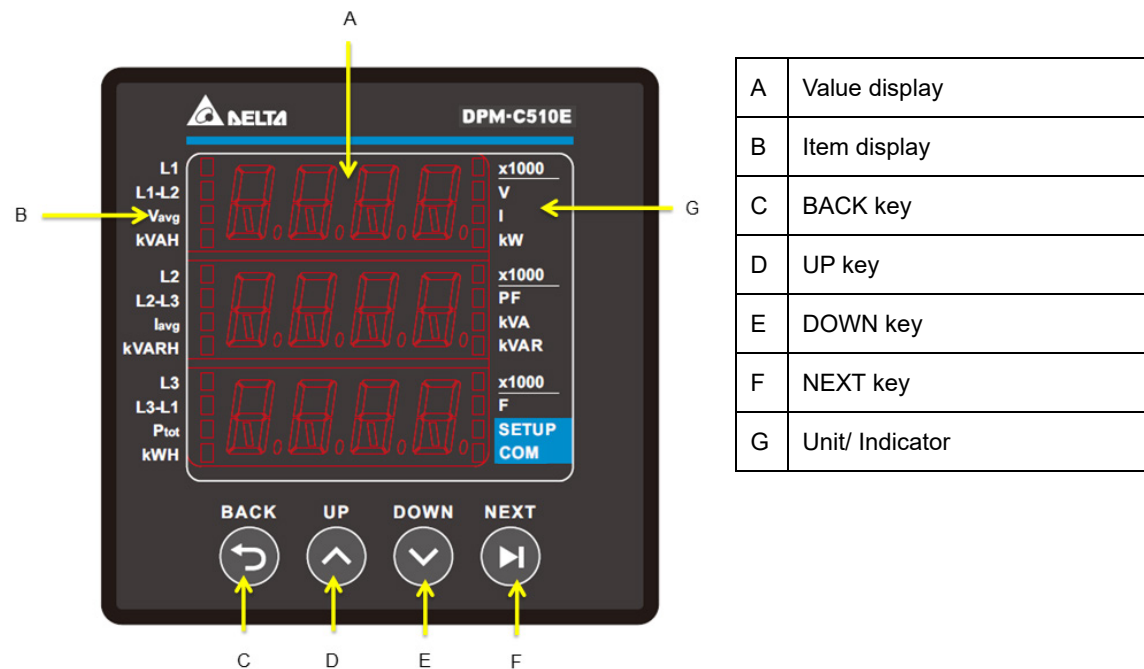
Communications (Only applied to C510E model)	
Ethernet	MODBUS-TCP
Baud rate	10/100 Mbps
Connection count	16(TCP/IP)

2.3 Operating the Display

DPM-C510



DPM-C510E



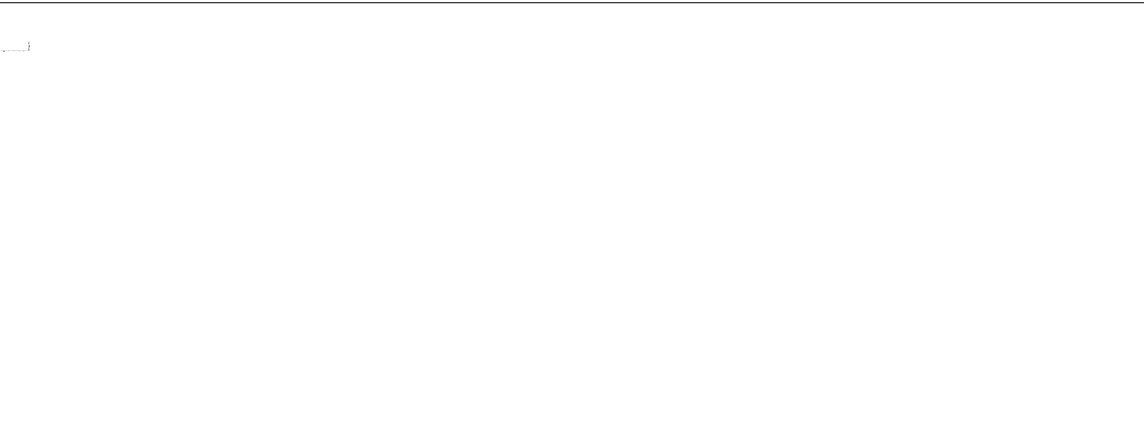
Button	Basic Mode	Setting Mode
BACK Key	Go to Menu or return to the previous screen	Return to the previous screen without saving the current setting
UP Key	To move between items and pages, use the UP key or the DOWN key.	Increment the number
DOWN Key		Decrement the number
NEXT Key	Enter the settings of selected item.	Enter the setting mode and move to the next setting.

*Home page display:

Parameter	Description
Vavg	Average voltage L-L: 3PH3W
	Average voltage L-N: 3PH4W
Iavg	Average current value
Ptot	Total real power

2.3.1 Menu Tree

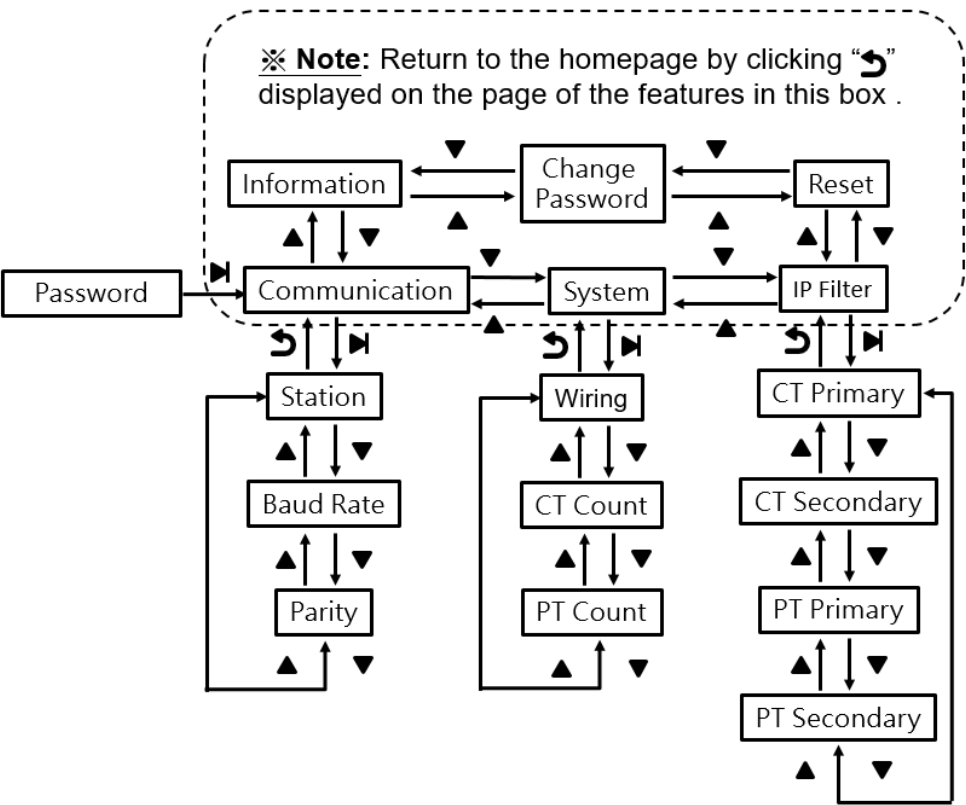
UI Display (DPM-C510 / DPM-C510E)



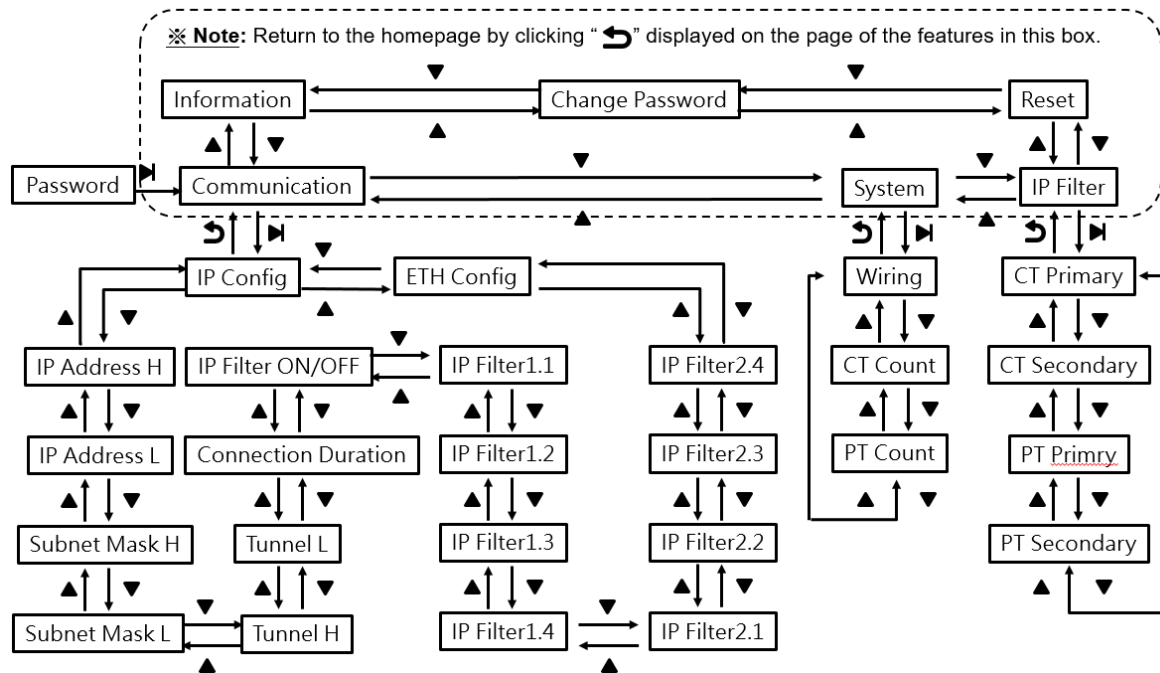
***Note:** Return to the homepage by clicking “↶” displayed on the page.

- Configuration

DPM-C510



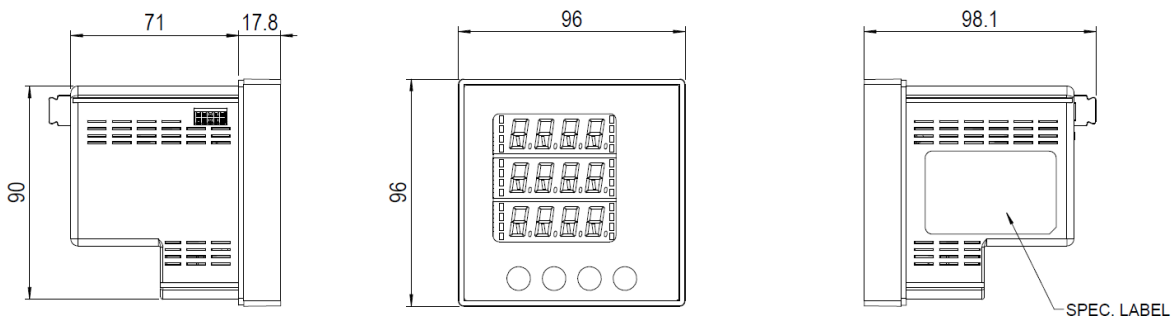
DPM-C510E



2

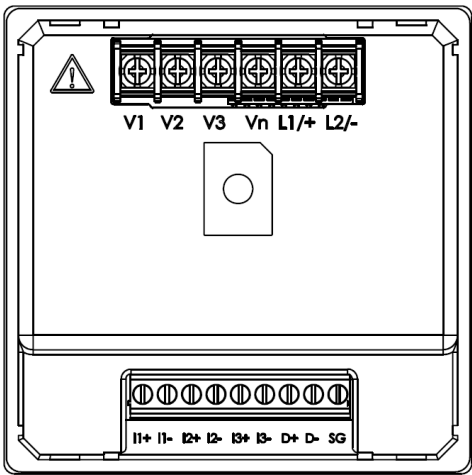
2.4 Dimensions

- DPM-C510/DPM-C510E



Unit: mm (Inch)

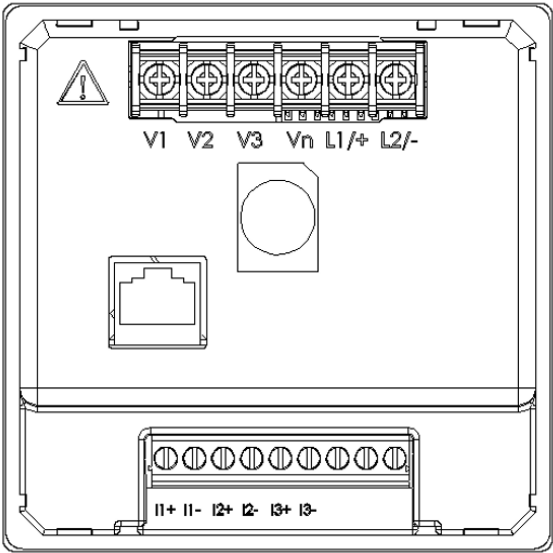
- DPM-C510 Back



Unit: mm (Inch)

Feature	Terminals	Voltage	Current
Measurement voltage	V1	20V L-N ~ 400V L-N 35V L-L ~ 690V L-L	-
	V2		
	V3		
	VN		
Operation voltage	L	80 ~ 265 VAC	400 mA MAX
	N		
Measurement current	I1+	-	1A ~ 5A
	I1-		
	I2+		
	I2-		
	I3+		
	I3-		
RS-485	D+	-7 ~ +12 VDC	-
	D-		
	SG		

● **DPM-C510E**



Feature	Terminals	Voltage	Current
Measurement voltage	V1	20V L-N ~ 400V L-N 35V L-L ~ 690V L-L	-
	V2		
	V3		
	VN		
Operation voltage	L	80 ~ 265 VAC	400 mA MAX
	N		
Measurement current	I1+	-	1A ~ 5A
	I1-		
	I2+		
	I2-		
	I3+		
	I3-		
Ethernet	RJ-45	-	-

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Chapter 3 Installation

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3.1 Installation

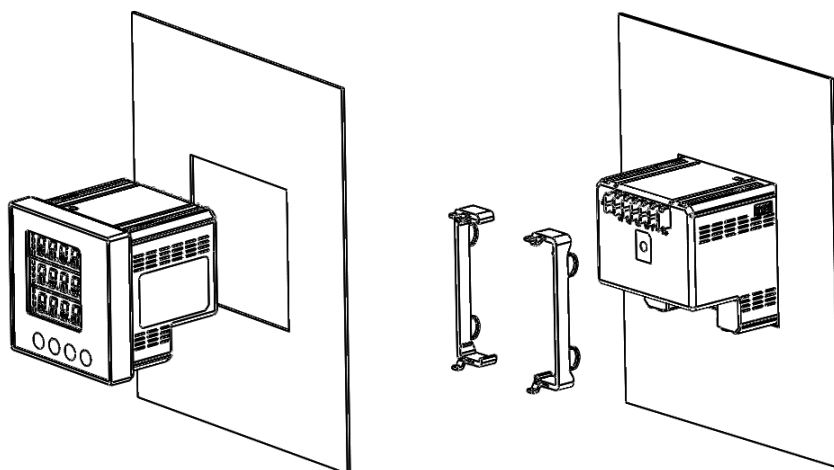
3.1.1 Installation Environment

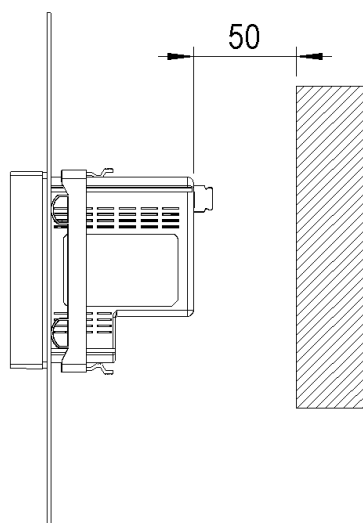
Keep the product in the shipping carton before installation. Store the product properly when it is not to be used for an extended period of time to retain the warranty coverage. Some storage suggestions are listed below.

- Store the power meter in a clean, dry, and controlled environment.
- Store in an ambient temperature range of $-30\text{--}60^{\circ}\text{C}$ ($-22\text{--}140^{\circ}\text{F}$).
- Store in a relative humidity range of 5–95%, non-condensing.
- Do not store the product in a place subjected to corrosive gases or liquids.
- Place the product on a solid and durable surface.
- Do not mount the product near heat-radiating elements; or in a location subjected to corrosive gases, liquids, airborne dust or metallic particles; or where it can be subjected to high levels of electromagnetic radiation.

3.1.2 Installation Notes

- Follow the instruction when installing the product to prevent equipment breakdown.
- To increase the cooling efficiency, install the product with sufficient space between adjacent objects and baffles and walls to prevent poor heat dissipation.



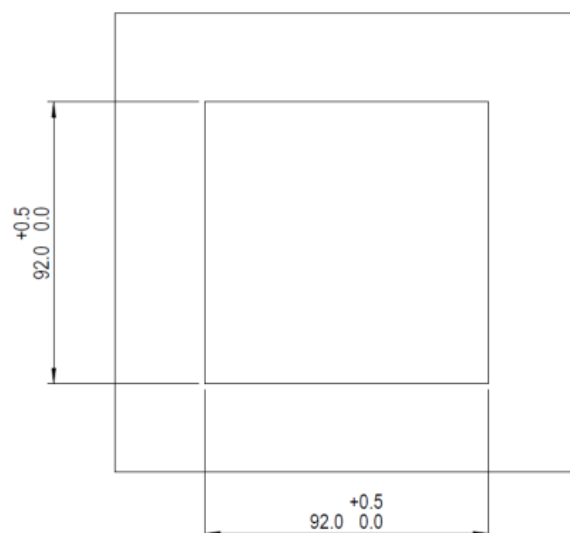


- Cabinet installation

1. For easier handling during mounting and dismounting, the mounting brackets and accessories are provided with the multi-function meter for the fixed installation
2. The dimension of the mounting hole is 92 mm * 92 mm in size. (Refer to the following description of mounting hole dimension).
3. Slide the mounting bracket into the slot. The maximum panel thickness should be 4.0 mm.

***Note:** Install on a flat mounting plane.

- Mounting Hole Dimensions



Panel Hole
Thickness : 0.8~4.0mm

Unit: mm

3.2 Basic Checks

Items	Contents
General Check	■ Regularly check for mounting looseness where the power meter and device are connected. ■ Prevent foreign objects, such as oil, water, or metal powder entering the device through the ventilation holes. Prevent drill shavings or other debris entering the power meter. ■ If the power meter is installed at a location with harmful gas or dust, prevent those materials from entering the power meter.
Pre-operation Check (not supplied with power)	■ Insulate the connections at the wiring terminals. ■ Communications wiring should be done properly to prevent abnormal operations. ■ Check for the presence of conductive and flammable objects, such as screws or metal pieces in the power meter. ■ If electronic devices near to the power meter experience electromagnetic interference, take steps to reduce the electromagnetic interference. ■ Check for the correct voltage level for the power supplied to the power meter.
Pre-running Check (supplied with power)	■ Check if the power indicator light is lit. ■ Check if communication between every device is normal. ■ If there is any abnormal response from the power meter, contact your distributor or our customer service center.

3.3 Wiring

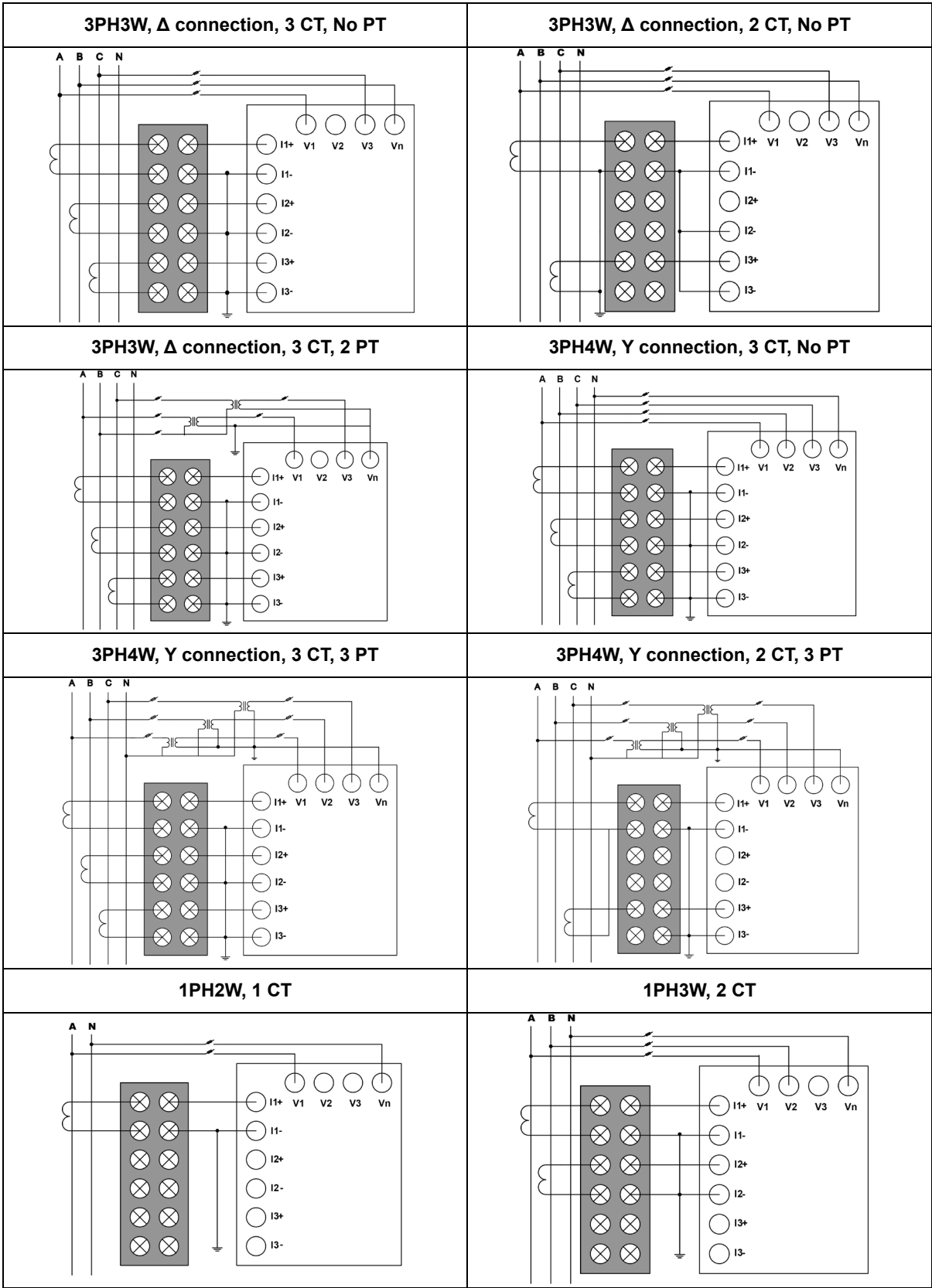
3.3.1 Wiring Diagrams

- To avoid electric shock, do not change the wiring when the power is on.
- It is necessary to install a breaker switch on the power cord of the meter due to no power switch on the power meter.
- When the measured voltage is higher than the rated specification for the device, it is necessary to use an external potential transformer (PT).
- When the measured current is higher than the rated specification for the device, it is necessary to use an external current transformer (CT).

The following table shows the recommended wiring materials.

Connecting Terminals	Wire Diameters	Screw Turning Torque	Temperature rating
Operating Power / Voltage Measurement	AWG 10–22	8.0 kgf-cm (0.8 N·m)	above 70°C
Current Measurement / RS-485	AWG 12–24	8.0 kgf-cm (0.8 N·m)	above 70°C
Ethernet	Cat 5/Cat 5E/Cat 6	-	-

● Connection Diagrams



The following table lists the symbols used in the diagram.

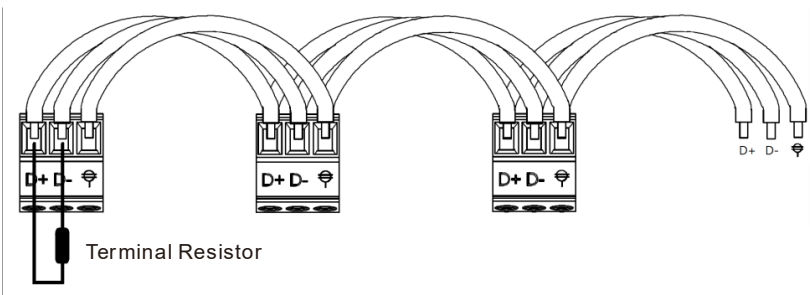
Symbol				
Description	Grounding	Current transformer	Terminal block	Fuse

3.3.2 Communication Characteristics

Communications Specifications (DPM-C510)

Max. Communication Distance	1200 m	Baud Rate	9600, 19200, 38400 bps
Max. Connection Number	32	Data Length	8-bits
Communication Protocols	MODBUS RTU	Parity	None, Odd, Even
Function Code	03, 06, 10	Stop Bits	1

- Use shielded twisted-pair cables for RS485 communication.



- Connect the D+ communication terminal for all devices on the same twisted pair cable. Connect the D- terminals on another twisted pair cable. Ground the cable shield. Install a terminal resistor on the terminal device as shown.
- Use cables with a diameter of 12–24 AWG.

Communications Specifications (DPM-C510E)

Max. Communication Distance	100 m	Baud Rate	10/100Mbps
Communication Protocols	MODBUS TCP	Function Code	03 、 06 、 10 、 FE
Topology	Daisy Chain (without Ring topology)		

Note: The Ethernet communication uses standard network cables to connect multiple devices (NOT including ring topology).

Chapter 4 Operation

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4.1 General Operation

4.1.1 Setting Menu

- HOME page (HOME): Voltage values measured by the power meter, including average voltage (Vavg), average current (Iavg), total power (Ptot).
 - Phase voltage: phase voltage values measured by the power meter, including phase A voltage (L1), phase B voltage (L2), phase C voltage (L3).
 - Line voltage: line voltage values measured by the power meter, including A-B line voltage (L1-L2), B-C line voltage (L3-L3), C-A line voltage (L3-L1).
 - Electric current page: electric current measured by the power meter, including phase A current (L1), phase B current (L2) and phase C current (L3).
 - Power factor page: power factors and frequencies measured by the power meter, including power factor (PF) and frequency (F).
 - Power measurement: values measured by the power meter, including total active power (kW), total reactive power (kVAR), and total apparent power (kVA).
 - Active power page (WATT): active power value measured by the power meter, including active power of phase A (L1), phase B (L2) and phase C (L3).
 - Reactive power page (VAR): reactive power value measured by the power meter, including reactive power of phase A (L1), phase B (L2) and phase C (L3).
 - Apparent power page (VA): apparent power value measured by the power meter, including apparent power of phase A (L1), phase B (L2) and phase C (L3).
 - Positive active energy page (kWH): positive active energy measured by the power meter, including positive active energy.
 - Positive reactive energy page (kVARH): positive reactive energy measured by the power meter, including positive reactive energy.
 - Positive apparent energy page (kVAH): positive apparent energy measured by the power meter, including positive apparent energy.
1. Use UP and DOWN keys to switch among setting pages.
 2. You can go back to HOME page by pressing BACK key.

Note 1: Use BACK key in HOME page to enter the setting page.

4.2 Setting Operation

4.2.1 Password Key (PASS)

- Enter the password: The password key set for users to start operations. (Default: 0000)
- Steps:
 1. Press NEXT key until the first figure starts flickering.
 2. Press UP or DOWN keys to select the first figure of the password.
 3. Press NEXT key to select the next figure.
 4. Repeat step 2 and 3 until the setting of the fourth figure is complete.
 5. Then press NEXT key to enter the setting page of power meter parameters.

Note: (1) In case that you enter a wrong figure, just press BACK key and the figure would stop flickering, then press NEXT key to enter the figure again.

Note: (2) To exit the password page, simply pressing BACK key to return to the homepage.

4.2.2 Communication Setup

4.2.2.1 Station Setup (id) (Only applicable to DPM-C510)

- **Communication station (id):** The setting range of station is from 1 to 254 with 1 being the factory default setting and 255 is set for the broadcasting station.
- Steps:
 1. Press NEXT key and the figures would start flickering.
 2. Press UP and DOWN keys to select the figures of the station number.
 3. Press NEXT key to complete the setting.

Note: You can go back to the previous setting item by pressing BACK key anytime, whether you have completed or canceled the setting.

4.2.2.2 Baud Rate (bAUd) (Only applicable to DPM-C510)

- **Baud Rate (BR):** Transmission speed; the setting options are 9600 kbps (default), 19200 and 38400 bps with 9600 bps being the default setting.

- Steps:

1. Press NEXT key and the figures would start flickering.
2. Press UP and DOWN keys to select the figures of the baud rate.
3. Press NEXT key to complete the setting.

Note: You can go back to the previous setting item by pressing BACK key anytime, whether you have completed or canceled the setting.

4.2.2.3 Parity Setup (PRty) (Only applicable to DPM-C510)

- Parity (PRty): Odd and even checking bit for communication; the setting options are (8n1), Even (8E1) and Odd (8o1) with None being the default setting.

- Steps:

1. Press NEXT key and the figures would start flickering.
2. Press UP and DOWN keys to select the figures of the parity bit.
3. Press NEXT key to complete the setting.

Note: You can go back to the previous setting item by pressing BACK key anytime, whether you have completed or canceled the setting.

4.2.2.4 Ethernet Setup (EtH) (Only applicable to DPM-C510E)

- IP Setup (iP ConF): IP access method. You may choose between StAt and dHCP, while the default setting is Static(StAt).
- IP address (AdR.H, AdR.L): The IP address of the device. The default is 192.168.1.5.
- Subnet mask (mSk.H, mSk.L): Determine whether the IP address of the target device is in the same subnet with the local device
- Gateway (Gwy.H, Gwy.L): Two different subnets can talk to each other through the gateway. The default is 192.168.1.1.
- TCP idle time (kEEP. time): Idle timeout in a TCP connection. The default is 30 seconds.
- IP Filter ON (iP FLtR): Enable IP filtering. The default is OFF (diS).
- IP Filter 1 (Ft1.1~Ft1.4): Process IP filtering. The default is 0.0.0.0.

- IP Filter 2(Ft2.1~Ft2.4) : Process IP filtering. The default is 0.0.0.0.
- Configuration check (Conf. ok): After checking all Ethernet parameters, input the above setting values. In case that there're incorrect parameters, Error Code page would be displayed.

Setup steps:

1. Unlock with the password to enter the EtH page.
2. Press "NEXT" and the IP configuration (iP ConF) page would be displayed.
3. Characters flash while pressing "NEXT".
4. Press UP or DOWN key to select the target mode, such as Static(StAt) or DHCP(dHCP).
5. Then press "NEXT" to complete. When the number stops flashing, the setting is done. If you need to cancel, press BACK to abort without saving the setting.
6. Press "DOWN" to select and enter the AdR.H setting page.
7. Press "NEXT" and the number would flash.
8. Press UP and DOWN keys to select the target number.
9. Press "NEXT" to continue finishing the setting of the next digit.
10. Repeat step (8) ~ (9), until finish the setting of the last digit. Press "Next" and the setting is complete when the number stops flashing. If pressing BACK key during the configuration, the setting would be aborted without being saved.
11. Press "DOWN" to select and enter the AdR.L setting page.
12. Press "NEXT" and the number would flash.
13. Press UP and DOWN keys to select the target number.
14. Press "NEXT" to continue finishing the setting of the next digit.
15. Repeat step (13) ~ (14) , until finish the setting of the last digit. Press "Next" and the setting is complete when the number stops flashing. If pressing BACK key during the configuration, the setting would be aborted without being saved.
16. Configure the settings of Subnet mask (mSk.H, mSk.L), Gateway (Gwy.H, Gwy.L), TCP idle timeout (KEEP. time), IP Filter ON (iP FLtR), IP Filter 1 (Ft1.1~Ft1.4) and IP Fiter 2 (Ft2.1~Ft2.4) as the steps above.
17. After complete all parameter settings, select and enter the Configuration check (Conf. ok) page.

18. When the option flashes, you can start the configuration by choosing YES (yES) and pressing NEXT key to input all the Ethernet parameters. In case that there're incorrect parameters, Error Code page would be displayed.
19. When Ethernet configuration save page (SAVE Conf) changes to Ethernet page (EtH), all setting uploads are complete and the new settings would be applied to Ethernet communication.

4.2.2.5 Troubleshooting (Only applicable to DPM-C510E)

- When an Error Code page is displayed, you would have to troubleshoot the parameter error. The following table details each error code:

Error Code	Debug Help	Error Details
Bit0	ERR iP	Wrong IP Address
Bit1	ERR mSk	Wrong Subnet Mask
Bit2	ERR Gwy	Wrong Gateway
Bit3	ERR Ft1.b	IP Filter 1 Wrong Start IP Address
Bit4	ERR Ft1.E	IP Filter 1 Wrong End IP Address
Bit5	ERR Ft2.b	IP Filter 2 Wrong Start IP Address
Bit6	ERR Ft2.E	IP Filter 2 Wrong End IP Address

For example: The error code would be 127 if all parameter settings are wrong. Debug help can only display an error at a time, which the order of the errors is determined by their importance.

Note: The range of legal IP address is from 1.0.0.0 to 223.255.255.255.

4.2.3 System (SyS)

4.2.3.1 System Setup (tyPE)

- Wiring methods (WR): options are three-phase three-wire (3PH3W), three-phase four-wire (3PH4W), one-phase two-wire (1PH2W) and one-phase three-wire (1PH3W); default: three-phase four-wire.
- Steps:
 1. Press NEXT key and the figures would start flickering.
 2. Press UP and DOWN keys to select the wiring method.
 3. Press NEXT key to complete the setting.

Note: You can go back to the previous setting item by pressing BACK key anytime, whether you have completed or canceled the setting.

4.2.3.2 CT Number (no.Ct)

- The number of CT applied in the system can be chosen to be 0, 1, 2 or 3. If the wiring is set to be 1P2W and 1P3W, the CT number is fixed to be 1 and 2 accordingly. The default is 3.
- The setting steps are shown below:
 1. Press NEXT key and the figure starts flickering.
 2. Press UP or DOWN key to select the CT number.
 3. Press NEXT to finish the setting.

Note: You can go back to the previous setting item by pressing BACK key anytime, whether you have completed or canceled the setting.

4.2.3.3 PT Number (no.Pt)

- The number of CT applied in the system can be chosen to be 0, 2, 3. If the wiring is set to be 1P2W and 1P3W, the PT number is fixed to be 3 and the default is 3.
- The setting steps are shown below:
 1. Press NEXT key and the figure starts flickering.
 2. Press UP or DOWN key to select the CT number.
 3. Press NEXT to finish the setting.

Note: You can go back to the previous setting item by pressing BACK key anytime, whether you have completed or canceled the setting.

4.2.4 CT and PT Transformers (Ct.Pt)

4.2.4.1 Primary Current Transformer Setup (Ct.PR)

- Ampere for the primary-side current transformer: ranging from 1 to 9999 A; default: 5 A.
- Steps:
 1. Press NEXT key until the first figure starts flickering.
 2. Press UP or DOWN keys to select the figures of the primary current transformer.
 3. Press NEXT key to select the next figure.

4. Repeat step 2 and 3 until all the four figures are set completely.

5. Then press NEXT key to complete.

Note: You can go back to the previous setting item by pressing BACK key anytime, whether you have completed or canceled the setting.

4.2.4.2 Secondary Current Transformer Setup (Ct.SE)

- Ampere for the secondary-side current transformer: options are 1 and 5 A; default 5 A.

- Steps:

1. Press NEXT key and the figures would start flickering.
2. Press UP and DOWN keys to select the figures of the secondary current transformer.
3. Press NEXT key to complete the setting.

Note: You can go back to the previous setting item by pressing BACK key anytime, whether you have completed or canceled the setting.

4.2.4.3 Primary Potential Transformer (Pt.PR)

- Primary PT: The voltage of primary PT can be set from 1 to 9999 V and the default is 1 V. The setting steps are shown below:

1. Press NEXT key and the figures would start flickering.
2. Press UP and DOWN keys to select the figures of the primary PT transformer.
3. Press NEXT key to select the next figure.
4. Repeat step 2 and 3 until all the four figures are set completely.
5. Press NEXT key to complete the setting.

Note: You can go back to the previous setting item by pressing BACK key anytime, whether you have completed or canceled the setting.

4.2.4.4 Secondary Potential Transformer (Pt.SE)

- Secondary PT: The voltage of secondary PT can be set from 1 to 9999 V and the default is 1 V. The setting steps are shown below:

1. Press NEXT key and the figures would start flickering.
2. Press UP and DOWN keys to select the figures of the secondary PT transformer.
3. Press NEXT key to select the next figure.
4. Repeat step 2 and 3 until all the four figures are set completely.
5. Press NEXT key to complete the setting.

Note: You can go back to the previous setting item by pressing BACK key anytime, whether you have completed or canceled the setting.

4.2.5 Reset Setup (RST)

- **No action (noneE):** No reset action would be proceeded.
- **Restore factory defaults (dEF):** Reset all the meter setting values back to the default factory settings.
- **Reset the energy value (kWH):** Reset the accumulated energy value to zero.
- Steps:
 1. Press NEXT key and the figures would start flickering.
 2. Press UP and DOWN keys to select the desired reset setting.
 3. Press NEXT key to perform the reset action.

Note: You can go back to the previous setting item by pressing BACK key anytime, whether you have completed or canceled the setting.

4.2.6 Change Password (Pwd)

- Change the password key with 0000 being the default factory setting.
- Steps:
 1. Press NEXT key and the figures would start flickering.
 2. Press UP or DOWN keys to select the figures of the password
 3. Press NEXT key to select the next figure.
 4. Repeat step 2 and 3 until the last figure is set.
 5. Then press NEXT key to complete.

Note: You can go back to the previous setting item by pressing BACK key anytime, whether you have completed or canceled the setting.

4.2.7 Meter Information (inFo)

- **Firmware Version:** X.YY
- **Firmware release date:** XXYY (MM.DD)

Chapter 5 Parameters and Functions

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5.1 Overview of Parameters

Modbus Address		Item	Range	Data Type	Unit	Data Size (byte)	Read (R) / Write (W)
Hex	Modicom Format						
0. System Parameters: 0001 – 00FF							
5	40006	Meter Constant	3200	uint	P/kWh	2	R
6	40007	Meter Model	0: None 4: DMP–C510	word		2	R
7	40008	Total running time of the meter	0 ~ 4294967295	uint	Minute	4	R
8	40009						
9	40010	Firmware version	0.00 ~ 9.99	word		2	R
A	40011	Firmware release date	Year: 00–99 Month: 1–12	byte	Year, Month	2	R
B	40012		Date: 1–31	word	Date	2	R
C	40013	Reserved					
D	40014	Power system configuration	0: 3φ4W 1: 3φ3W 2: 1φ2W 3: 1φ3W	word		2	R/W
E	40015	Primary CT (A)	1 – 9999	uint	A	2	R/W
F	40016	Secondary CT (A)	0: 1A 1: 5A	word	A	2	R/W
10	40017	Primary PT	1 ~ 9999	uint	V	2	R / W
11	40018	Secondary PT	1 ~ 9999	uint	V	2	R / W

12	40019	Transformer counts	0 : 3CT3PT 1 : 3CT2PT 2 : 3CT0PT 3 : 2CT3PT 4 : 2CT2PT 5 : 2CT0PT 6 : 1CT3PT 7 : 1CT2PT 8 : 1CT0PT	word		2	R / W
13	40020	Reserved					
14	40021	Backlight delay (sec.)	0 – 99 0: Backlight remains OFF. 99: Backlight remains ON.	word	Second	2	R / W
15	40022	Reserved					
16	40023	Baud Rate (Only applicable to DPM-C510)	0: 9600 1: 19200 2: 38400	word	bps	2	R / W
17	40024	Communication mode (Only applicable to DPM-C510)	1: RTU	word		2	R / W
18	40025	Data bit (Only applicable to DPM-C510)	0: 8	word	bit	2	R / W
19	40026	Parity bit (Only applicable to DPM-C510)	0: None 1: Even 2: Odd	word		2	R / W
1A	40027	Stop bit (Only applicable to DPM-C510)	0: 1	word	bit	2	R / W
1B	40028	Modbus address	1 – 254 (Modbus) 1 ~ 247 (Modbus TCP)	word		2	R / W
1C	40029	Reset	0: None 1: Reset to factory default 2: Reset energy value	word		2	W

1. Meter Parameters: 0100 – 01FF							
100	40257	Phase A voltage	0.000 – 99999.999	float	V	4	R
101	40258						
102	40259	Phase B voltage	0.000 – 99999.999	float	V	4	R
103	40260						
104	40261	Phase C voltage	0.000 – 99999.999	float	V	4	R
105	40262						
106	40263	Average phase voltage	0.000 – 99999.999	float	V	4	R
107	40264						
108	40265	A–B line voltage	0.000 – 99999.999	float	V	4	R
109	40266						
10A	40267	B–C line voltage	0.000 – 99999.999	float	V	4	R
10B	40268						
10C	40269	C–A line voltage	0.000 – 99999.999	float	V	4	R
10D	40270						
10E	40271	Average line voltage	0.000 – 99999.999	float	V	4	R
10F	40272						
120	40289	Phase A current	0.000 – 99999.999	float	A	4	R
121	40290						
122	40291	Phase B current	0.000 – 99999.999	float	A	4	R
123	40292						
124	40293	Phase C current	0.000 – 99999.999	float	A	4	R
125	40294						
126	40295	Three-phase average current	0.000 – 99999.999	float	A	4	R
127	40296						
128	40297	Neutral line current	0.000 – 99999.999	float	A	4	R
129	40298						
132	40307	Total power factor	0.00000 – 1.00000	float		4	R
133	40308						
134	40309	Power factor of phase A	0.00000 – 1.00000	float		4	R
135	40310						

136	40311	Power factor of phase	0.00000 – 1.00000	float		4	R
137	40312	B					
138	40313	Power factor of phase	0.00000 – 1.00000	float		4	R
139	40314	C					
142	40323	Frequency	0.0000 – 99.9999	float	Hz	4	R
143	40324						
144	40325	Total instantaneous active power	-99999.999 ~ 99999.999	float	kW	4	R
145	40326		(Positive number: Load consumption / Negative number: Load power)				
146	40327	Instantaneous active power of phase A	-99999.999 ~ 99999.999	float	kW	4	R
147	40328		(Positive number: Load consumption / Negative number: Load power)				
148	40329	Instantaneous active power of phase B	-99999.999 ~ 99999.999	float	kW	4	R
149	40330		(Positive number: Load consumption / Negative number: Load power)				
14A	40331	Instantaneous active power of phase C	-99999.999 ~ 99999.999	float	kW	4	R
14B	40332		(Positive number: Load consumption / Negative number: Load power)				
14C	40333	Total instantaneous reactive power	-99999.999 ~ 99999.999	float	kVAR	4	R
14D	40334		(Positive number: Load consumption / Negative number: Load power)				
14E	40335	Instantaneous reactive power of phase A	-99999.999 ~ 99999.999	float	kVAR	4	R
14F	40336		(Positive number: Load consumption / Negative number: Load power)				
150	40337	Instantaneous reactive power of phase B	-99999.999 ~ 99999.999	float	kVAR	4	R
151	40338		(Positive number: Load consumption / Negative number: Load power)				

152	40339	Instantaneous reactive power of phase C	-99999.999 ~ 99999.999	float	kVAR	4	R
153	40340		(Positive number: Load consumption / Negative number: Load power)				
154	40341	Instantaneous	0.000 – 99999.999	float	kVA	4	R
155	40342	apparent power					
156	40343	Instantaneous	0.000 – 99999.999	float	kVA	4	R
157	40344	apparent power of phase A					
158	40345	Instantaneous	0.000 – 99999.999	float	kVA	4	R
159	40346	apparent power of phase B					
15A	40347	Instantaneous	0.000 – 99999.999	float	kVA	4	R
15B	40348	apparent power of phase C					
15C	40349	Active energy of three - phase delivered	0 ~ 4294967295	unit	kWh	4	R
15D	40350						
160	40353	Reactive energy of three - phase delivered	0 ~ 4294967295	unit	kVARh	4	R
161	40354						
164	40357	Apparent energy of three - phase delivered	0 ~ 4294967295	unit	kVAh	4	R
165	40358						

5. Advanced setting: 0x500 ~ 0x5FF (Only applicable to DPM-C510E)

598	41433	IP Configuration	0 : Static (default) 1 : DHCP	word		2	R / W
599	41434	IP Address(XXX.YYY.A AA.BBB) P.S. read only when DHCP	XXX : high byte(default: 192)	word		2	R / W

59A	41435	IP Address(XXX.YYY.A AA.BBB) P.S. read only when DHCP	YYY : low byte(default: 168)	word		2	R / W
59B	41436	IP Address(XXX.YYY.A AA.BBB) P.S. read only when DHCP	AAA : high byte(default: 1)	word		2	R / W
59C	41437	IP Address(XXX.YYY.A AA.BBB) P.S. read only when DHCP	BBB : low byte(default: 5)	word		2	R / W
59D	41438	SubNet mask(XXX.YYY.AAA. BBB) P.S. read only when DHCP	XXX : high byte(default: 255)	word		2	R / W
59E	41439	SubNe mask(XXX.YYY.AAA. BBB) P.S. read only when DHCP	YYY : low byte(default: 255)	word		2	R / W
59F	41440	SubNet mask(XXX.YYY.AAA. BBB) P.S. read only when DHCP	AAA : high byte(default:255)	word		2	R / W
5A0	41441	SubNe mask(XXX.YYY.AAA. BBB) P.S. read only when DHCP	BBB : low byte(default: 0)	word		2	R / W

5A1	41442	default gateway(XXX.YYY.A AA.BBB) P.S. read only when DHCP	XXX : high byte(default: 192)	word		2	R / W
5A2	41443	default gateway(XXX.YYY.A AA.BBB) P.S. read only when DHCP	YYY : low byte(default: 168)	word		2	R / W
5A3	41444	default gateway(XXX.YYY.A AA.BBB) P.S. read only when DHCP	AAA : high byte(default: 1)	word		2	R / W
5A4	41445	default gateway(XXX.YYY.A AA.BBB) P.S. read only when DHCP	BBB : low byte(default: 254)	word		2	R / W
5A5	41446	Ethernet setting	0 : Disable 2 : complete settings	word		2	R / W
5A6	41447	MAC address(XX:YY:ZZ:A A:BB:CC)	XX : high byte(default: 0x00) YY : low byte(default: 0x18)	word		2	R
5A7	41448	MAC address(XX:YY:ZZ:A A:BB:CC)	ZZ : high byte(default: 0x23) AA : low byte	word		2	R
5A8	41449	MAC address(XX:YY:ZZ:A A:BB:CC)	BB : high byte CC : low byte	word		2	R

5A9	41450	Keep Alive Time	10 ~ 9999	word		2	R / W
5AA	41451	IP filter Enable	0 : Disable 1 : Enable	word		2	R / W
5AB	41452	IP filter#1 start(XXX.YYY.AAA.B BB)	XXX : high byte(default: 0)	word		2	R / W
5AC	41453	IP filter#1 start(XXX.YYY.AAA.B BB)	YYY : low byte(default: 0)	word		2	R / W
5AD	41454	IP filter#1 start(XXX.YYY.AAA.B BB)	AAA : high byte(default: 0)	word		2	R / W
5AE	41455	IP filter#1 start(XXX.YYY.AAA.B BB)	BBB : low byte(default: 0)	word		2	R / W
5AF	41456	IP filter#1 end(XXX.YYY.AAA.B BB)	XXX : high byte(default: 0)	word		2	R / W
5B0	41457	IP filter#1 end(XXX.YYY.AAA.B BB)	YYY : low byte(default: 0)	word		2	R / W
5B1	41458	IP filter#1 end(XXX.YYY.AAA.B BB)	AAA : high byte(default: 0)	word		2	R / W
5B2	41459	IP filter#1 end(XXX.YYY.AAA.B BB)	BBB : low byte(default: 0)	word		2	R / W
5B3	41460	IP filter#2 start(XXX.YYY.AAA. BBB)	XXX : high byte(default: 0)	word		2	R / W
5B4	41461	IP filter#2 start(XXX.YYY.AAA. BBB)	YYY : low byte(default: 0)	word		2	R / W
5B5	41462	IP filter#2 start(XXX.YYY.AAA. BBB)	AAA : high byte(default: 0)	word		2	R / W

5B6	41463	IP filter#2 startt(XXX.YYY.AAA. BBB)	BBB : low byte(default: 0)	word		2	R / W
5B7	41464	IP filter#2 endt(XXX.YYY.AAA.B BB)	XXX : high byte(default: 0)	word		2	R / W
5B8	41465	IP filter#2 endt(XXX.YYY.AAA.B BB)	YYY : low byte(default: 0)	word		2	R / W
5B9	41466	IP filter#2 endt(XXX.YYY.AAA.B BB)	AAA : high byte(default: 0)	word		2	R / W
5BA	41467	IP filter#2 endt(XXX.YYY.AAA.B BB)	BBB : low byte(default: 0)	word		2	R / W
5BB	41468	IP filter Setting	0 : Disable 1 : Enable	word		2	R / W

5.2 Modbus Communication

5.2.1 Supported Modbus Function Codes

Function Code	Modbus Name	Description
0x03	Read Holding Registers	Read the contents of read location
0x06	Preset Single Registers	Preset the contents of written location
0x10	Preset Multiple Registers	Preset the contents of written loacations

When the protocol is Modbus RTU, the maximum address to be gathered with a single Modbus block read is 50 for function code 0x3, and the maximum address is 49 for function code 0x10. The function code 0xFE can be used only when the protocol is Modbus RTU.

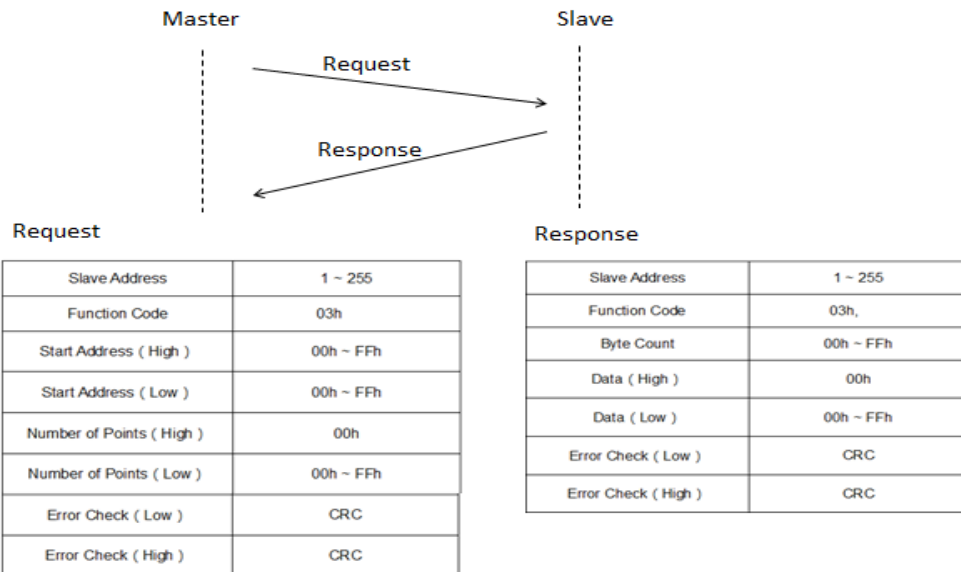
5.2.2 Modbus Communication Protocol

Modbus RTU mode is adopted with Modbus Master sending out the Request, in which the Function Code uses 0x03 to request response from Slave to correspond to values in Modbus address. In Response, Modbus Slave responds to the values of Modbus address in the Master request. The packet format of IEEE754 is used for the address of floating point numbers that corresponds to the register values found in table 5.2, using 2's complement packet format. The format are as follows:

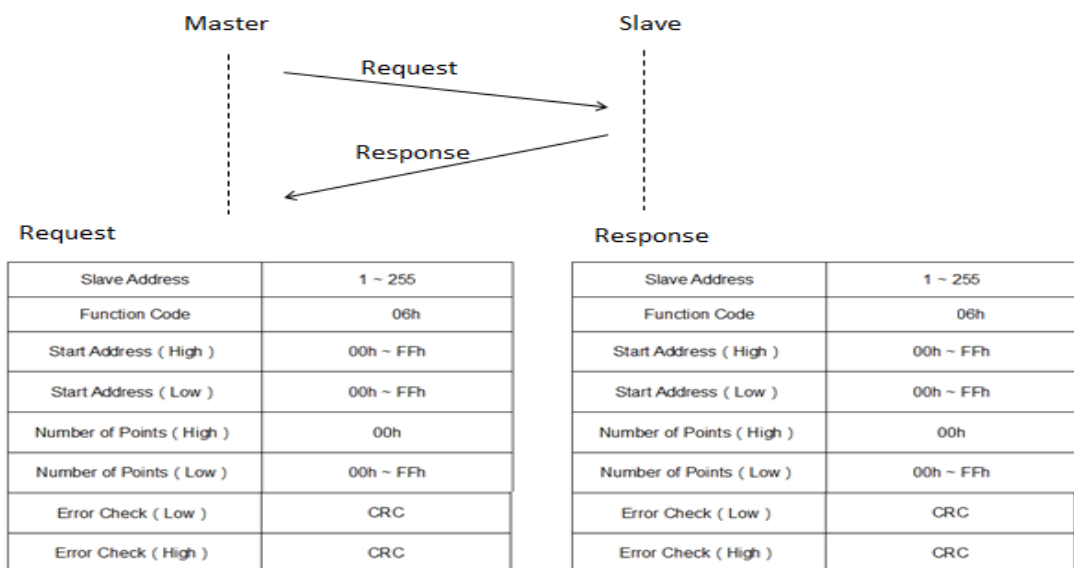
Low Word		High Word	
High Byte	Low Byte	High Byte	Low Byte

The packet formats (2's complement) for the address of integers that corresponds to the register values found in table 5.2 are shown in the example below.

Read :



Write:

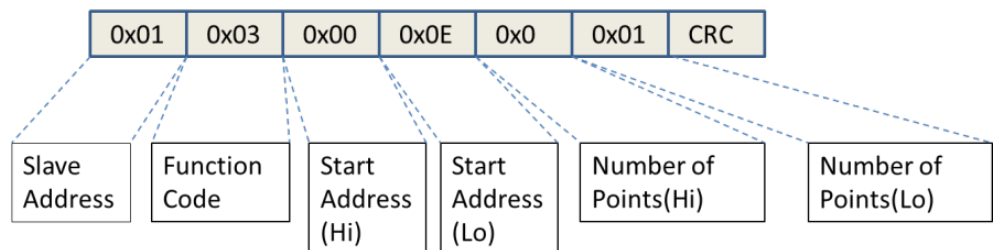


Example:

For Modbus Master, such as PLC or data collector, it uses Modbus protocol to get the value of CT setting (Register address 0x000E) on the power meter (Modbus Slave) (Slave address 0x1). The register value is 1000.

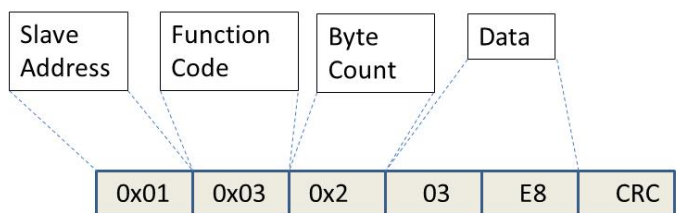
The packet format for Request sent out by Modbus Master (PLC or data collector) is as follows:

Master Request



The packet format for Response responded by Modbus Slave (power meter) is as follows:

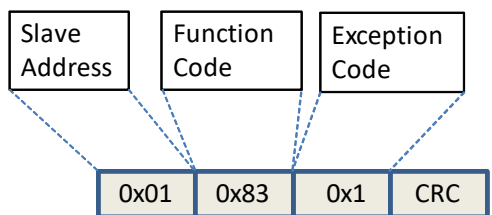
Slave Response



After receiving response from the power meter, Modbus Master acquires the value of currents from the primary-side current transformer (register address 0x000E), which is 1000.

Should Modbus Slave (power meter) receive an abnormal Request, the format of the abnormal packet responded is as follows.

Slave Response



Chapter 6 Error Codes

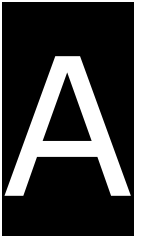
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6.1 Error Codes

When an error occurs during operation, the power monitor sends an error code through Modbus. The following table lists the error codes and causes.

Error Code	Name	Description
0x01	Illegal function	Incorrect function code
0x02	Illegal data address	Incorrect data address to read or write
0x03	Illegal data value	Incorrect data format (for example, data length)
0x04	Slave device failure	Slave cannot execute the command.



Appendix A Accessories

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A.1 DCTMC SeriesA-2

A.2 DCTCS Series.....A-3

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A.4 DCT2000 Series.....A-6

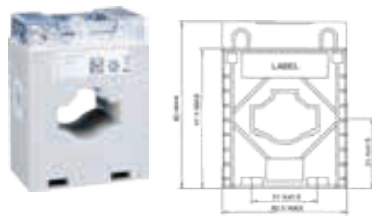
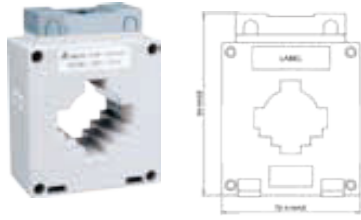
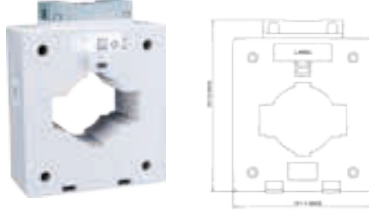
When measured current is higher than the rated specification for the device, use of an external current transformer (CT) is necessary. Choose the proper CT from the table below to install.

A.1 DCTMC Series

Model Number	Measurement Accuracy	Primary Current	Secondary Current	Rated Burden (VA)	External Dimension*1 (mm)	Size of Opening*1 (mm)
DCT-MC010-5	1.0%	100A	5A	1.5	80*60*38	20*30.5
DCT-MC020-5	0.5%	200A	5A	3.75		
DCT-MC030-5	0.5%	300A	5A	5	98*74.5*43	42*42
DCT-MC040-5	0.5%	400A	5A	7.5		
DCT-MC050-5	0.5%	500A	5A	5	127*103*45	51*61
DCT-MC060-5	0.5%	600A	5A	10		

*1: See the following table for detailed information on the external dimensions and sizes of opening.

Toroidal Current Transformer

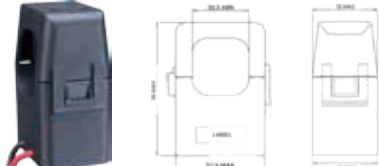
Model Number	Dimension (mm)	
DCT-MC010-5	External Dimension : 80 x 60 x 38 Size of Opening : 20 x 30.5	
DCT-MC020-5		
DCT-MC030-5	External Dimension : 98 x 74.5 x 43 Size of Opening : 42 x 42	
DCT-MC040-5		
DCT-MC050-5	External Dimension : 127 x 103 x 45 Size of Opening : 51 x 61	
DCT-MC060-5		

A.2 DCTCS Series

Model Type	Measurement Accuracy	Primary Current	Secondary Current	Rated Burden (VA)	External Dimension*1 (mm)	Size of Opening*1 (mm)
DCT-CS010-5	1%	100A	5A	1000	66.8*49.8*34.2	23.8*25.2
DCT-CS020-5	1%	200A	5A	1000		
DCT-CS030-5	1%	300A	5A	1000		
DCT-CS040-5	1%	400A	5A	1000	85*69*42.5	36.5*36.5
DCT-CS050-5	1%	500A	5A	1000		
DCT-CS060-5	1%	600A	5A	1000		

*1: See the following table for detailed information on the external dimensions and sizes of opening.

Small Size Toroidal Current Transformer

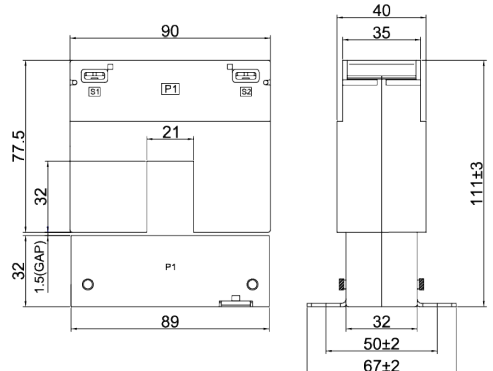
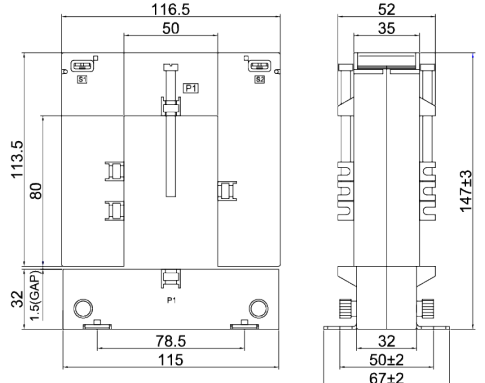
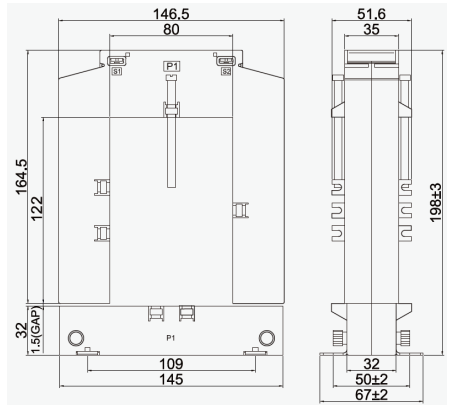
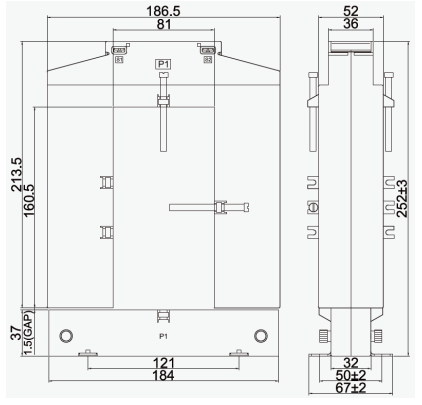
Model	Dimension (Unit: mm)	
DCT-CS010-5	External Dimension : 66.8 x 49.8 x 34.2 Size of Opening : 23.8 x 25.2	
DCT-CS020-5		
DCT-CS030-5		
DCT-CS040-5	External Dimension : 85 x 69 x 42.5 Size of Opening : 36.5 x 36.5	
DCT-CS050-5		
DCT-CS060-5		

A.3 DCT1000 Series

Electromagnetic Compatibility: CE-marking, IEC61869-2.

Model Number	Measurement Accuracy	Primary Current	Secondary Current	Rated Burden (VA)	External Dimension*1 (mm)	Size of Opening*1 (mm)
DCT-S301C	1.0%	100 A	5 A	1.5	90 x 40 x 111	21 x 32
DCT-S211C	0.5%	200 A	5 A	1		
DCT-S221C	0.5%	300 A	5 A	1.5		
DCT-S231C	0.5%	400 A	5 A	2.5		
DCT-S241C	0.5%	500 A	5 A	2.5	116.5 x 52 x 147	50 x 80
DCT-S251C	0.5%	600 A	5 A	2.5		
DCT-S261C	0.5%	750 A	5 A	2.5		
DCT-S271C	0.5%	1000 A	5 A	5		
DCT-S281C	0.5%	1500 A	5 A	7.5	146.5 x 51.6 x 198	80 x 122
DCT-S291C	0.5%	2000 A	5 A	10	186.5 x 52 x 252	81 x 160.5
DCT-S2A1C	0.5%	2500 A	5 A	15		
DCT-S2B1C	0.5%	3000 A	5 A	20		

*1: See the following table for detailed information on the external dimensions and sizes of opening.

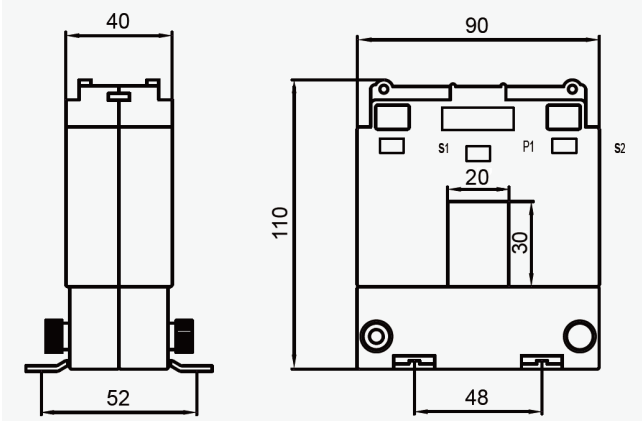
Model Number	Dimension (mm)	
DCT-S301C	External Dimension: 90 x 40 x 111 Size of Opening: 21 x 32 	
DCT-S211C		
DCT-S221C		
DCT-S231C		
DCT-S241C	External Dimension: 116.5 x 52 x 147 Size of Opening: 50 x 80 	
DCT-S251C		
DCT-S261C		
DCT-S271C		
DCT-S281C	External Dimension: 146.5 x 51.6 x 198 Size of Opening: 80 x 122 	
DCT-S291C	External Dimension: 186.5 x 52 x 252 Size of Opening: 81 x 160.5 	
DCT-S2A1C		
DCT-S2B1C		

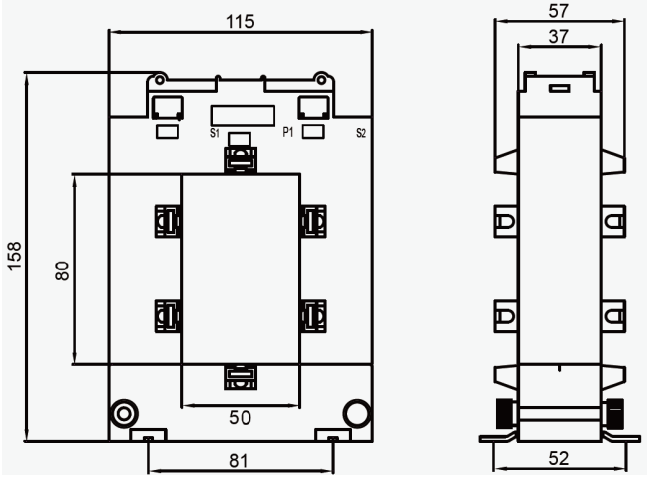
A.4 DCT2000 Series

Electromagnetic Compatibility: UL, UL2808.

Model Number	Measurement Accuracy	Primary Current	Secondary Current	Rated Burden (VA)	External Dimension*1 (mm)	Size of Opening*1 (mm)
DCT-S201B	1.0%	100 A	5 A	1	90 x 40 x 110	20 x 30
DCT-S211B	0.5%	200 A	5 A	1		
DCT-S221B	0.5%	300 A	5 A	1.5		
DCT-S231B	0.5%	400 A	5 A	1.5	115 x 57 x 158	50 x 80
DCT-S241B	0.5%	500 A	5 A	2.5		
DCT-S251B	0.5%	600 A	5 A	2.5		
DCT-S261B	0.5%	750 A	5 A	2.5		
DCT-S2C1B	0.5%	800 A	5 A	3.75		
DCT-S271B	0.5%	1000 A	5 A	5		

*1: See the following table for detailed information on the external dimensions and sizes of opening.

Model Number	Dimension (mm)	
DCT-S201B	External Dimension: 90 x 40 x 110 Size of Opening: 20 x 30 	
DCT-S211B		
DCT-S221B		

DCT-S231B	External Dimension: 115 x 57 x 158	
DCT-S241B	Size of Opening: 50 x 80	
DCT-S251B		
DCT-S261B		
DCT-S2C1B		
DCT-S271B		

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