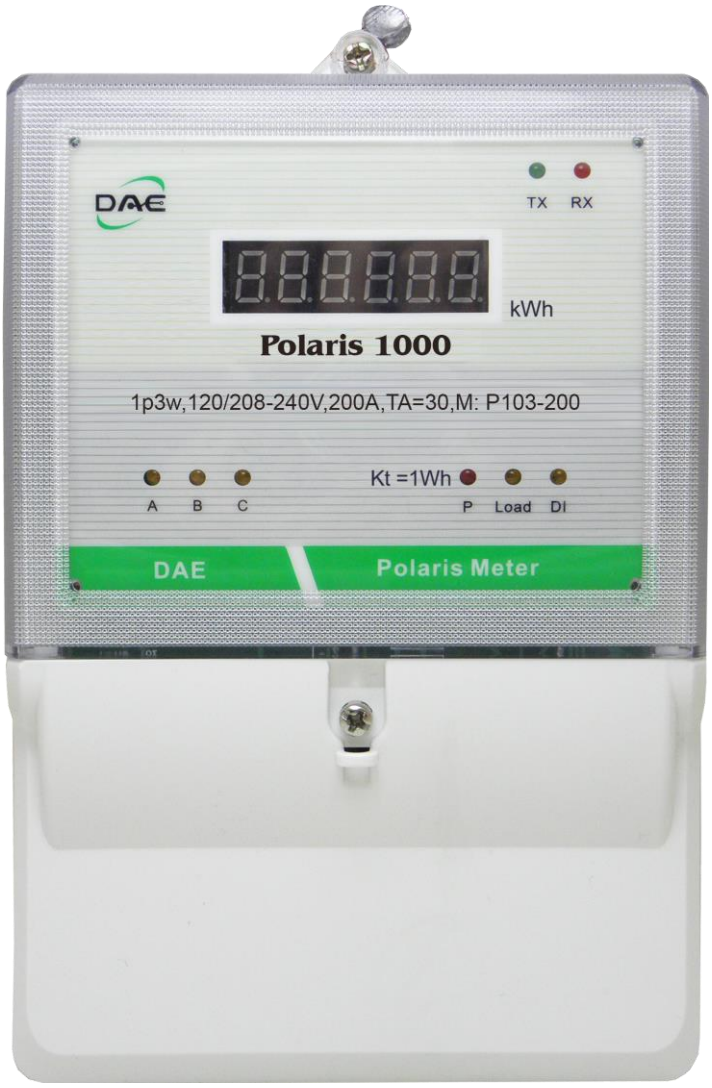
Polaris 1000

User's Manual



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Polaris 1000 User's Manual, 2019, Nov.

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Safety Precautions

Please read these safety instructions before using this equipment.

For safety purposes, please observe the following when unwrapping and installing the package：

1. When opening the package, check that the contents have not been damaged during transit.
2. Check to make sure that the product model and the labeling on the outside of the packaging are consistent.
3. This product is designed for and suitable for most electrical power panels.
4. Do not install this product at the openings of ventilation ducts or near heat sources.
5. Make sure that the actual wiring conforms to the wiring diagram designated in this manual.
6. Guard against dust and water damage.
7. Make sure all power sources to be connected to the product have been shut off before installing.
8. If the equipment is used in a manner not specified by manufacturer, the protection provided by the equipment may be impaired.

	This symbol means double insulation.
	This symbol means to beware of electric shock, turn off all adjacent sources of high voltage during installation.
	This symbol means there is risk of danger.

The Polaris is a sensitive electrical equipment, care should be taken so that the maximum benefit and performance can be derived from the device.

Before cleaning or performing any maintenance on the Polaris, disconnect the device from its power source. The input voltage and current should be either turned off or disconnected.

Cleaning

Use a dry cloth or dry brush to wipe away the dust, or use in conjunction with a vacuum cleaner to suck the dust as it is being wiped away. Do not use any water or other liquid cleaning agents.

Ventilation

Check to make sure that there is sufficient space around the periphery of the Polaris to allow air to circulate. Reposition any extraneous wiring that is on the Polaris.

Maintenance

Check to make sure that the wiring contacts are tight and making good contact, tighten any terminal screws that may have loosened over time from jarring or vibration. Make sure that the wiring contact of each terminal is not touching or shorting adjacent terminals.

Repair

Do not attempt to repair the product or modify the circuitry; contact the product representative or a qualified electrical person if the product requires repair or servicing.

CONTENT

1 Introduction

1.1 General Description

The Polaris 1000 meter is an electronic kilowatt-hour (kWh) meter that is designed for permanent connection to an electrical service. It is designed for single phase applications.

Polaris 1000 meters can be used in 1 phase 2 wire and 1 or 2 phase 3 wire configurations.

1.2 Features

- Revenue-grade accuracy
- Non-volatile memory, the stored data is maintained through power outages
- Use with DAE's dedicated split-core CTs (50~600A). Optional solid-core CTs available in 50~600A.
- Parallel up to three sets of CTs for cumulative reading

1.3 Certifications

- UL/CUL Listed, California CTEP Approved. Certified by independent test lab to exceed ANSI C12.1 national accuracy standards.

1.4 Specifications

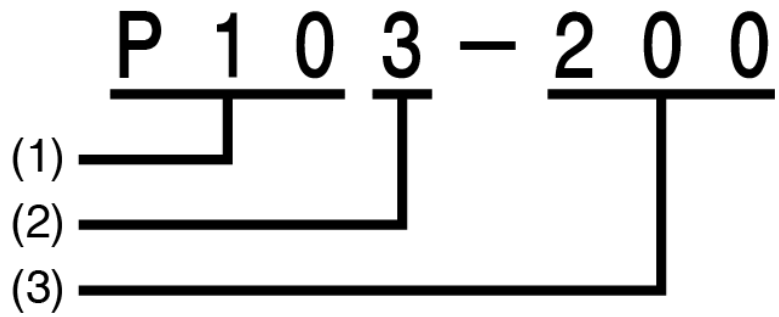
Item	Description
Frequency	50/60 Hz
Working Voltage	Derived from A phase
Power Consumption	7VA
Measured Parameters	kWh (default), water meter pulse count (optional)
Operating Environment	-20~50℃ (-4~122℉) 0~95%RH (non-condensing)
Accuracy [1]	0.5% from 1% to 100% of rated load
Weight	733g (regular terminal cover) 690g (**special** terminal cover [2])
Dimensions [2]	W 5" x H 7.42" x D 2.24" wall-mount (regular terminal cover) W 5" x H 6.5" x D 2.24" wall-mount (**special** terminal cover [2])

[1] Based on DAE solid-core CT @ PF=1

[2] Please see section 2.5 Conduit and Wire Ingress.

1.5 Product Information

Polaris 1000 meters model No.



No.	Item	Description
(1)	Series	**P10** – Polaris 1000
(2)	Configurations	**3** – 1-phase, 2 wire, 120V 1- or 2-phase, 3 wire, 120/208~240V **4** – 1-phase, 2 wire, 208~240V
(3)	CT Rating	**200** – 50~200A depends on CT current range **400** – 400A **600** – 600A

Water meter option

Water meter pulse input is an optional feature, which needs to be specified when ordering. The meter with water meter pulse input function will be marked on the label on the left side of the meter.

Current sensor information

Model No.	CT Type	Amp	Compatible with
CT-50S / CT-50SB	Split-core	50A	P103-200, P104-200
CT-100S / CT-100SB		100A	
CT-200S / CT-200SB		200A	
CT-400S		400A	P103-400, P104-400
CT-600S		600A	P103-600, P104-600
CT-50D3	Solid-core	50A	P103-200, P104-200
CT-200D3		200A	
CT-400D6		400A	P103-400, P104-400
CT-600D9		600A	P103-600, P104-600

Current sensor requirement

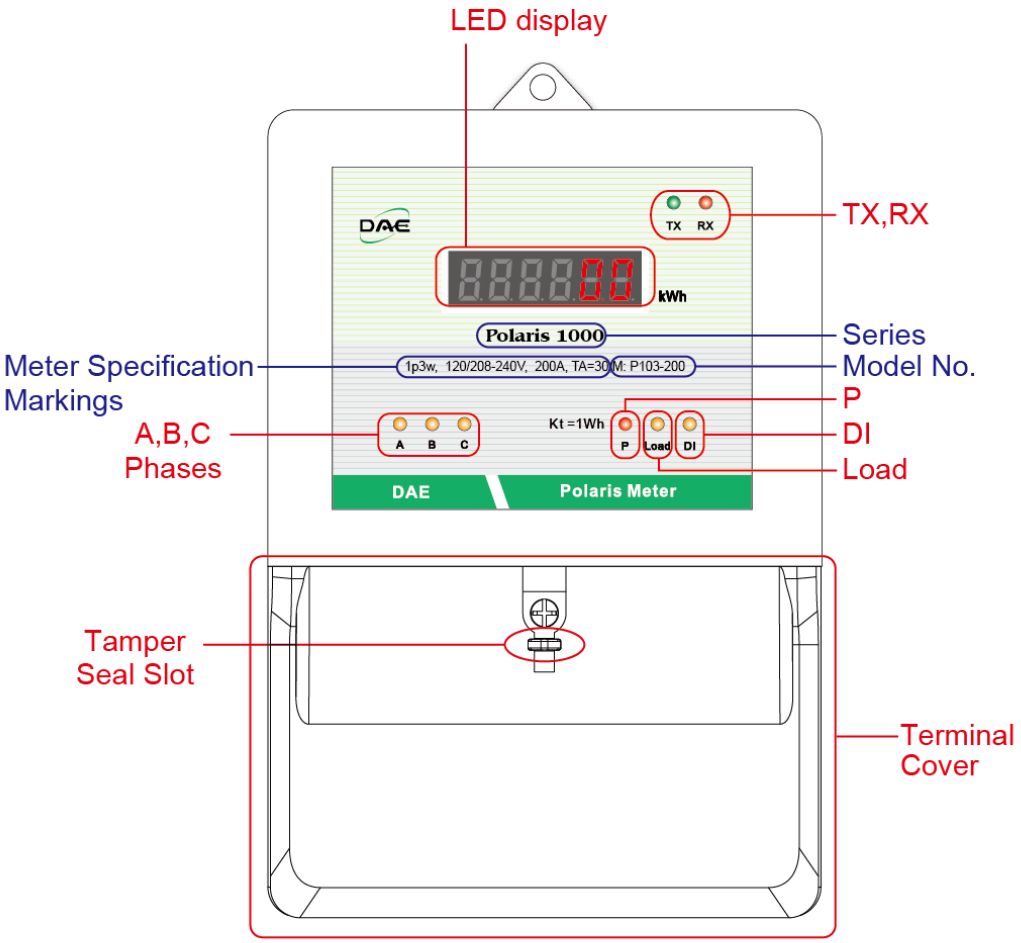
Configuration	CTs Required
1-phase, 2 wire	1 CT
1-or 2-phase, 3 wire	2 CTs

2 Installation

The Polaris is a sophisticated energy meter with multiple capabilities and functions. Before installation be sure to read and understand this section and the appropriate wiring diagrams. Installation of this device must be performed by qualified personnel according to these instructions and in conjunction with all applicable electrical codes. DAE Instrument and its representatives assumes no responsibility for any damage or injury resulting from the improper installation of this equipment.

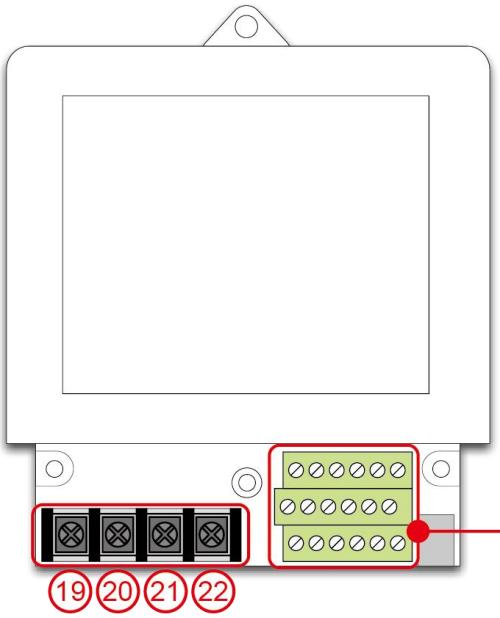
WARNING: Please make sure to read the "Safety Precautions" at the beginning of this manual before starting installation.

2.1 Front Panel

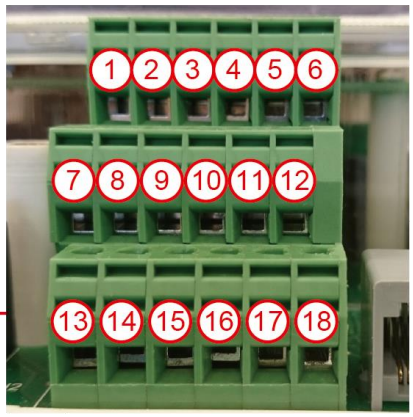


LED display	6-digit primary LCD display for showing kWh and other parameters
TX, RX	Reserved
A, B, C Phases	A, B, C phase voltage inputs indicator
P	Watthour test constant indicator Kt=1Wh (1000 imp/kWh)
Load	Load status indicator
DI	Water meter pulse input indicator
Terminal Cover	To cover the terminals
Series	Model series
Model No.	This specific model ordering code
Meter Specification Markings	Phase/wire, voltage, max current and test current

2.2 Terminals



Terminal cover removed



Voltage input terminals

(19)	VA	Phase A voltage input
(20)	VB	Phase B voltage input
(21)	VC	Phase C voltage input
(22)	VN	Phase N voltage input

CT input terminals

(13)	CT-A +	Phase A CT + input
(14)	CT-A –	Phase A CT – input
(15)	CT-B +	Phase B CT + input
(16)	CT-B –	Phase B CT – input
(17)	CT-C +	Phase C CT + input
(18)	CT-C –	Phase C CT – input

Water meter pulse input terminals (optional)

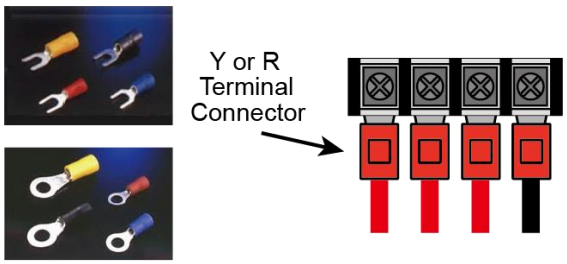
(3)	DI +	Water meter pulse input
(4)	DI –	

Other terminals (1~2, 5~12) are reserved.

Terminal detail

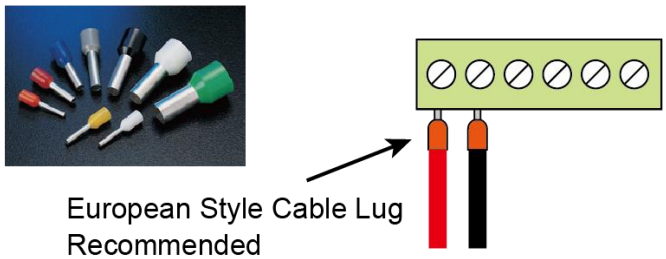
(1) Voltage input terminals

Use the proper size and wire type as per electrical regulations.



(2) Other terminals

Make sure that the wires are screwed tightly onto the terminals and making good contact.



(3) Recommended wire size

Terminal type	Wire range
Voltage input	#18-22 AWG, screw torque 16 lb-inch
CT input	#14-22 AWG, screw torque 5 lb-inch
Water meter pulse input	#14-22 AWG, screw torque 5 lb-inch

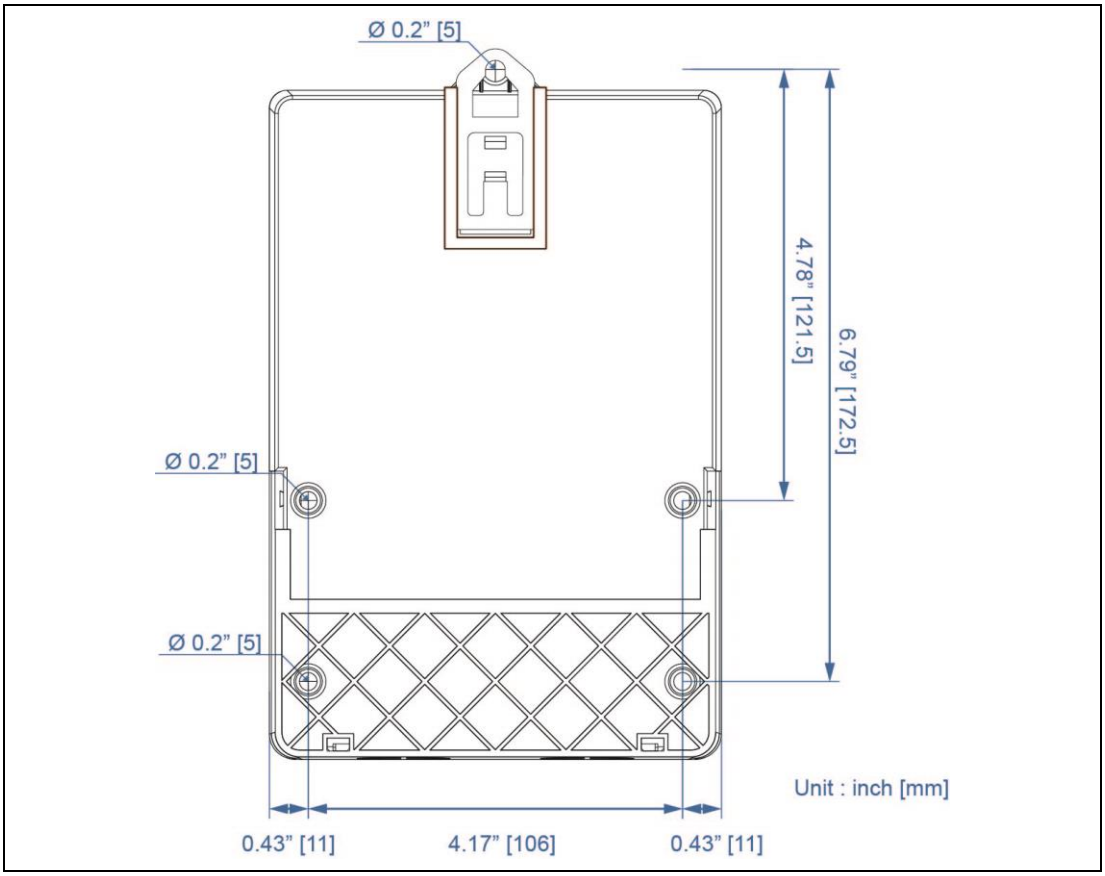
Note : It is important to make sure to consult your local electrical codes for proper sizing requirements.

2.3 Mounting Procedure

(1) The Polaris is wall-mounted, drill the screw holes according to the diagram below.

(2) Place the Polaris flat against the wall making sure that the mounting holes are aligned with the screw holes.

(3) Secure the Polaris using the screws through the mount holes.



2.4 Before Installation

(1) Check that the ratings and specifications of the model to be installed is suitable for its intended application.

(2) Verify that the dedicated CT being used is compatible with the type of Polaris. Note that the Polaris cannot be directly used with non-DAE dedicated CTs.

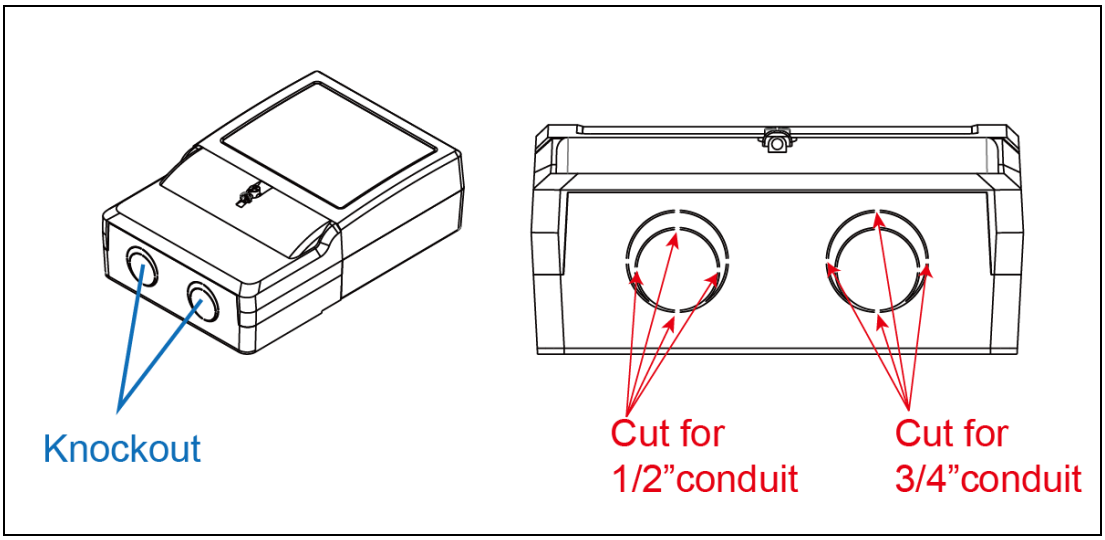
(3) Verify that the current rating of the dedicated CT being used is suitable for its intended load.

(4) Make sure to turn off all power sources to the Polaris and any adjacent power sources before performing the installation.

2.5 Conduit and Wire Ingress

(1) Regular terminal cover

Each Polaris meter has two knockouts at the bottom. Both knockouts can be cut open for either 1/2" or 3/4" conduit. For voltage and CT wirings, cut open the knockout for 3/4" conduit.



Note : Please use UL certified cables and conduits.

(2) Special terminal cover

An alternate terminal cover is also available (purchased separately) for use when the meter is to be installed within an enclosure. The voltage and CT wires will enter the meter through the rear opening of the terminal cover.

2.6 Meter Installation

(1) Attach the dedicated CTs to the CT terminal with their appropriate phases.

(2) Connect the phase A voltage terminal of the Polaris to the corresponding power source with an intermediate fuse.

(3) Connect the voltage terminals of the Polaris to their corresponding phase voltages. (* Use 18 to 22 AWG, 600V wire for the voltage terminals.)

(4) Assemble the CTs onto the corresponding conductors being measured making sure that the direction and orientation of the CTs with wiring are consistent. With solid core CTs, the wire must be threaded through the CT, which would necessitate disconnecting the wire from the load. With split core CTs and clamp type CTs, the CT can be opened and clipped or clamped onto the conductor without the need to disconnect the wiring to the load.

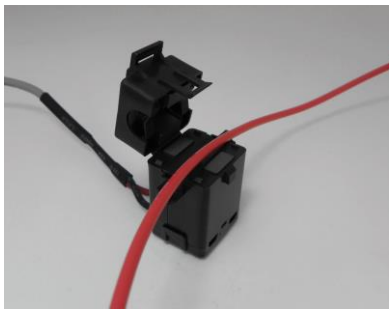
2.7 CT Installation

The Polaris can only make use of the dedicated CTs provided by DAE. There are two types of dedicated CTs as shown in the following descriptions.

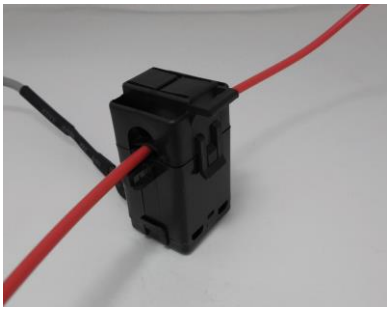
(1) Split-core CT installation

Load side

Step 1. Open the split-core CT



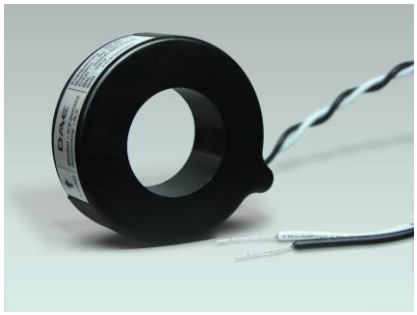
Step 2. Lay the load wire inside the opening



Step 3. Snap close the split-core CT

Meter side

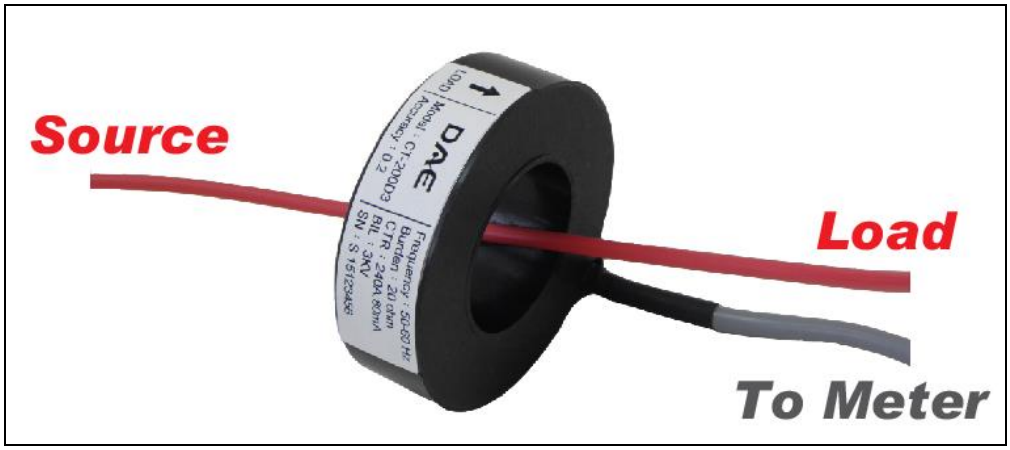
Connect the CT white wire to the CT+ terminal on the meter, and the CT black wire to the CT– terminal on the meter. Please refer to section 2.2 on Terminals.



(2) Solid-core CT installation

Load side

With solid core CTs, the wire must be threaded through the CT, which would necessitate disconnecting the wire from the load.

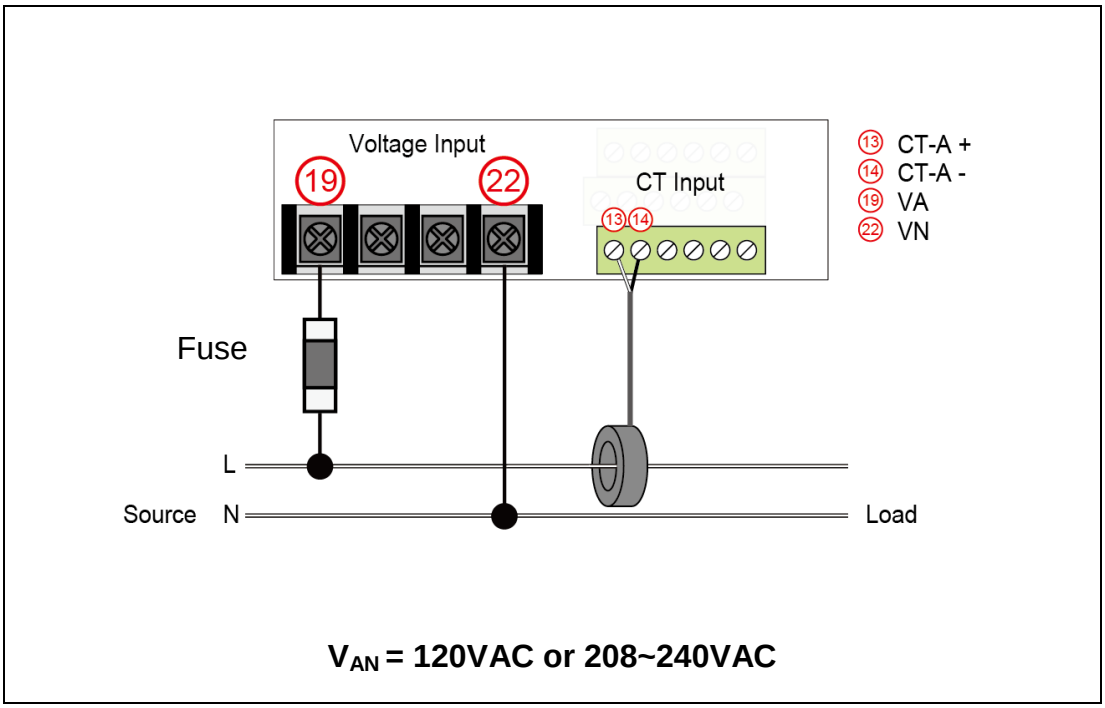


Meter side

Connect the CT white wire to the CT+ terminal on the meter, and the CT black wire to the CT– terminal on the meter. Please refer to section 2.2 on Terminals.

2.8 Wiring Diagram

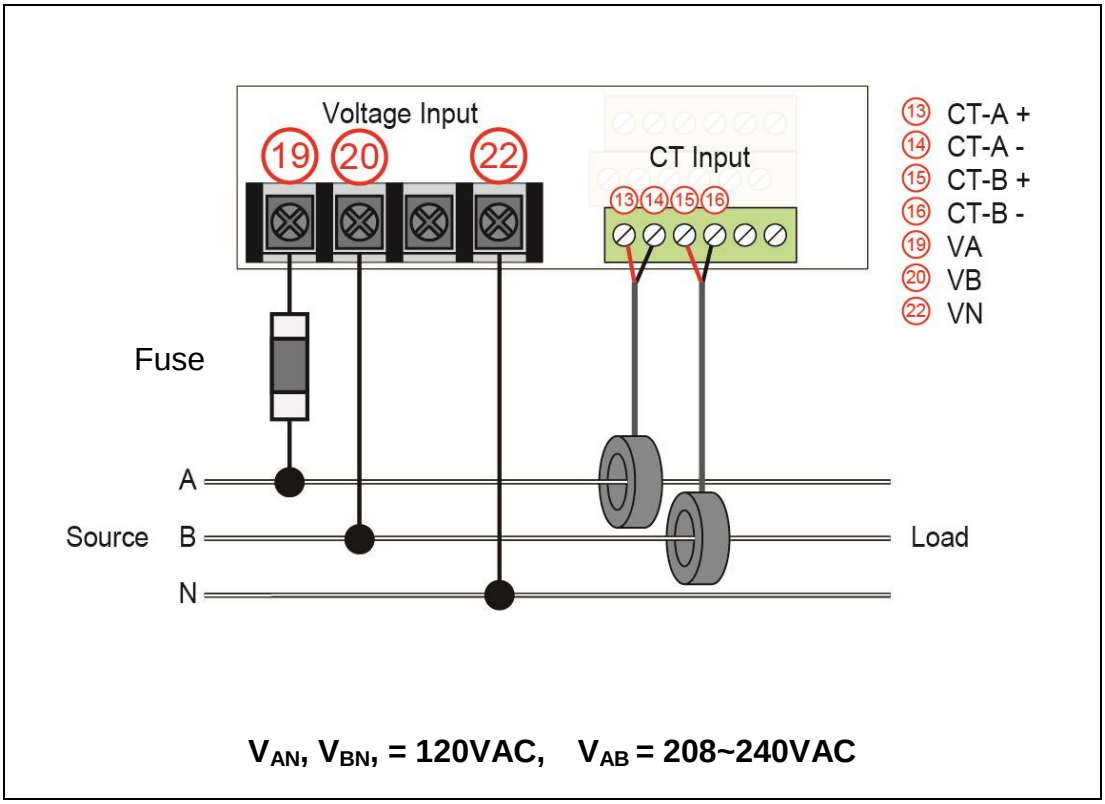
(1) 1-phase, 2 wire



V_{AN} = 120VAC or 208~240VAC

Note : Please install a fuse for each voltage input. (Except the phase N)

(2) 1- or 2-phase, 3 wire



V_{AN}, V_{BN}, = 120VAC, V_{AB} = 208~240VAC

Note : Please install a fuse for each voltage input. (Except the phase N)

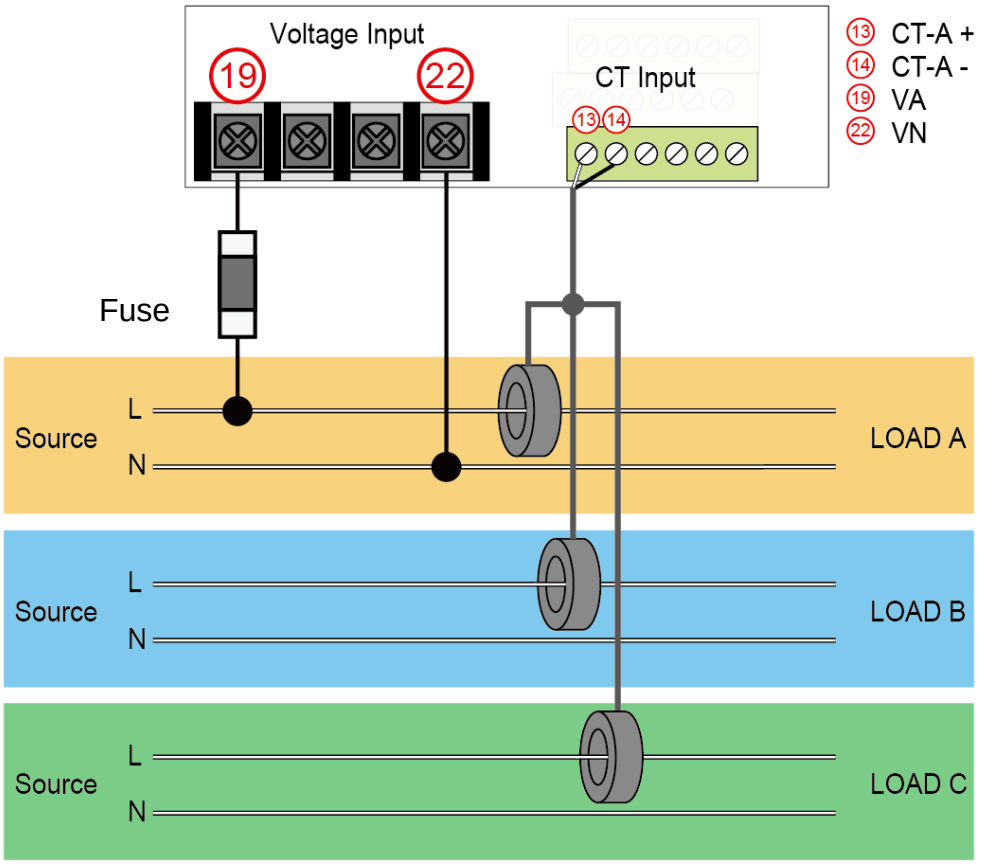
2.9 Measuring Multiple Loads with One Meter

(1) The loads must be the same configuration and come from the same power source.

(2) Each meter can accept 3 loads at most, each load needs to have its own set of CTs and each CT must be of the same rating.

(3) The load wires threaded through the CTs must be in the same direction. Each of the CTs for the same phase on different loads must be connected to the correct polarity (CT white wire to the CT+ terminal on the meter, and the CT black wire to the CT– terminal on the meter)

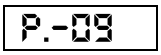
e.g. 1 phase, 2 wire on 3 loads



2.10 Power Supply

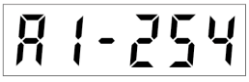
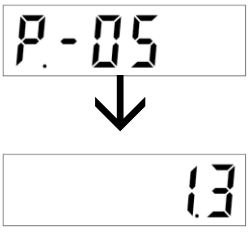
The power supply of the Polaris is derived from the phase A voltage. To provide additional protection for the Polaris, a fuse should be placed between the Polaris and the power source as shown in each of the electrical wiring diagrams.

3 Display

The Polaris 1000 meter normally displays the kWh reading, but if a water meter feature is enabled, the display will toggle between the kWh (Page 5, ) and pulse count of the water meter (Page 9, ).

3.1 Startup Display

The power up sequence of the Polaris shows the following information on the display:

#	Display Shows	Example	Description	Range
1	8.8.8.8.8.8.		LED display test	---
2	A1-**xxx**		Reserved	---
3	b1- **xx**		Reserved	---
4	r--**xxx**		Firmware version	Varies
5	1000**ab**		Polaris type and function	(1) 1000 = Polaris 1000 (2) **a** = w (with water meter) **a** = n/a (without water meter) (3) **b** = n/a (P10**x**-200) **b** = 4 (P10**x**-400) **b** = 6 (P10**x**-600)
6	8.8.8.8.8.8.		LED display test	---
7	P.-05 ↓ **xxxxx.x**		Page 5 Energy (kWh)	0~99,999.9 kWh

4 Troubleshooting

The Polaris meters are fully calibrated and tested during production. The Polaris meters should work normally if installed properly by correctly following our installation guide. If the meter has any problem, please consider the following troubleshooting procedures.

Problems or Symptoms	Possible Causes and Solutions
The LED does not light up.	(a) Check that the voltage input terminal wiring are connected properly. (b) Check that the fuse and circuit breaker are neither blown nor tripped, respectively. (c) Check to make sure that power is being supplied from the power source to the voltage input. (d) Check that the power source voltage is within the rated power supply. (e) Check to make sure that the enclosure or terminals are not damaged.
kWh value is not incrementing.	(a) Check that CT wiring to the terminals. (b) Check to make sure that the measured circuit corresponds to its phase. (c) Check to make sure that the power is on for the load circuit being measured. (d) Check the fuse or circuit breaker. (e) Check to make sure that only the L wire passes through the CT. If the N wire is also passing through then remove it from the CT. (f) The CT may be damaged or defective, swap it with another CT for a cross check. If defective or damaged, replace the CT.

Problems or Symptoms	Possible Causes and Solutions
Any Voltage input indicators do not light up.	(a) Check to make sure that the voltage input terminal wiring is connected properly. (b) Check the voltage input terminals are not damaged.
The accumulation of kWh does not match total consumption.	(a) Check to make sure the voltage input is continuously 24 hours/day. (b) Check the CT wiring direction on load and polarity on meters if parallel 2 or 3 CTs for any phase. When parallel 2 or 3 CTs, the wiring direction and polarity must be the same.

5 Frequently Asked Questions

Q. Why is the kWh value of a new Polaris meter not zero?

A. Each Polaris meter must proceed a loading test with a calibration exam before put in stock. The kWh value exists to make sure this unit passes the calibration exam.

Q. What is the meaning of Kt = 1Wh?

A. It means 1000 pulses will be output for every kWh. Another way of saying it is that 1 pulse is output for every Watt. The P indicator will flash once for every Watt consumed.

Q. Does the Polaris meters come with its own CTs? Can I make use of my own CTs?

A. The Polaris meters are sold with the CTs included which cannot be used direct connects. The Polaris 1000 meters use DAE's dedicated CTs and can accept neither regular 5A output CTs nor dedicated CTs from other suppliers. The CT input of the Polaris can only accept milli-amps which matches DAE's dedicated CTs. Connecting a regular 5A output CT directly will thus damage the Polaris meters.

Q. Can the CT lead wire be extended?

A. Yes, the CT lead wire can be extended up to 2000 feet. An example of a suitable cable would be the 7958A or the 7957A from Belden cables. It is important to make sure to consult your local electrical codes for proper sizing requirements.

Q. Can a single CT be used to monitor multiple circuits?

A. It is possible to do so if the different circuits share the same phase and power source. The L wire for each circuit must go through the CT in the same direction, and the current rating of the CT in must be higher than the total amperage for all the circuits to be measured.

Q. Can a single Polaris be used to monitor two different sub panels?

A. It is possible if the two sub panels have the same power source. If the two sub panels do not share the same power source, then two separate Polaris must be used.

Q. What will happen if the polarities are reversed for each of the CT?

A. The Polaris only considers the absolute value of the current and disregards the direction; thus, the current and energy values can only be positive. However, we still recommended that the CTs be connected with the correct wiring orientation.

Q. What does Polaris message "cht-01" mean?

A. It means that the circuit currently being measured has a power factor that is less than 0.5. This is not normal behavior and could be caused by having the phases reversed (voltage and current phases are not properly matched), or there may be some run-down equipment that are in need of repair or replacement. Check to make sure that the voltage and current inputs are matched properly, if they are, they check the condition of equipment on the circuit being measured.

Q. I have checked and followed all the troubleshooting guidelines but my problem is still not resolved; what should I do?

A. Contact our technical support by phone or email before concluding that the unit is faulty and removing it. Our technical support team will help to diagnose your problem and provide advice on potential fixes. Please see Section 7, **Supplementary Information**, for our contact info.

6 Warranty and Return Policy

6.1 Warranty

The warranty is effective for a period of five years from the date of shipment. The buyer must inform DAE of the defect within 80 days after the defect is experienced or found. DAE's responsibility is limited to repair, replacement, or refund, any of which may be selected by DAE in its sole discretion. DAE reserves the right to substitute functionally equivalent new or serviceable used parts.

This warranty covers only defects from normal use and does not include the damage due to improper installation, improper maintenance, misuse, neglect, water damage, acts of nature, tornadoes, any alterations or repairs that are not DAE.

DAE's liability to the Customer from the sale of DAE's products, whether such liability is asserted on the basis of contract, tort or otherwise, shall not exceed the purchase price paid by Customer for the products claimed.

6.2 Return Policy

All returned material must be in good, "as new" and in salable condition. A 20% restocking fee is charged on all RMA's.

Products may not be returned if more than 80 days have elapsed since the shipment date from DAE.

Buyer must notify DAE and request a Returned Material Authorization Number (RMA Number) and state the specific reason for return. Unauthorized returns will not be accepted. When requesting an RMA Number please supply the following information:

(1) Distributor name and address
(2) Model number of meter
(3) Original purchase order number
(4) Reason for return

All paperwork and boxes must be marked with an RMA number issued by DAE. All authorized returned materials must be shipped freight prepaid to DAE. DAE is not responsible for uninsured packages or packages lost by your carrier.

RMA's are only valid for 30 days. The buyer will be responsible for all return shipping costs and customs duties.

7 Supplementary Information

Please add fuses to the voltage input to protect damage from a short circuit.

Our contact information

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