MT-1/WT3

HIGH ACCURACY THREE-PHASE WIRELESS WATTHOUR METER TESTER

USER GUIDE

PROBEWELL

MT-1/*WT3*

User Guide

Version 2.3 – March 2021

IT IS ESSENTIAL THAT OPERATORS THOROUGHLY READ THIS INSTRUCTION MANUAL BEFORE PUTTING THIS PRODUCT INTO SERVICE.

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Your MT-1/WT3 comes with a two-year hardware warranty. Probewell Lab Inc. (Probewell) warrants this MT-1/WT3 against defects in material and workmanship for a period of two (2) years from the date of purchase from Probewell. This warranty applies only to the original purchaser of the MT-1/WT3 and is not transferable.

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Table of Contents

List of Abbreviations

Abbreviation	Complete term
A	Ampere
Amp	Ampere
AC	Alternating current
AP	Access point
ATK	Accuracy Testing Kit
CFM	Cubic feet per minute
CL	Class
CSV	Comma-separated values
CT	Current transformer
DSP	Digital signal processor
HL	High load (full load)
Kh	Watthour constant. The number of watthours represented by one revolution of the disk. Also called disk constant.
Kt	Test constant. For electronic (no disk) meters, the amount of energy represented by each calibrated pulse of the LED.
kW	Kilowatt
Lb.	Pound
LL	Light load
NIST	National Institute of Standards and Technology
PF	Power factor
PPI	Pore per inch
Rev	Revolution, number of revolutions
RMS	Root mean square
TA	Test ampere
THD	Total harmonic distortion
V	Volt
VA	Volt-ampere
VAC	Volt(s) of alternating current
VARh	VARhour (volt-ampere reactive hour)
Vdc	Voltage direct current
VT	Voltage transformer
W	Watt(s)

Abbreviation	Complete term
Wh	Watthour
WiFi	Wireless fidelity
WLAN	Wireless local area network
WWW	World Wide Web
µWh	Micro-watthour
µVARh	Micro-VARhour

Chapter 1

Introduction

The Probewell Lab MT-1/WT3 is a portable three-phase meter tester with built-in WiFi technology.

MT-1/WT3 Overview

The MT-1/WT3 test socket adapter weighs only 6.4 lb which makes it the ideal tool for field testing. With the MT-1/WT3, meter technicians can accurately test residential, commercial or industrial electricity meter on site in mere minutes.

The MT-1/WT3 can be set to test all three phases simultaneously in one step (*Quick Test*) or set to test the three phases simultaneously, followed by each element separately (*Full Test*). The MT-1/WT3 provides measurements for active and reactive energy with forward and reverse flow testing capability.

The MT-1/WT3 has a built-in three-phase phantom load consisting of synthesized 50 A current sources and a three-phase electronic standard with a typical accuracy of ±0.02% and a guaranteed accuracy of ±0.05%. It comes with a complete calibration report certifying measurement accuracy across its entire operating range.

The MT-1/WT3 comes with a shock-resistant carrying bag. The bag has individual compartments for the test socket, the pickups, the update cable and the User Guide. There is also enough space for small accessories, such as the magnetic adapter for the optical pickup, seals, pliers, etc.

Optional: A handheld remote is available for the MT-1/WT3. It has a keypad and an LCD display and weighs only 0.6 lb.

Chapter 2

Description

The first part of this chapter describes the MT-1/WT3 socket. The second part explains the theory of operation for the tester.

MT-1/WT3 Socket

The MT-1/WT3 socket is cylinder-shaped, designed to be easily inserted in both ringless and ring-type meter bases. A latch with a quick release mechanism is available as an option for ring-type meter bases.

The socket contains three 50A synthesized AC current sources to simulate resistive and reactive loads, a high accuracy three-phase electronic standard and a WiFi communication controller.

The rear of the socket has six standard fixed tabs with bypasses and two removable twist tabs, with twist-and-lock mechanism. The socket gets its power directly from these back tabs and accepts an input voltage from 100 to 600VAC.

The twist tabs can be placed at the 3, 5, 6 or 9 o'clock position as required by the meter base where the test is being conducted. The twist tab at 3 o'clock can be inserted at two different positions to hold either forms 6S, 8S, 9S or form 4S. The twist tab at 9 o'clock can be inserted at two different positions to hold either forms 6S, 8S, 9S or forms 3S, 4S, 12S. One of the twist tabs can be placed at the 5 o'clock position for some 3S or 12S meter bases or at the 6 o'clock position for 14S, 15S, 16S meter bases. See Appendix C for all twist tab configurations.

The front of the socket has seven jaws and five spring-loaded contact pistons. The pistons are actuated by the meter’s middle lugs. A spring contact at the 6 o'clock position is also provided for 12S meters. The meter under test is entirely controlled by the socket. No setup wiring is needed.

The socket has a dead-front design for safer operation. The front jaws of the socket only become live when a meter is inserted. See Appendix A for all technical specifications.

Front/Rear View of the Socket

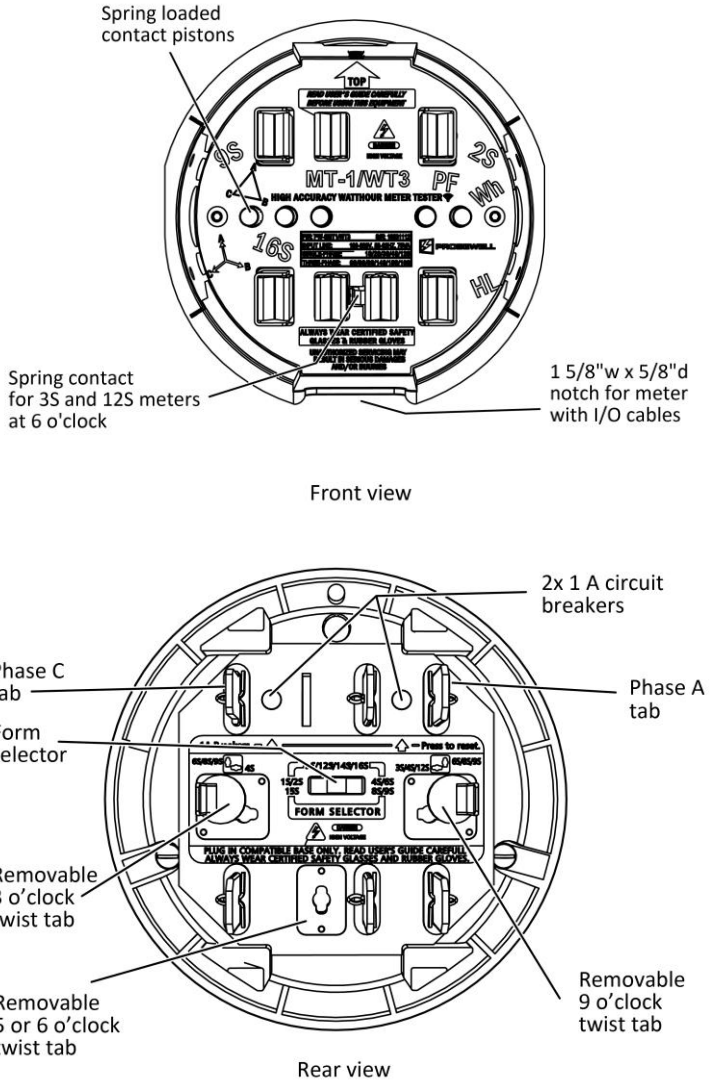


Fig. 2.1 – Front and Rear View of the Socket

Fig. 2.1 shows the removable twist tabs which do not require any tools to be move from one position to another. The above illustration shows the twist tabs positioned at 3 and 9 o'clock.

Side View of the Socket

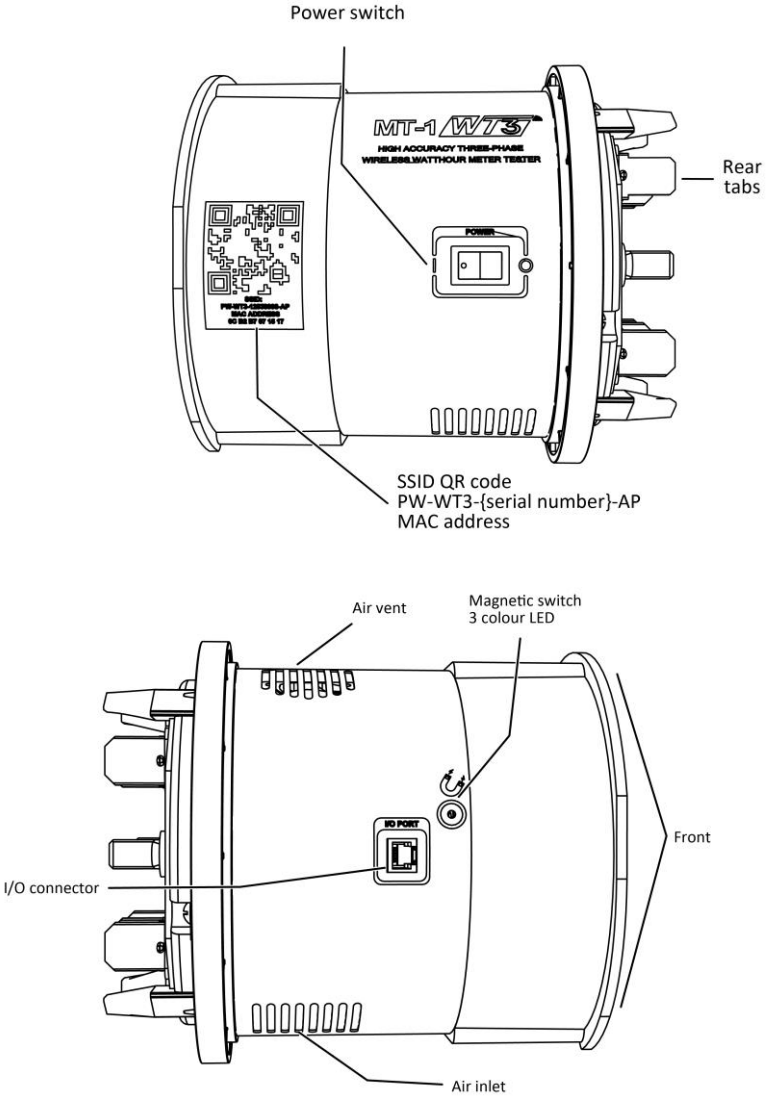


Fig. 2.2 – Side View of the Socket

Identification	Description
Rear tabs	The rear tabs connect the socket to the front jaws of the meter base. The socket gets its power directly from the meter base (100–600 VAC) circuit. The service current shorting bars (bypasses) are rated for high capacity amperage.
Removable tabs	These tabs can be positioned at the 3, 5, 6, or 9 o'clock position as required by the meter base where the test is being conducted. See Appendix C.
Form selector	In position 1S/2S/15S, the unit is powered from the two upper tabs. In position 3S/12S/14S/16S, the unit is powered from the Phase C and the neutral tab. In position 4S/6S/8S/9S, the unit is powered from the 3 and 9 o'clock tabs.
Circuit breakers	Protection for the MT-1/WT3 and the meter. Two 1 A circuit breakers, which can be reset by pressing a spring-loaded button.
Power switch	Socket's main power On/Off switch.
Front jaws	The front jaws are controlled by internal relays used to test the meters. The front jaws only become live when a meter is inserted. The voltage on the front jaws is current limited for additional protection.
Pistons	These are actuated by the small lugs on the back of the meter when inserted for testing.
I/O connector	Isolated full-duplex communication port. It also provides an isolated and current-limited low-voltage supply for the accessories (Optical Pickup and Metercam) and the optional handheld remote control.
QR code sticker	The QR code sticker contains the access point information to be scanned for a mobile device as well as the MAC address.
LED	Socket status indicator.
Magnetic switch	Switch for any manual entry using a magnet.
Air vent [(1)]	Warm air exit. A 5 CFM miniature fan forces air circulation inside the socket.
Air inlet [(1)]	Cool air input. Filtered through a polyurethane foam filter.
[(1)] Do not block air circulation. Keep away from direct heat or flame.	

Theory of Operation

MT-1/WT3 applies a load to the meter under test, then measures the exact quantity of energy that passes through the meter. After a predetermined number of disk revolutions, or a minimum time in the case of a solid-state meter, the test will end, and the application (Probewell Connect) will display the difference between the meter and the MT-1/WT3's internal electronic standard.

Current Applied to the Meter

The current applied to the meter under test is achieved by three independent built-in 50 A synthesized AC current sources. The current level is adjustable and regulated. The current sources simulate loads at unity and at a lagging power factor of 0.5. They are isolated and form three independent current loads in closed-link arrangement. This configuration makes it possible to check a meter without needing to open its potential link and setting up any wiring.

Voltage Applied to the Meter

The voltage applied to the front jaws is derived from the meter base circuit. For safety reasons, the voltage is only applied to the front jaws when a meter is inserted. The voltage is also current-limited.

The front jaws of the MT-1/WT3 are controlled by internal relays used to test self-contained and CT-rated three-phase and single-phase watthour meter form configurations with no wire setup necessary.

Built-in Electronic Standard

The MT-1/WT3's built-in electronic standard offers exceptional accuracy thanks to the use of electronic transducers developed by Probewell. These transducers have an exceptional long-term stability and linearity and are not affected by temperature.

The electronic standard does not contain any potentiometers or other types of screw adjustment that could become unstable with time. It uses digital technology to ensure maximum reliability over time. A DSP processor measures and calculates the exact energy, active or reactive, that passes through the meter. This technology has the advantage of a more compact and lightweight electronic standard, with smaller, lighter electronic components.

Accuracy Test

The MT-1/WT3's electronic standard is calibrated using a primary standard traceable to NIST and comes with a complete calibration report certifying measurement accuracy on both Wh and VARh scales over its entire operating range. Accuracy test on MT-1/WT3 can be conducted in your own laboratory using:

- An electronic reference standard traceable to NIST. The electronic standard must have at least one isolated current input port of a minimum capacity of 50 A with auto ranging capability and a typical precision of 0.01% or better.
- A laboratory-stabilized and -isolated AC power source with fundamental waveform selectable 120 V or 240 V, 60 Hz, rated at least 150 VA.
- The Accuracy Test Kit (ATK-3) for three-phase testers.

For more information on the socket accuracy test please refer to the ATK and Probewell Connect for WT series documentations.

Meter Testing

Tests performed with a pickup accessory (Optical or Metercam)

Five different tests can be performed with optical pickups: Quick, Full, Custom, Four-Quadrant (Wh) and Four-Quadrant (VARh).

Quick Test, Full Test, Four-Quadrant (Wh) Test and Four-Quadrant (VARh) Test are made up of a predetermined sequence of consecutive steps and tests, all of which are performed in a single operation. The sequence is programmable and can be modified through the "Settings" tab. By default, the sequence includes one test point for each of the loads: HL, PF and LL.

In **Quick Test,** the three phases (ABC) are tested simultaneously in one step.

In **Full Test,** a Quick Test is performed followed by each phase (A, B, and C) tested separently. In the "Settings" tab, there is an option to remove the PF and/or LL for each single-element test.

In **Four-Quadrant (Wh) Test**, the equivalent of a Quick Test is conducted at various phase lags between voltage and current. This is meant to test the meter's operation in all four quadrants of the power vector diagram. For this test, the device expects the meter to pulse on Wh units.

In **Four-Quadrant (VARh)Test**, the equivalent of a Quick Test is done at various phase lags between Voltage and Current. This is meant to test the operation of the meter in all four quadrants of the power vector diagram. For this test, the device expects the meter to pulse on VARh units.

Please note that with single-phase meters, only the Quick Test, Four-Quadrant (Wh) Test and Four-Quadrant (VARh) Test will be activated as there is no Full Test for single-phase meters.

Custom Test consists of choosing one of the three loads to apply to the meter: HL, PF or LL. The pickup automatically counts the disk revolutions or pulses. No critical timing is required to start a test. The test ends automatically.

When testing a three-phase meter, you can also choose to apply the load on all phases (ABC) at the same time or on each phase individually (A, B or C). Select the appropriate phase (A, B, C, or A+B+C) in the "Select Active Phase" drop-down window.

Tests performed without a pickup accessory (Optical or Metercam)

Manual Test is when the operator counts the disk revolutions manually. The test is started and stopped manually by applying a magnet to the side of the socket (see Figure 2.2). Operators can set their own parameters for conducting a test, such as the number of revolutions and the load to be applied. The load can be switched dynamically during the test.

Please note that without the help of a pickup, if the operator signals the start or the end of a test with the magnet too early or too late, the number of disk revolutions (whole number, no fractions) may not be accurate and will affect the test's precision.

Tracking Test is similar to Manual Test except that the socket counts the number of revolutions and displays them on your wireless device. The count is based on the selected Kh for the meter and the cumulative watthours recorded by the MT-1/WT3, not the physical count of the disk revolutions. A magnet can be used to start and end the test.

kW Demand Test allows the operator to perform a kW demand test. The test is calculated using this formula:

kW = kWh x 60/T

Where T = Demand interval length in minutes

Note: With solid-state metering, conducting energy and demand tests may be considered redundant since they are both results of the same measurement.

Set up the meter for a kW demand test following the manufacturer's instructions. Please note that instructions for conducting kW demand tests will vary by manufacturer, as per their respective technical guides.

Line Monitor Test analyzes the input voltage to statistically determine the line voltage, frequency fluctuations and its harmonic content (THD) up to the 32nd order.

KYZ Test is used to verify the KYZ or KY meter's output pulses.

Accessories

Metercam

The Metercam is used with electromechanical (rotating disk) meters. It is a digital disk sensor without the many drawbacks of most photoelectric sensors, such as difficulty in aligning properly and sensitivity to light. With the Metercam, no alignment is necessary since it detects and picks up the disk by itself. Another feature is its electronic shutter, which makes it impervious to light variations, including bright sunlight.

The Metercam is built around a miniature digital camera with a ½" field view combined with a RISC processor that detects the meter disk's position and automatically locks onto the reference point (black flag).

The Metercam is mounted on four suction cups installed directly on the back.

For a secure and lengthy hold, lightly moisten the inside of the suction cups, especially when field testing in colder weather. Also, keep the inside of the suction cups clean.

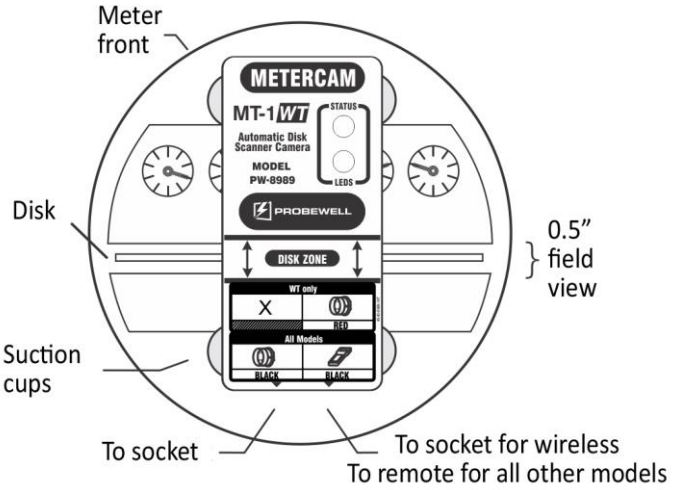


Fig. 2.4 – Metercam

Note: A side-mount Metercam is available for electromechanical meters with a hidden disk.

Optical Pickup

The Optical Pickup is used with solid-state meters. It is mounted with a suction cup or integrated in a magnetic head that detects infrared light pulses generated by solid-state meters. The optical pickup uses edge triggering for less sensitivity to changes. On the top of the pickup's head, there is a pulse indicator in the form of a visible red LED that flashes when pulses are being received.

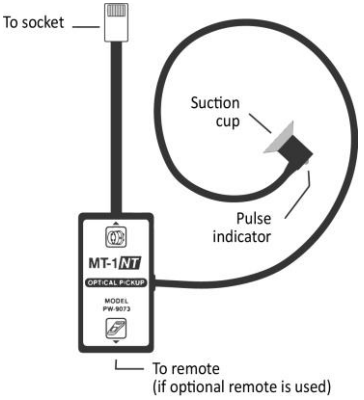


Fig. 2.5a – Optical Pickup

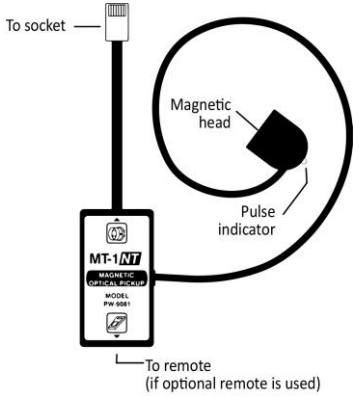


Fig. 2.5b – Magnetic Optical Pickup

Adapters

The **Focus Adapter** is used with the Optical Pickup for meters with a protuberant shape over the test pulse.

The **Magnetic Adapter** is used to affix the Optional Pickup's suction cup on meters with a metallic port.

Meter Adapters

Sensus 3S: This adapter is used to test Sensus' 3S meter. The meter will be damaged if this adapter is not used.

Class 320: This adapter is used to test 4S and 12S meter in a CL320 meter base, without this adapter the WT3 will not be insertable in the meter base.

Chapter 3

Operation

CAUTION!

MT-1/WT3's is strictly reserved for personnel authorized to manipulate electric installation meters. For safety reasons, ***certified safety glasses and rubber gloves*** are strongly recommended, but are not provided with the MT-1/WT3.

The operation of removing and inserting a meter from its meter base under power exposes live electric terminals. **Use utmost caution. Do not stick your hands or any metal objects into the open meter base. You could suffer bodily burns, electric shocks and even electrocution.**

It is imperative that you **follow your company's safety procedures**.

Summary

The MT-1/WT3 is compatible with meter forms 1S, 2S, 3S, 4S, 6S (36S, 46S), 8S, 9S, 12S (25S), 14S, 15S and 16S as well as Fitzall™. Before testing a meter in the field, always make sure the meter base's electrical wiring is fully compatible with that shown in Appendix B.

The MT-1/WT3 socket must first be inserted between the meter base and the meter. The installation procedure for a ringless meter base is described hereafter in Fig. 3.1.

When powered on, the MT-1/WT3 recognizes the type of meter installed and validates of the form and the TA required. With some meters, it is sometimes necessary to select the form manually.

When a pickup (Optical or Metercam) is used, the socket detects the meters's Kh and uses it. If for some reason the suggested Kh does not match the Kh indicated on the meter, the operator can change it manually by restarting the socket and disabling "Kh autodetection". If not using a pickup, the operator must manually enter the meter's Kh.

The next step is to choose a type of test to perform.

If a pickup is used, testing becomes fully automatic and the available test modes are: Custom, Quick, Full, Four-Quadrant (Wh) and Four-Quadrant (VARh)*.

If not using a pickup, the available test modes are: Manual and Tracking. In Tracking, the test is conducted manually and the meter disk (or simulated disk for solid-state meters) must complete a precise number of revolutions. It is up to the operator to start and stop the test at the right time by pressing "START/STOP" or using the magnetic switch on the side of the socket.

Once the load is applied and the test has started, the MT-1/WT3 measures the energy that passes through the meter with its internal electronic standard. All the important measurements are shown on the mobile device or computer display while testing.

When the test ends, the test result is displayed in percentage error (e.g. -0.02%) or in percentage registration (e.g. 99.98%).

*The Four-Quadrant (Wh) and the Four-Quadrant (VARh) test are only available for electronic meters with an optical pulse.

Installing the Socket

1. Removing the Meter

WARNING:

Do not remove the meter when it is under a heavy load to avoid sparks. The front jaws of the meter base are live. **Do not stick your hands or any metal objects into the meter base! Certified safety glasses and rubber gloves are strongly recommended.**

Carefully remove the meter from its base **according to your company's safety procedures**. Avoid removing the meter under heavy load it may cause sparks. Before removing the meter from a CT-rated meter base, **be sure to short the secondary CTs** to prevent equipment damage and personal injury.

Make sure the wiring connecting the meter to the line is compatible with one of the configurations shown in Appendix B. If not compatible, stop here and put the meter back into place. Field-testing with the MT-1/WT3 is not possible for that meter installation.

2. Installing the MT-1/WT3 Socket[1]

Make sure the MT-1/WT3's power switch is set to "OFF". Check Appendix B to setup the twist tabs and the Form Selector before inserting into the meter base. For ringless meter bases, remove the latch if necessary, using the quick-release mechanism.

Hold the MT-1/WT3 socket firmly, with the arrow pointing upward and align the socket's rear tabs with the meter base's front jaws. Then firmly insert the MT-1/WT3 socket into the meter base. Secure the installation. For ring-type meter bases, a latch can be purchased as an option.

[1] When the MT-1/WT3 is used in the meter shop, do not plug into a test board. It will not run properly. You can use a single-phase four-jaw meter base with a capacity of at least 150 VA. Keep the Form Selector in the 1S/2S/15S position for all meter types. The nominal voltage must be respected according to the meter being tested.

3. Installing the Meter

Plug the meter into the front of the MT-1/WT3 socket. If I/O cables are present, place them into the notch before inserting the meter. Make sure everything is well-secured. The socket installation is complete. Operation examples are provided further on.

Installation Procedure (ringless meter base)

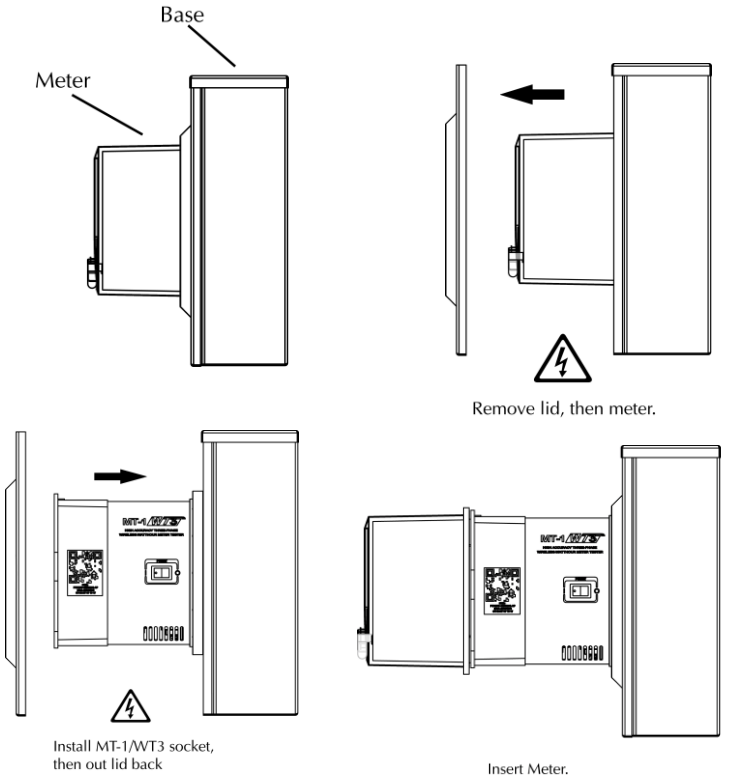


Fig. 3.1 – Installation Ringless Meter Base

THIS SYMBOL INDICATES THAT VOLTAGE IS PRESENT AND EXTREME CAUTION SHOULD BE USED.

ONLY INSTALL THE MT-1/WT3 SOCKET IN COMPATIBLE METER BASES. SEE APPENDIX B FOR COMPATIBILITY.

Connecting to the MT-1/WT3

This section explains how to connect to the MT-1/WT3 over WiFi for a quick start. For more detailed information, please refer to the Probewell Connect for WT Series documentation.

Setting up the connection

First, power up the MT-1/WT3 with the "On/Off" switch.

Probewell Connect for IOS and Android

Open the application on your mobile device.

> How to get the app:
> For iOS: Go to the Apple App Store.
> For Android: Go to Google Play Store.
> Search for "Probewell Connect".

Scan QR for a first use or select known socket SSID.

For a Probewell Connect App for Windows 10[1]

Go to "Windows Settings."

Select "Network & Internet."

Click on "Show available networks."

Locate the socket SSID within the available networks list.

Input the SSID name as the security key. (i.e., PW-WT3-{S/N}-AP). This number is located under the QR code on the side of the tester.

Wait to be connected to the socket.

Start the Probewell Connect* application from your computer.

> **Note**
> When the procedure has been completed once, the SSID will be accessible directly from the network list.
>
> Probewell Connect for Windows is downloadable from our website.
>
> (https://probewell.com/pw-connect/)

Running the Application

Please refer to the Probewell Connect User Guide.

[1] We recommend Windows 10; other versions are not being tested.

AvailableTests

- **Quick**: Tests all phases simultaneously with all loads (HL, PF, LL).
- **Custom**: Tests all phases simultaneously with only one load selected by the operator.
- **Full**: Performs a Quick Test and all phases separately (only available with polyphase meters).
- **Four-Quadrant (Wh):** Performs a Quick Test at various phase angle lags between voltage and current to test operation in all four quadrants. The measurements are in Wh.
- **Four-Quadrant (VARh):** Performs a Quick Test at various phase angle lags between voltage and current to test operation in all four quadrants. The measurements are in VARh.
- **Manual/Tracking**: Tests the meter manually, without using a pickup.
- **Line Monitor**: Analyzes the line voltage, the frequency fluctuation and the line voltage harmonic content (THD) up to the 32nd order.
- **Creep**: Performs a creep test.
- **Demand**: Allows the operator to perform a KW demand test.
- **Accuracy**: Verifies against a NIST-traceable electronic standard (only available on the “Settings” page if no meter is installed).

Quick, Custom, Full, Four-Quadrant (Wh) and Four-Quadrant (VARh) test are only available when an optical pickup is installed.

Test Examples

In the following examples, we assume the MT-1/WT3 socket is already installed into the meter base and the meter under test is also plugged into the MT-1/WT3 socket and the installation is well-secured. For more detailed information, please refer to the Probewell Connect for WT Series documentation.

Below are some testing examples included in this manual. The tests are available for all meter types :

1. Quick-Test – 9S solid-state meter
2. Custom Test – 9S solid-state meter
3. Tracking Test – 12S(N) electromechanical meter
4. Custom Test – 2S electromechanical meter
5. KW demand test – 14S (M-90) electromechanical meter
6. Full Test – 8S Fitzall™ meter
7. Four-Quadrant (WH) Test – 9S solid-state meter
8. Meter tested in a meter shop

Please download the Probewell Connect app to control and take advantage of the meter tester's wireless functionalities.

For more information on how to launch and run the application, refer to the Probewell Connect WT Series User Guide available on Probewell's website.

In the following examples, we assume that the MT-1/WT3 socket is already installed into the meter base and the meter under test is also plugged into the MT-1/WT3 socket and the installation is well-secured.

Example 1: Quick Test - Solid-State 9S Meter

Meter:	Solid-state, form 9S
Voltage:	120-480 V
Kh:	1.8
TA:	2.5
CL:	20
Accessory:	Optical Pickup

A **Quick Test** involves applying loads on the meter for at least 20 seconds (the time can be modified) for each load: HL, PF and LL. Please note that the meter's three potential coils are automatically switched in parallel by the socket.

1. Connecting the Optical Pickup

To connect the cables:

- Plug the RJ12 connector at the end of the Optical Pickup's straight cable into the socket's I/O port.
- Look for the meter's LED output pulse and position the Optical Pickup's suction cup over it.

Note: An adapter may be required on some meters and can be purchased as an option.

2. Performing a Quick Test

Once the installation is complete and the connection to the socket and meter setup is done (see previous section), you can proceed with the test.

Select "Quick Test."

Start the sequence. The load current will increase to HL, the meter will start to send pulses and the internal electronic standard will begin to register the energy passing through the meter. The test can be stopped at any time.

In addition to the test parameters appearing on the display, you can see the voltage and current applied to the meter, the chronometer and the cumulated energy registered by the electronic standard.

While testing, you can check the partial results of the test scrolling up and down the screen. You will get the results as they come in.

3. Obtaining and Saving the Test Results

After the three test points, the watthour measurement period ends automatically. Then, the load is removed and three test results are displayed: one for HL, one for

PF and one for LL. A fourth test result is available: the weight average according to the formula (4HL+2LL+PF)/7.

The tests results can then be saved.

Before saving, the operator must enter the meter ID, if it was not already entered or scanned, and must answer up to eight custom questions saved in the MT-1/WT3.

Please note that if **Full Test** mode had been selected in this example, the test would have continued, checking each of phases A, B and C, one after the other under the HL, PF and LL loads.

Note: To speed up the test in Full Test mode, the LL and/or the PF load can be disabled in the “Settings” tab.

In Full Test mode, once all phases (A, B and C) have been completed and the test for each phase has begun, you can cancel the test at any time by pressing “STOP TEST.”

Example 2: Custom Test - Solid-State 9S Meter

Meter:	Solid-State, form 9S
Voltage:	120-480 V
Kh:	1.8
TA:	2.5
CL:	20
Accessory:	Optical Pickup

1. Performing Custom Test

Press "**Custom Test**" in the "Test" tab.

Select the load (HL, PF, LL) and the phase.

If you select "HL" for all the phases (A+B+C), the load current will increase to 2.5 A and the meter will start sending pulses. In the following display, the meter is reading a 873.75 W load (voltage x current x 3)

Note: If you want to test only Phase A, select "Phase A" in the "Select active phase" drop-down window. If you want to only test phase B, select "Phase B" and so on for phase C. In the current example, only phase B is selected.

Press "START TEST" to start the test. The meter will send pulses and MT-1/WT3's internal electronic standard will start measuring the energy sent to the meter.

In addition to the test parameters appearing on the display, you can see the voltage and current applied to the meter, the chronometer and the cumulated energy registered by the electronic standard.

On the display, the internal electronic standard of the MT-1/WT3 shows that it has registered up to now 3.93Wh (voltage x load x 3 x time/3600). When calculating Wh, time is expressed in hours.

2. Test Results

The watthour measurement period ends automatically after the default minimum test time, here >20 seconds. Then the load is automatically removed, and the test results are displayed.

Test results show this meter has a percentage registration of 100.02% under a 2.5 A load. By default, the test result is displayed in percentage registration. Test results can be saved by clicking "YES".

You can abort a test at any time by pressing the "STOP TEST" button.

Example 3: Tracking Test – 12S(N) Meter

Meter used:	Electromechanical, form 12S
Voltage:	120 V, 3-wire network
Kh:	14.4
TA:	30
CL:	200
Accessory:	None

When "**Tracking Test"** is chosen, it involves applying a 30 A (HL) load for 10 revolutions. No pickup is used for this test. The test can be started and ended with the "START/STOP TEST" button or by using a magnet on the side of the tester (see Figure 2.2).

The meter setup will be displayed on your wireless device with the form 12S and a TA of 30 A. Form 12S will be detected if the meter has the 9 o'clock contact terminal pressed down on the proper piston on the front of the test socket. However, if a meter has a 6 o'clock terminal, the form detected would be 2S. In that case, use the drop-down menu to select form 12S instead of 2S. Once the proper form appears, press "NEXT."

By default, the selected Kh for a 12S meter is 14.4. It can be changed in the "Tests" tab using "Select meter Kh." The test is performed over 10 revolutions by default, but you can change this by clicking on the number of revolutions and entering the desired value.

1. Performing a Tracking Mode Test

On the "**Manual Test"** page, toggle the selected mode to "**Tracking**." In "Rev," select the desired revolutions. The default setting is 10.

The load current will increase to 3 A and the disk will start to rotate slowly. When the black flag on the disk lines up with the black line (on the meter nameplate), apply a magnet to the side of the socket to start the test and change the current from 3 A to 30 A. At this precise moment, the MT-1/WT1's internal electronic standard will begin registering the energy passing through the meter.

Note: It is easier to start and end a test when the disk is rotating slowly. Press "TOGGLE LOAD" to toggle between HL and LL and vice versa.

On this display, the internal electronic standard measures the energy passing though the meter.

Press on "TOGGLE LOAD." The current will increase to 30 A and the disk will begin rotating rapidly.

The socket will emit a beep each time the disk has completed one revolution.

On the 9th revolution, the sound of the beep will change to warn that the end of the test is near. Toggle to LL to slow the disk. When the black flag on the disk lines up with the black line, apply the magnet to the side of the socket to end the test.

2. Test Results

The result indicates the meter's accuracy under a 30 A load.

Note: It is not possible to save the results of a test in Manual or Tracking mode.

Example 4: Custom Test – 2S Electromechanical Meter

Meter used:	Electromechanical, form 2S
Voltage:	240V
Kh:	7.2
TA:	30
CL:	200
Accessory	Metercam

The **Custom** mode involves applying a 30 A load for 10 revolutions. The Metercam is used for this test.

1. Installing the Metercam and the Cable

Install the Metercam and the cable:

1. Roughly align the Metercam's 0.5" field view disk zone with the meter disk.
2. Press the Metercam's four corners onto the meter cover hard enough for the suction cups to grip.
   Notes: Make sure that the four suction cups stick perfectly to the meter cover for the entire duration of the test**.** If necessary, lightly moisten the inside of the suction cups.
3. Insert the red end of the socket's coiled cable into the Metercam's bottom right connector. See Fig. 2.4.

2. Disk Detection

Once the unit detects the Metercam's presence, a load is automatically applied to the meter to spin the disk. The Metercam starts the scanning process to detect the meter disk's position. The red LED turns on when the scanning starts. The green LED turns on when the Metercam has found the disk's position. Finally, the red LED turns off when the black flag is found on the disk and turns on only when the black flag passes in front of the Metercam.

Once the Metercam has found the black flag, a self-test is performed automatically to estimate the meter's Kh. If the estimated Kh found is already stored in the remote, it is selected for the test.

3. Initialization

On the "Test" page, select "Custom Test" to go to the "Tests" tab.

At the top right of your screen, check that the Kh is 7.2.

4. Loading and Testing

Press “HL.” The load current will increase to 30 A and the disk will start to rotate. Press “START/STOP” to initiate the test. Measurement will only begin when the Metercam has picked up the black flag and starts to count the disk revolutions. At this precise time, the MT-1/WT3 will start to measure the energy passing through the meter. A double beep will sound, indicating that the test has begun.

In addition to the test parameters appearing on the display, you can see the voltage and current applied to the meter, the chronometer and the cumulated energy registered by the electronic standard.

On this display, the MT-1/WT3’s internal electronic standard shows that it has registered up to now 14.4 Wh (voltage x load x time/3,600). When calculating Wh, time is expressed in hours.

5. Test Results

The watthour measurement period ends automatically after the 10th disk revolution, i.e. when the Metercam has registered its 10th revolution. The load is then automatically removed to stop the disk and the test results are displayed.

The test results show the meter’s accuracy under a 30 A load.

The results can be saved by clicking “YES.”

Once the results are saved, it is possible to repeat the test at PF or LL.

If you do not wish to save the results, press “CANCEL.” You will be returned to the “Tests” tab. Repeat the test at PF or LL, if desired.

Example 5: kW Demand Test – Electromechanical 14S Meter

Meter:	Electromechanical, form 14S
Voltage:	120 V, 3-wire network,
Kh:	21.6
TA:	30
CL:	200
Accessory	None

The meter is equipped with an electronic kW demand register (Type M-90). The kW **Demand Test** will be done at 50 A on 15 minutes time interval. The operator first set the meter in kW demand test by removing the meter's cover and flip over the small tab located on the M-90's face plate. This enables kW demand test by pressing a small push-button switch. (Please refer to the meter's user manual to determine how to setup the meter to perform demand testing)

1. Initialization

Be sure to select the right form **14S**.

In the "Tests" tab select "Demand Test".

By default, the maximum load applied to the meter is 50 A, the timer or test duration is 3 minutes and the meter's demand interval is 15 minutes. Test duration (timer) can be set from 3 to 15 minutes and set the load at 50.

Set up the meter for a kW demand test following the manufacturer's instructions. Please note that the kW demand test method varies between manufacturer's reference technical guide for instructions.

Then, set the timer for the duration of the test. The timer must be less or equal to the demand interval of the meter under test.

Finally, make sure the interval matches the demand interval length of the meter under test. The test interval can be set between 1 and 99 minutes.

2. Loading and Testing

While resetting the demand register on the meter under test, press "Start Test" on your mobile device.

The timer for the duration of the test will be counting down while the kW Max will accumulate.

When the timer for the duration of the test reaches zero, the load is removed, and the demand test ends.

Type in the value of the demand meter register in the results KW Max Meter. Afterwards, click GET RESULTS and the MT-1/WT3 will calculate and display the results.

A result higher than 100% means the meter records a higher kW demand compared to the reference. Conversely, a result lower than 100% means the meter records less kW demand compared to the reference.

Please note that the response time to signal the beginning of the test and reset the demand register of the meter may affect the precision of the test.

Example 6: Full Test – Solid-State 8S Fitzall Meter

Meter:	kV GE Fitzall, programmed in form 8S
Voltage:	120-480 V
Kh:	0.3
TA:	2.5
CL:	20
Accessory	Optical Pickup

A **Full Test** consists in applying loads on the meter for at least 20 seconds (the time can be modified) for each loads HL, PF and LL. Please note that the three potential coils of the meter are automatically switched in parallel by the socket.

1. Connecting the Optical Pickup

To connect the cables:

- Plug the RJ12 connector at the end of the Optical Pickup's straight cable into the socket's I/O port.
- Look for the meter's LED output pulse and position the Optical Pickup's suction cup over it.

Note: An adapter may be required on some meters and can be purchased as an option.

2. Performing a Full Test

Once the installation is complete and the connection to the socket and meter setup is done (see previous section), you can proceed with the test.

Select "Full Test".

Start the sequence. The load current will increase to HL, the meter will start to send pulses and the internal electronic standard will begin to register the energy passing through the meter. The test can be stopped at any time.

In addition to the test parameters appearing on the display, you can see the voltage and current applied to the meter, the chronometer and the cumulated energy registered by the electronic standard.

While testing, you can check the partial results of the test scrolling up and down the screen. You will get the results as they come in.

3. Obtaining and Saving Test Results

After the three test points, the watthour measurement period ends automatically. Then, the load is removed and three test results are displayed: one for HL, one for

PF and one for LL. A fourth test result is available: the weight average according to the formula (4HL+2LL+PF)/7.

The tests results can then be saved.

Before saving, the operator must enter the meter ID, if it was not already entered or scanned, and must answer up to eight custom questions saved in the MT-1/WT3.

Please note that if **Full Test** mode had been selected in this example, the test would have continued, checking each of phases A, B and C, one after the other under the HL, PF and LL loads.

Note: To speed up the test in Full Test mode, the LL and/or the PF load can be disabled in the “Settings” tab.

In Full Test mode, once all phases (A, B and C) have been completed and the test for each phase has begun, you can cancel the test at any time by pressing “STOP TEST.”

Example 7: Four-Quadrant (Wh) Test – Solid-State 9S Meter

Meter:	Solid-State, Form 9S
Voltage:	120-480V
Kh:	1.8
TA:	2.5
CL:	20
Accessory:	Optical Pickup

A **Four-Quadrant (Wh) Test** consists in running the equivalent of a Quick Test at various phase angle lags to assess the meter's ability to register energy in all four quadrants of the power vector diagram.

Please note that the meter's three potential coils are automatically switched in parallel by the socket.

1. Connect the optical pickup

To connect the cables:

- Plug the RJ12 connector at the end of the Optical Pickup's straight cable into the socket's I/O port.
- Look for the meter's LED output pulse and position the Optical Pickup's suction cup over it.

Note: An adapter may be required on some meters and can be purchased as an option.

Note: Some high-end meters can have two pulse outputs, one for the Watthour reading and one for the VARhour reading. Connect the Optical Pickup to the Watthour pulse output before starting the test.

2. Starting a Four-Quadrant (Wh) Test

Once the installation is complete and the connection to the socket and meter setup is done (see previous section), you can proceed with the test.

Select "Four-Quadrant (Wh) Test".

Start the sequence. The load current will increase to HL, the meter will start to send pulses and the internal electronic standard will begin to register the energy passing through the meter. The test can be stopped at any time.

In addition to the test parameters appearing on the display, you can see the voltage and current applied to the meter, the chronometer and the cumulated energy registered by the electronic standard.

While testing, you can check the partial results of the test scrolling up and down the screen. You will get the results as they come in.

3. Test execution

The Four-quadrant (Wh) Test sequence is divided in four distinct subtests. Each subtest runs the equivalent of a Quick Test, with the base phase lag angle between voltage and current changing each time.

4. Obtaining and Saving Test Results

After the three test points, the watthour measurement period ends automatically. Then, the load is removed and three test results are displayed: one for HL, one for PF and one for LL. A fourth test result is available: the weight average according to the formula (4HL+2LL+PF)/7.

The tests results can then be saved.

Before saving, the operator must enter the meter ID, if it was not already entered or scanned, and must answer up to eight custom questions saved in the MT-1/WT3.

When saved to the unit's non-volatile memory, the Four-Quadrant (Wh) Test will be divided into four separate test reports (one for each subtest). They can be viewed in the Reports section of the mobile app.

Example 8: Meter Tested in the Meter Shop

The MT-1/WT3 can be used as a test board in the meter shop to check both single-phase and three-phase meters using a single-phase four-jaw meter base mounted on the wall. The meter base must provide a voltage of 120 V or 240 V on the two upper jaws with a capacity of at least 150 VA. **The meter base's voltage must respect the nominal voltage value of the meter under test.**

Before inserting the MT-1/WT3 in the meter base, set the Form Selector switch in the back of the tester at the 1S/2S/15S position so that the MT-1/WT3 is powered from the two upper tabs (see Appendix C). It is recommended to use a holding ring to secure the MT-1/WT3 in place.

Once installed, the test procedure to apply is the same as in the field.

Appendix A

Specifications

General

Physical dimensions

Test Socket (Diam. x D)	6.9" x 7.7" (175 x 195 mm)
Remote Control (HxLxD)	8.3" x 3.9" x 1" (210 x 100 x 26 mm)
Carrying Bag (HxLxD)	11" x 11" x 8" (280 x 280 x 203 mm)

Weight

Test Socket	6.4 lb (2.91 kg)
Overall with Carrying Bag	8.5 lb (3.86 kg)

Temperature

Operation	-4 to 140 °F (-20 to 60 °C)
Storage	-4 to 140 °F (-20 to 60 °C)
Humidity	0% to 95% (non-condensing)

Optional test accessories

Metercam	Metercam (digital camera disk sensor)
Pulse Pickup	Optical pickup for electronic meters
Magnetic Optical Pickup	Magnetic optical pickup for electronic meters with metallic output pulse
MT-1/ATK-3	Accuracy testing kit
Remote Control	An optional handheld controller
Latch	To secure the socket to the ring-typed meter bases
Quick-Release Latch	A quick release to remove the latch from the socket
Focus Adapter	Used with the MT-1/PUL-3 optical pickup for L&G Focus with a triangle output pulse
Magnetic Adapter	Used with MT-1/PUL-3 optical pickup for meters with metallic output pulse
KYZ device	To monitor the KYZ output for meter equipped with the KYZ feature.

Test Socket

Input

Voltage	100-600 VAC
Line frequency	58-62Hz
Power consumption	75V A (maximum)
Bypass circuit	200 A (standard)
Circuit breakers	2 x 1 A (press-to-reset mechanism)

Output

Voltage	No voltage source is included in the MT-1/WT3. Line voltage is used for the energy measurement. Therefore, the accuracy is less than 200ppm.
Current	The current sources are designed with a very tight feedback loop to get the most accurate current, therefore the current accuracy is less than 200ppm.

Communication

Wireless	802.11 b/g
I/O port	Full-duplex (isolated)

Meter Forms

Single-phase	1S, 2S, 3S, 4S, 12S(N), 25S
Three-phase	6S (36S, 46S), 8S, 9S (10S), 12S, 14S, 15S, 16S
Fitzall^{tm}	CT-rated and Self-Contained
Class	CL10, CL20, CL100, CL200, CL320

Current synthesizers

Channel	3
Adjustable current	0.25 to 50 A
Phase Angle (Wh)	Unity and 60^{o} lag
Phase Angle (VARh)	90^{o} lag and 30^{o} lag

Voltage applied to meter	Line voltage protected by two 1 A circuit breakers and activated only when the meter is inserted. Voltage is also current-limited.

Electronic standard accuracy[1]

Typical	±0.02%
Maximum guaranteed	±0.05%
Influence affecting accuracy	None

Multifunction measurements accuracy

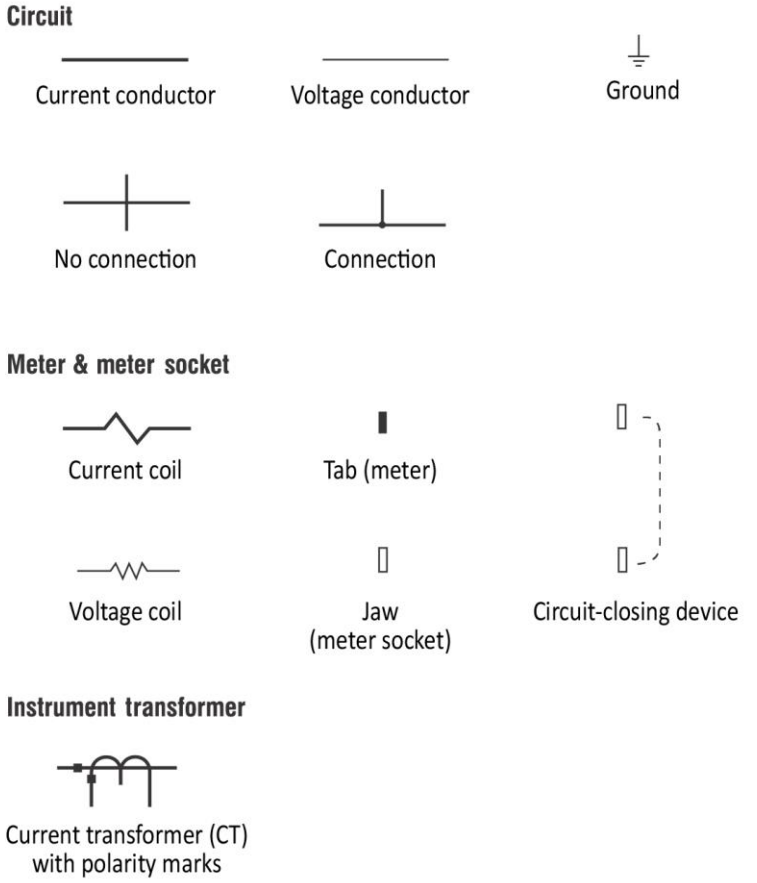
RMS voltage	±0.05%, maximum
RMS current	±0.05%, maximum
Frequency	±0.01%, maximum

[1] The MT-1/WT3's internal electronic standard is calibrated using a reference standard traceable to NIST and comes with a complete calibration report certifying measurement accuracy for both Wh and VARh scales over its entire operating range. Test accuracy can be checked using a reference standard and the three-phase Accuracy Testing Kit (ATK-3). The calibration of the MT-1/WT3's standard can be slightly changed using the "User Calibration" menu. However, User Calibration offset is limited to ±0.05% (in ±0.001% increments) from factory calibration. User Calibration is stored in the socket's non-volatile memory. The socket contains a unique internal number that identifies its internal electronic standard.

Appendix B

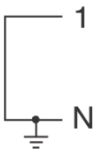
Compatible Meter Forms

This Appendix lists all the meter forms compatible with the MT-1/WT1. For each meter form, the electrical service is shown at the top left and an internal schematic of the meter installed is shown at the top right. The wiring that connects the meter to the line and load is also shown. Before proceeding with a field test, make sure that the connections to the socket for a given form are similar to those shown hereafter. The symbols used are:



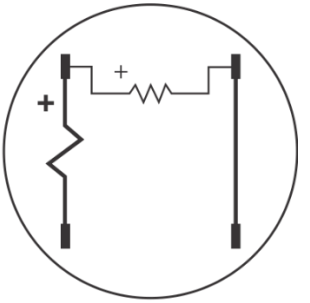
Form 1S

Single-Phase Two-Wire

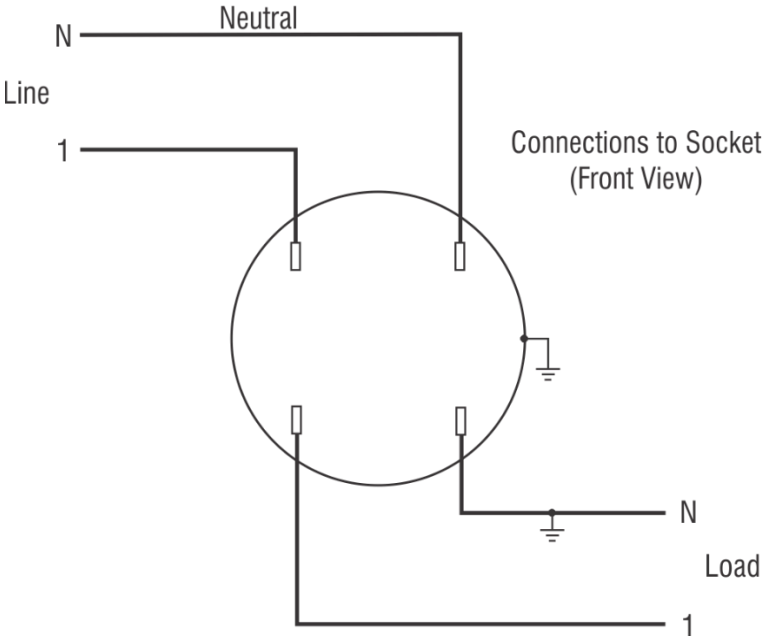


120 or 240 volts

Form 1S

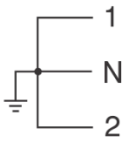


Meter Internal Wiring
(Front View)



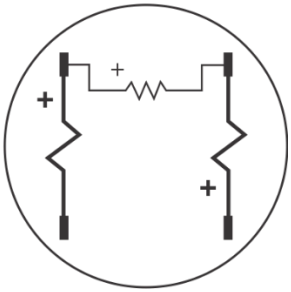
Form 2S

Single-Phase Three-Wire

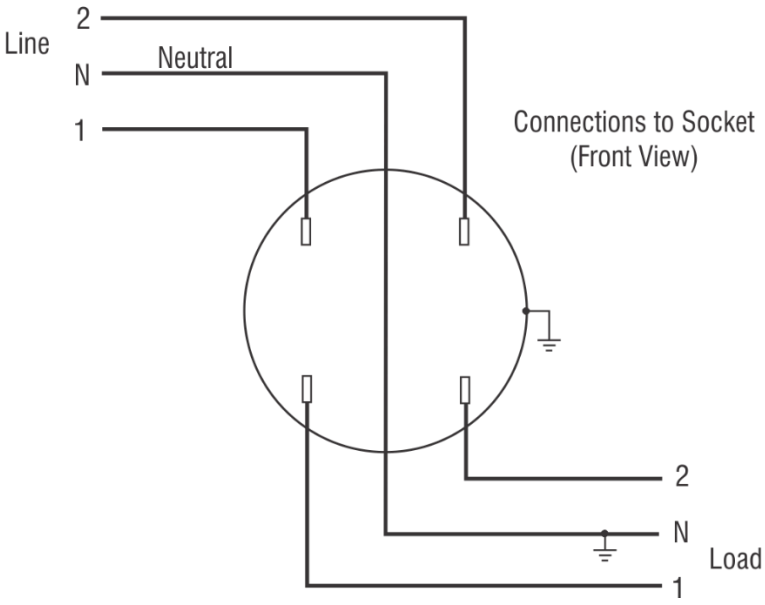


120 volts line-to-neutral
240 volts line-to-line

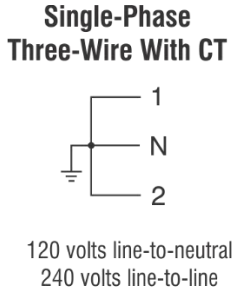
Form 2S

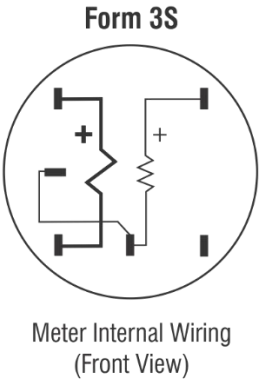


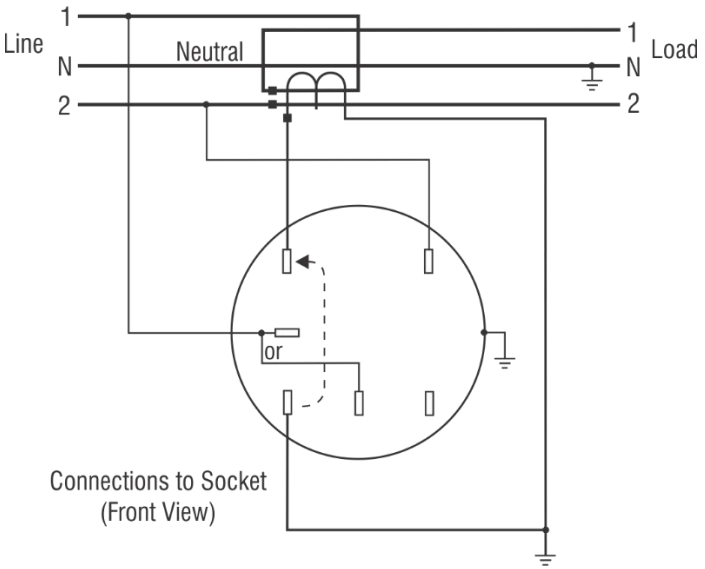
Meter Internal Wiring
(Front View)



Form 3S







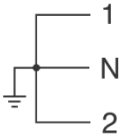
Form 3S single-phase, 120 volts two-wire with CT is also compatible.

Caution: Never open a circuit-closing device if current is flowing in the CT primary. Serious personal injury may result.

Note: Some older-design 3S, 240 V forms have higher impedance and will not reach full HL when tested with MT-1/WT3. However, the socket will test as high as it can.

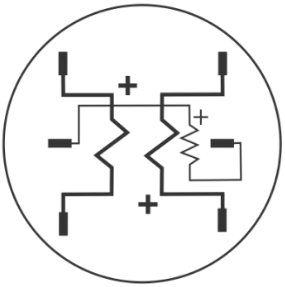
Form 4S

Single-Phase
Three-Wire Two CTs

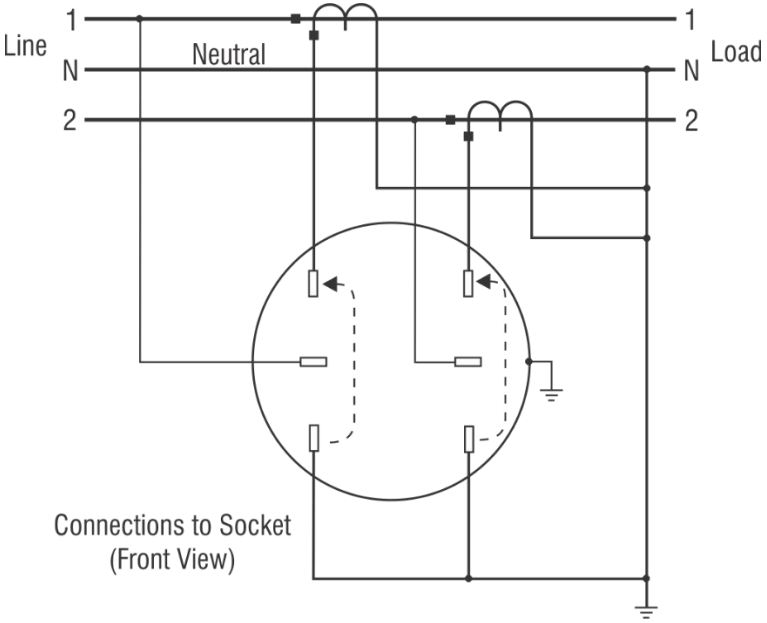


120 volts line-to-neutral
240 volts line-to-line

Form 4S



Meter Internal Wiring
(Front View)

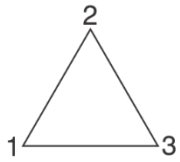


Connections to Socket
(Front View)

Caution: Never open a circuit-closing device if current is flowing in either CT primaries. Serious personal injury may result.

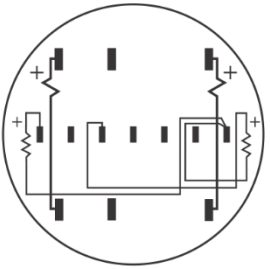
Form 5S, 35S & 45S Fitzall^{tm} (3Δ 2CT)

Three-Phase
Three-Wire Delta
With Two CTs

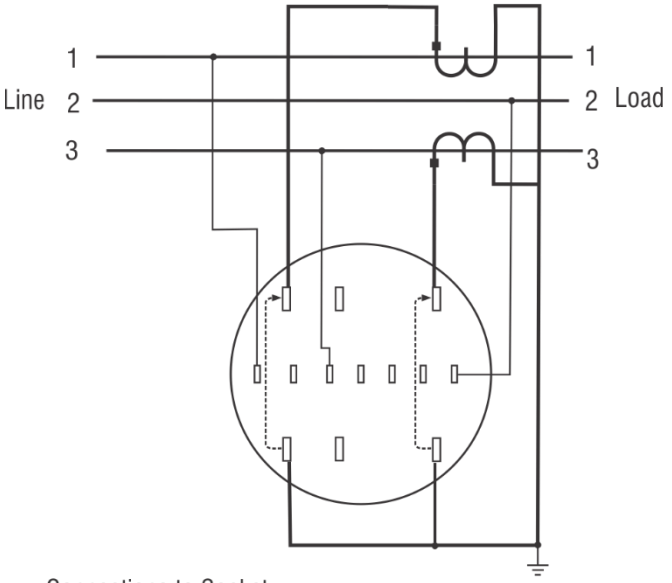


240 volts line-to-line
or 480 volts line-to-line
or 120 volts line-to-line

FITZALL Form 5S, 35S, 45S



Meter Internal Wiring
(Front View)

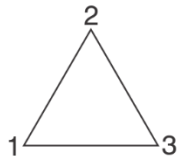


Connections to Socket
(Front View)

Caution: Never open a circuit-closing device if current is flowing in either CT primaries. Serious personal injury may result.

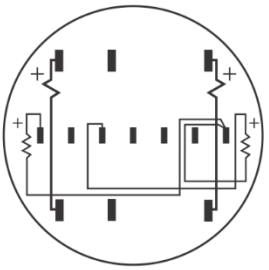
Form 5S, 35S & 45S Fitzall^{tm} (3Δ 2CT 2PT)

Three-Phase
Three-Wire Delta
With Two CTs and Two VTs

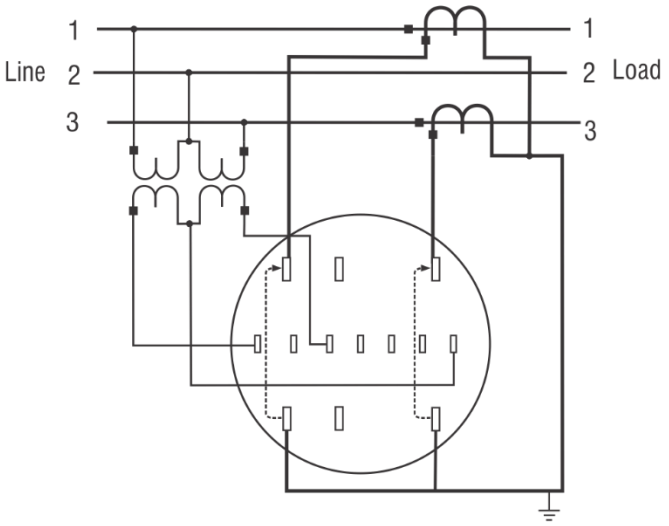


240 volts line-to-line
or 480 volts line-to-line
or 120 volts line-to-line

FITZALL Form 5S, 35S, 45S



Meter Internal Wiring
(Front View)

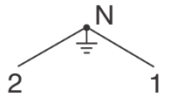


Connections to Socket
(Front View)

Caution: Never open a circuit-closing device if current is flowing in either CT primaries. Serious personal injury may result.

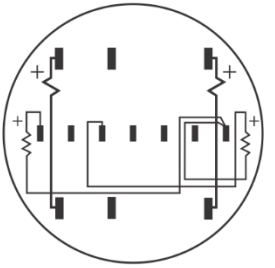
Form 5S, 35S & 45S Fitzall^{tm} (N 2CT)

Three-Wire Network With Two CTs

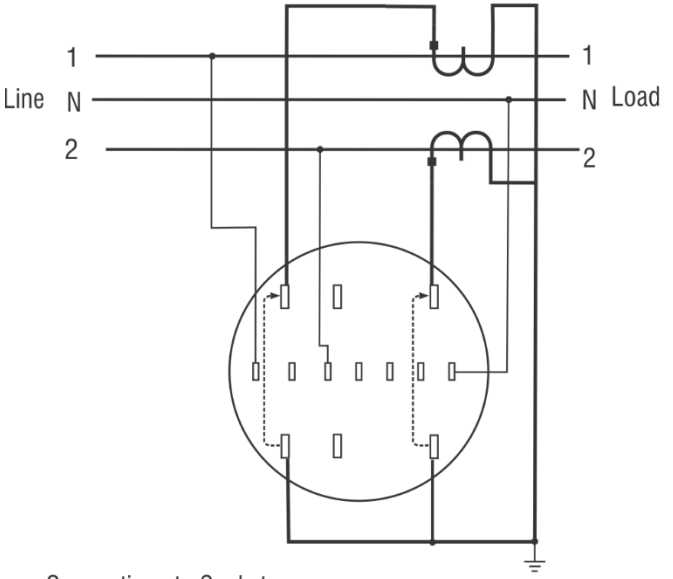


120 volts line-to-neutral
208 volts line-to-line

FITZALL Form 5S, 35S, 45S



Meter Internal Wiring
(Front View)

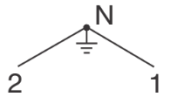


Connections to Socket
(Front View)

Caution: Never open a circuit-closing device if current is flowing in either CT primaries. Serious personal injury may result.

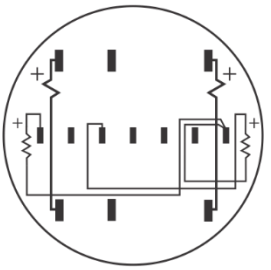
Form 5S, 35S & 45S Fitzall^{tm} (N 2CT 2PT)

Three-Wire Network
With Two CTS and Two VTS

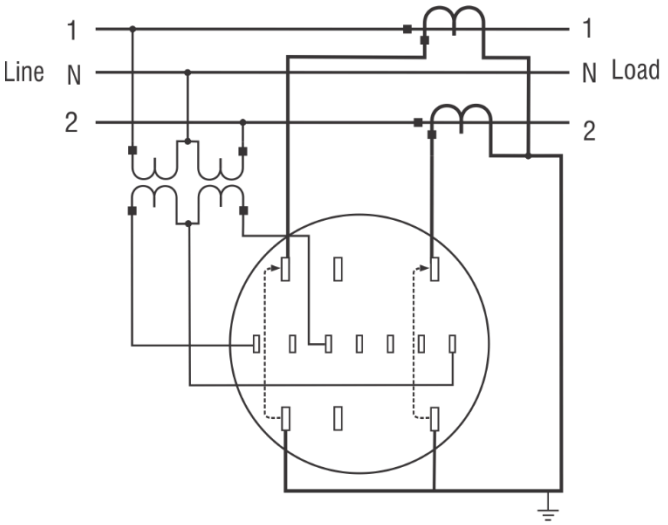


120 volts line-to-neutral
208 volts line-to-line

FITZALL Form 5S, 35S, 45S



Meter Internal Wiring
(Front View)

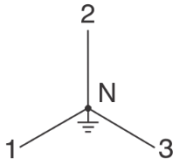


Connections to Socket
(Front View)

Caution: Never open a circuit-closing device if current is flowing in either CT primaries. Serious personal injury may result.

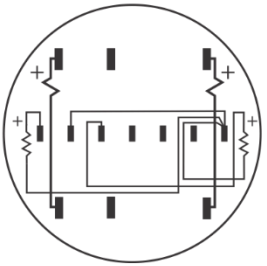
Form 5S, 35S & 45S Fitzall^{tm} (Y 3CT)

Three-Phase Four-Wire Wye With Three CTs

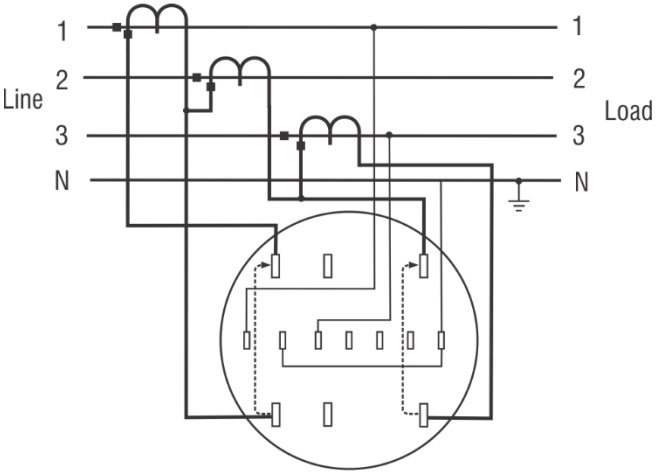


208 volts line-to-line
120 volts line-to-neutral
or
480 volts line-to-line
277 volts line-to-neutral

FITZALL Form 5S, 35S, 45S



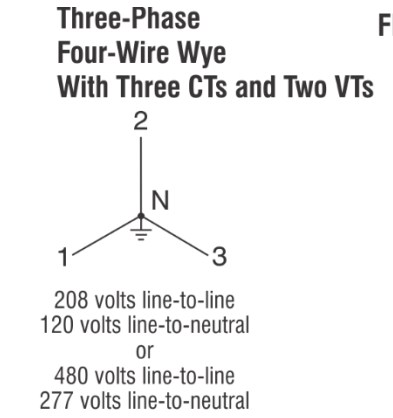
Meter Internal Wiring
(Front View)

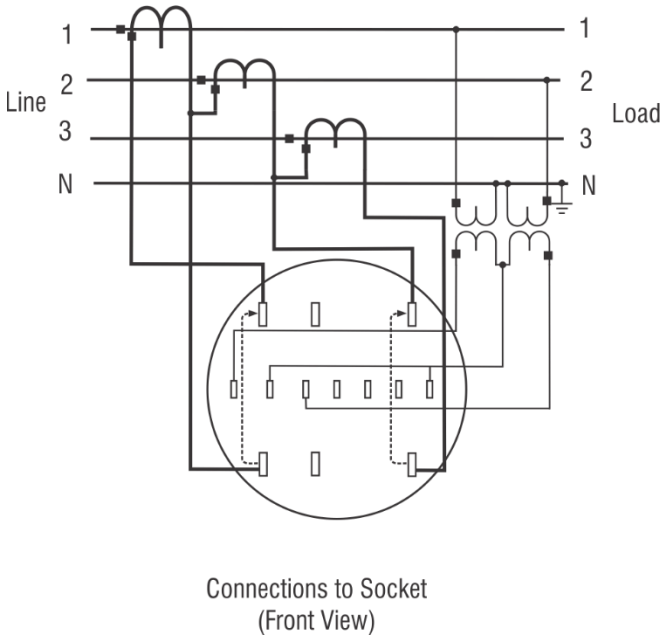


Connections to Socket
(Front View)

Caution: Never open a circuit-closing device if current is flowing in either CT primaries. Serious personal injury may result.

Form 5S, 35S & 45S Fitzall^{tm} (Y 3CT 2PT)



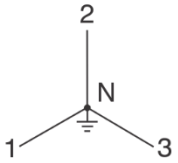


Caution: Never open a circuit-closing device if current is flowing in either CT primaries. Serious personal injury may result.

Form 5S, 35S & 45S Fitzall^{tm} (Y 2CT)

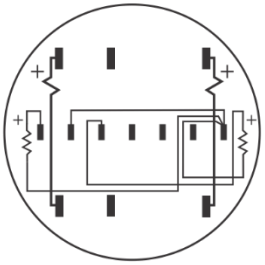
(Y 2CT)

Three-Phase
Four-Wire Wye
With Two Equal-Ratio CTs

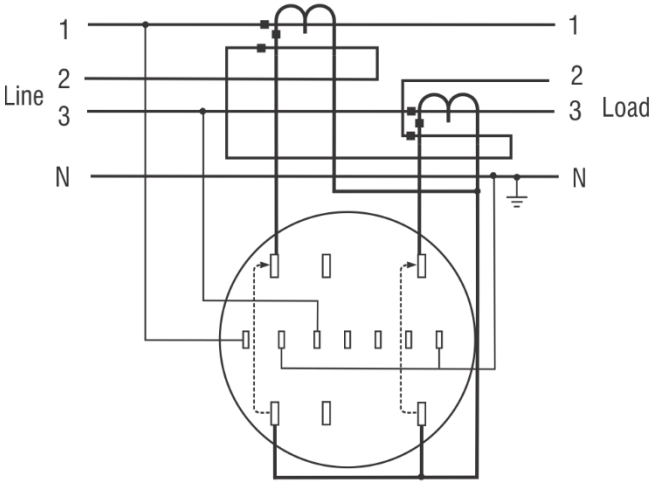


208 volts line-to-line
120 volts line-to-neutral
or
480 volts line-to-line
277 volts line-to-neutral

FITZALL Form 5S, 35S, 45S



Meter Internal Wiring
(Front View)

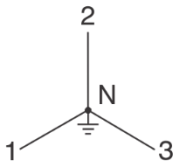


Connections to Socket
(Front View)

Caution: Never open a circuit-closing device if current is flowing in either CT primaries. Serious personal injury may result.

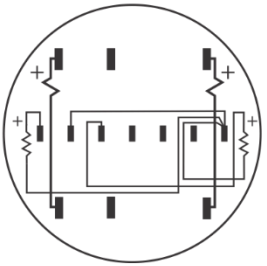
Form 5S, 35S & 45S Fitzall^{tm} (Y 3CT 2PT)

Three-Phase
Four-Wire Wye
With Three CTs and Two VTs

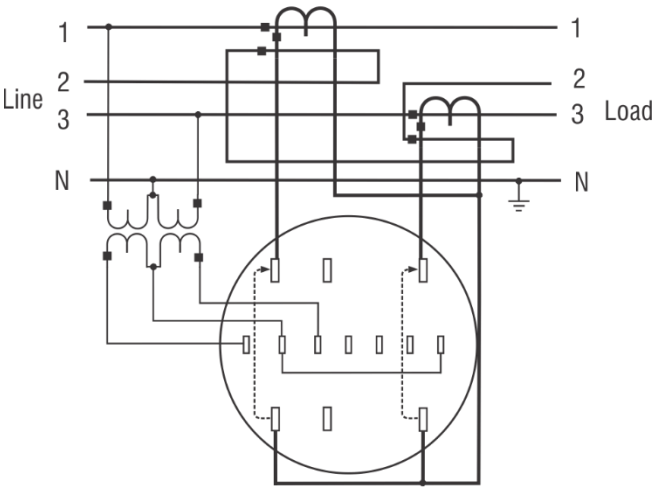


208 volts line-to-line
120 volts line-to-neutral
or
480 volts line-to-line
277 volts line-to-neutral

FITZALL Form 5S, 35S, 45S



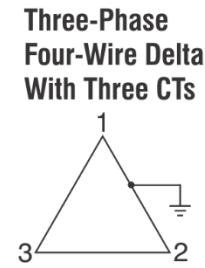
Meter Internal Wiring
(Front View)

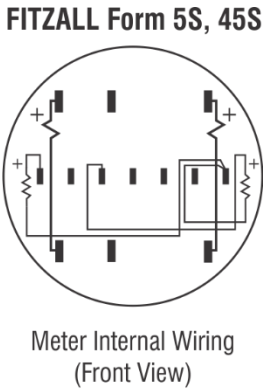


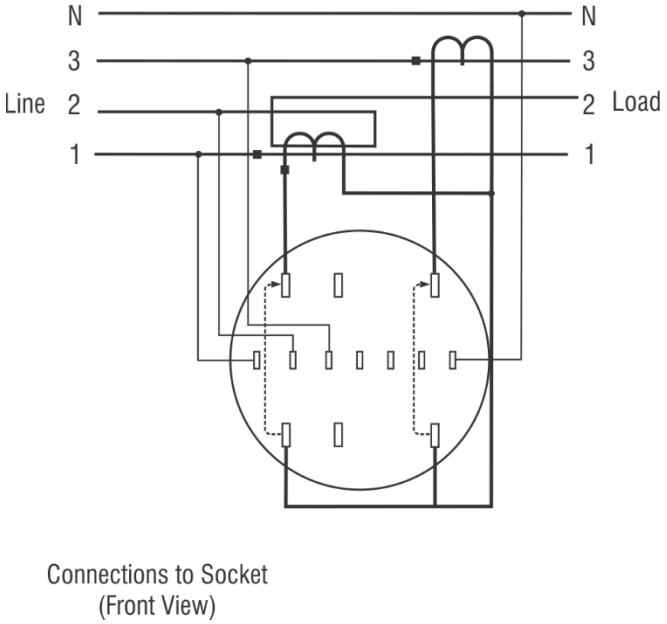
Connections to Socket
(Front View)

Caution: Never open a circuit-closing device if current is flowing in either CT primaries. Serious personal injury may result.

Form 5S, 35S & 45S Fitzall^{tm} (4Δ 3CT 2PT)



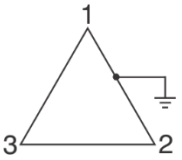




Caution: Never open a circuit-closing device if current is flowing in either CT primaries. Serious personal injury may result.

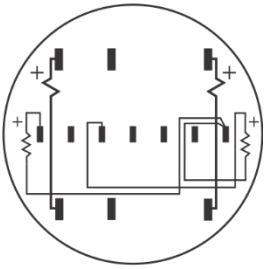
Form 5S, 35S & 45S Fitzall^{tm} (4Δ 3CT)

Three-Phase Four-Wire Delta With Three CTs

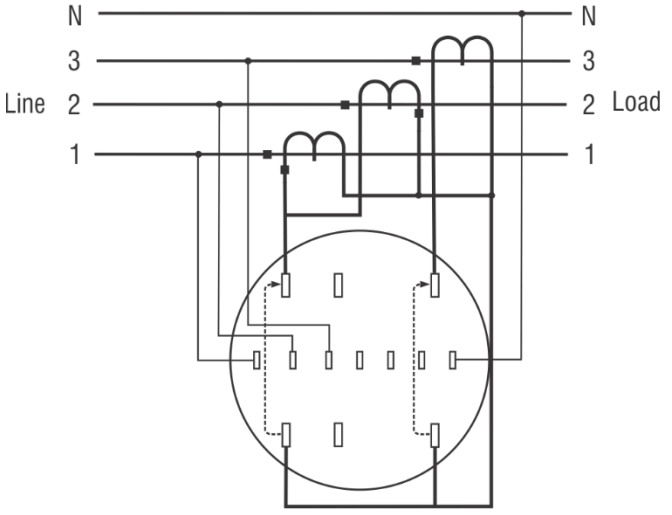


240 volts line-to-line
or 480 volts line-to-line
or 120 volts line-to-line

FITZALL Form 5S, 45S



Meter Internal Wiring
(Front View)



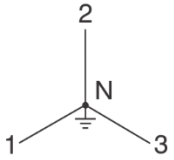
Connections to Socket
(Front View)

Caution: Never open a circuit-closing device if current is flowing in either CT primaries. Serious personal injury may result.

Form 6S (36S, 46S) (Y 3CT)

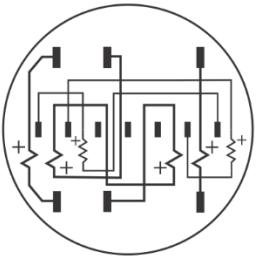
Wye with three CTs

Three-Phase
Four-Wire Wye
With Three CTs

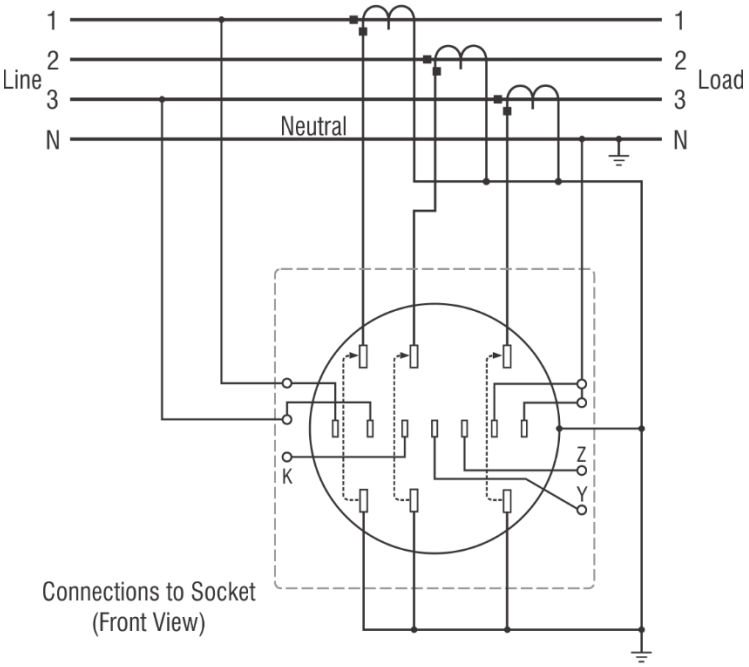


208 volts line-to-line
120 volts line-to-neutral
or
480 volts line-to-line
277 volts line-to-neutral

Form 6S



Meter Internal Wiring
(Front View)

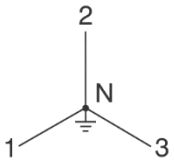


Connections to Socket
(Front View)

Caution: Never open a circuit-closing device if current is flowing in the CT primary. Serious personal injury may result.

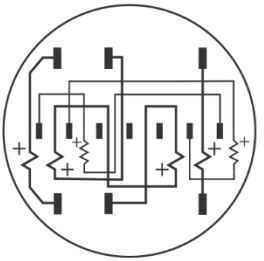
Form 6S (36S, 46S) (Y 3CT 2PT)

Three-Phase
Four-Wire Wye
With Two VTs and Three CTs

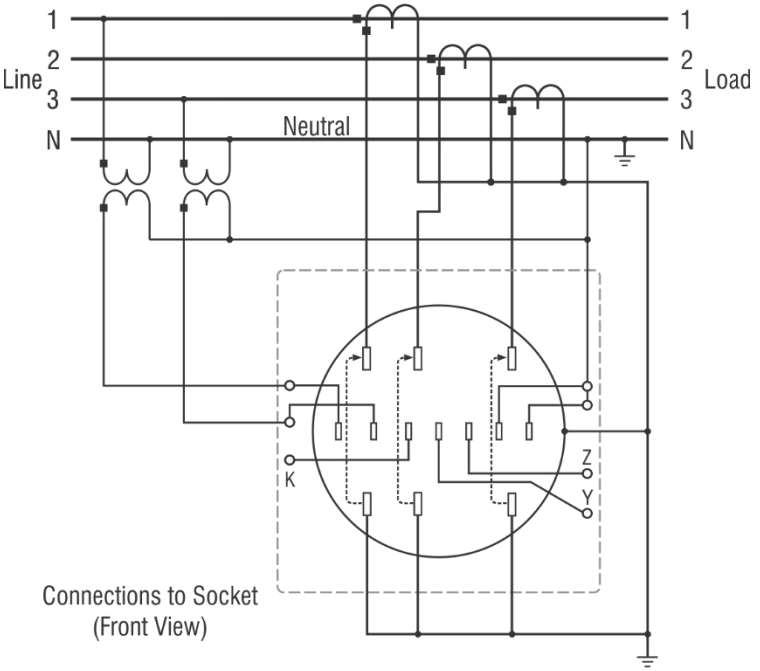


For high voltages.
The VTs apply reduced voltages to the meter.

Form 6S



Meter Internal Wiring
(Front View)

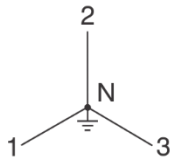


Connections to Socket
(Front View)

Caution: Never open a circuit-closing device if current is flowing in the CT primary. Serious personal injury may result.

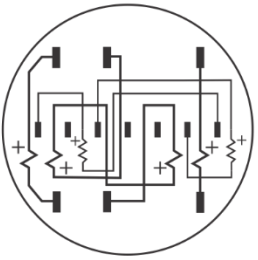
Form 6S (36S, 46S) Fitzall^{tm} (Y 3CT)

Three-Phase
Four-Wire Wye
With Three CTs

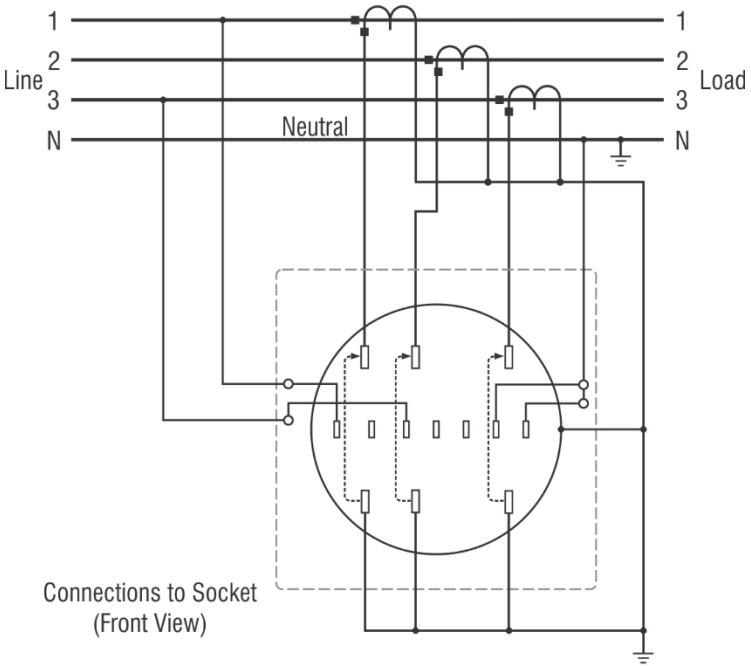


208 volts line-to-line
120 volts line-to-neutral
or
480 volts line-to-line
277 volts line-to-neutral

Form 6S FITZALL



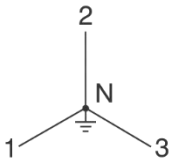
Meter Internal Wiring
(Front View)



Caution: Never open a circuit-closing device if current is flowing in the CT primary. Serious personal injury may result.

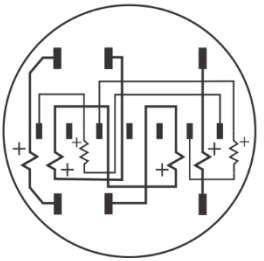
Form 6S (36S, 46S) Fitzall^{tm} (Y 3CT 2PT)

Three-Phase
Four-Wire Wye
With Two VTs and Three CTs

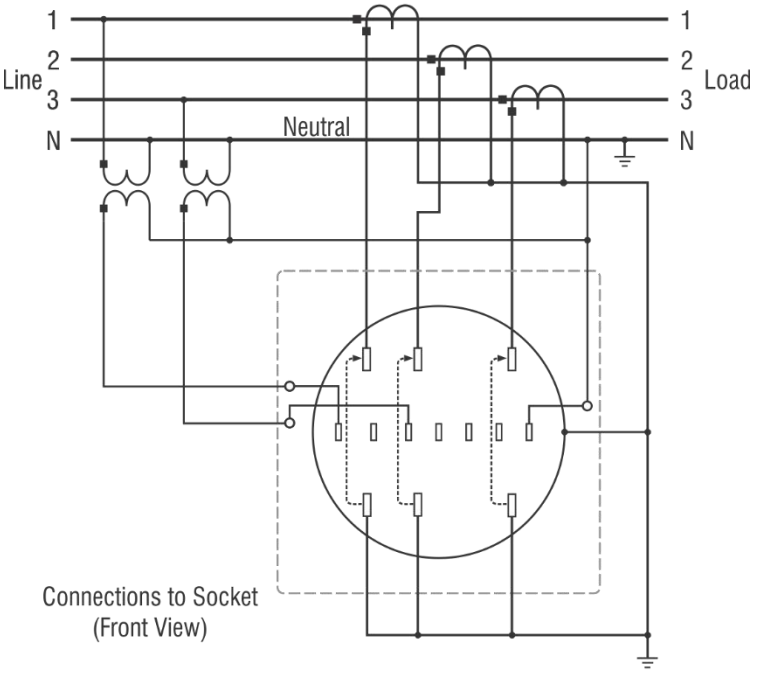


For high voltages.
The VTs apply reduced
voltages to the meter.

Form 6S FITZALL



Meter Internal Wiring
(Front View)

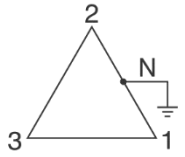


Connections to Socket
(Front View)

Caution: Never open a circuit-closing device if current is flowing in the CT primary. Serious personal injury may result.

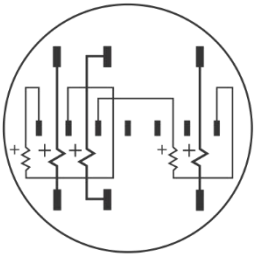
Form 8S (4Δ 3CT)

Three-Phase
Four-Wire Delta
With Three CTs

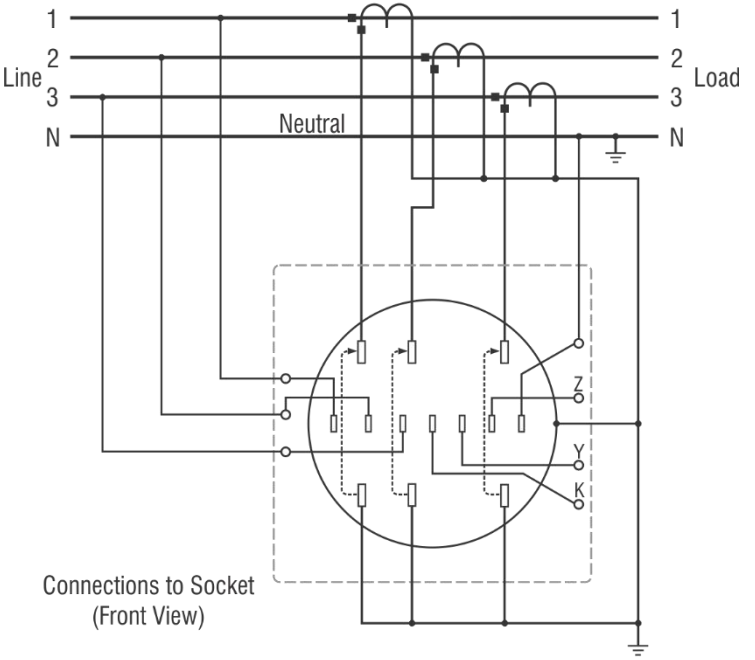


240 volts: 1 to 2, 2 to 3, 3 to 1
120 volts: 1 to neutral, 2 to neutral
208 volts: 3 to neutral

Form 8S



Meter Internal Wiring
(Front View)

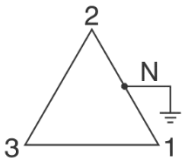


Connections to Socket
(Front View)

Caution: Never open a circuit-closing device if current is flowing in the CT primary. Serious personal injury may result.

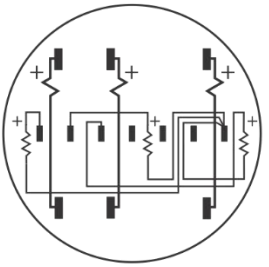
Form 9S (4Δ 3CT)

Three-Phase
Four-Wire Delta
With Three CTs

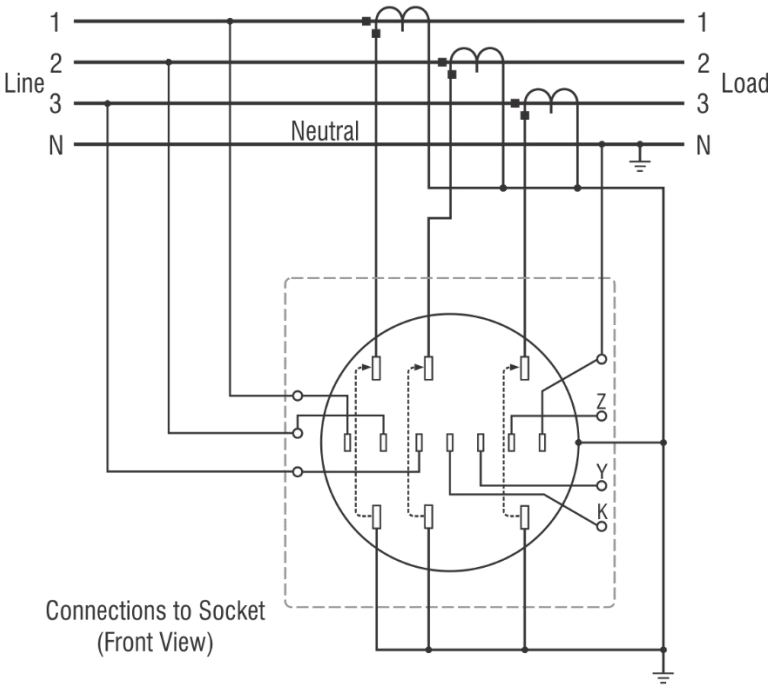


240 volts: 1 to 2, 2 to 3, 3 to 1
120 volts: 1 to neutral, 2 to neutral
208 volts: 3 to neutral

Form 9S



Meter Internal Wiring
(Front View)

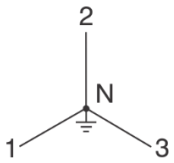


Connections to Socket
(Front View)

Caution: Never open a circuit-closing device if current is flowing in the CT primary. Serious personal injury may result.

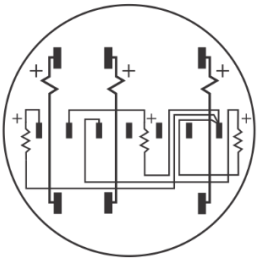
Form 9S (Y 3CT)

Three-Phase Four-Wire Wye With Three CTs

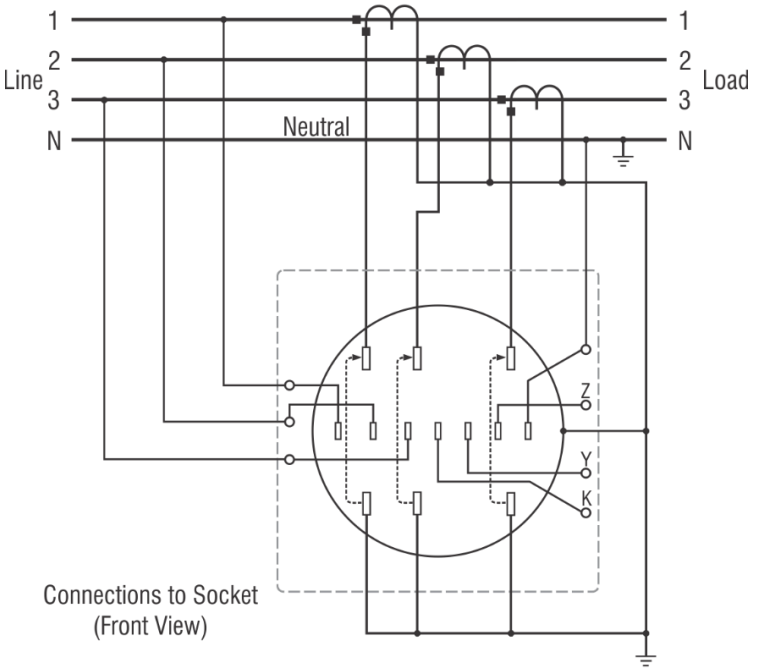


208 volts line-to-line
120 volts line-to-neutral
or
480 volts line-to-line
277 volts line-to-neutral

Form 9S



Meter Internal Wiring
(Front View)

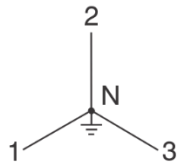


Connections to Socket
(Front View)

Caution: Never open a circuit-closing device if current is flowing in the CT primary. Serious personal injury may result.

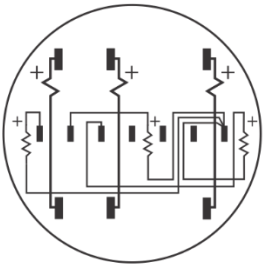
Form 9S (Y 3CT 3PT)

Three-Phase
Four-Wire Wye
With Three VTs and Three CTs

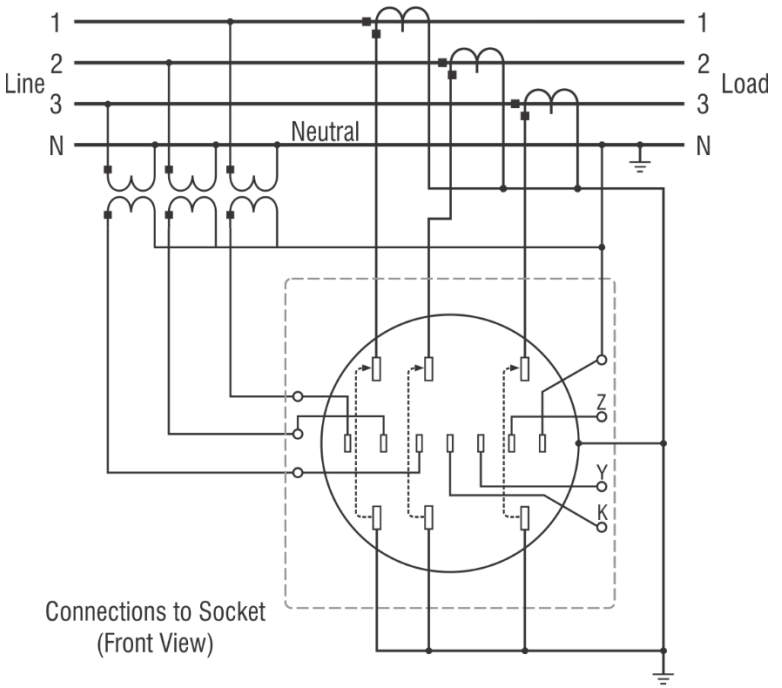


For high voltages.
The VTs apply reduced
voltages to the meter.

Form 9S



Meter Internal Wiring
(Front View)



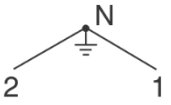
Connections to Socket
(Front View)

Caution: Never open a circuit-closing device if current is flowing in the CT primary. Serious personal injury may result.

Form 12S (25S) (3N)

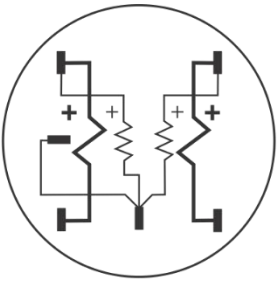
(N) Network

Three-Wire Network

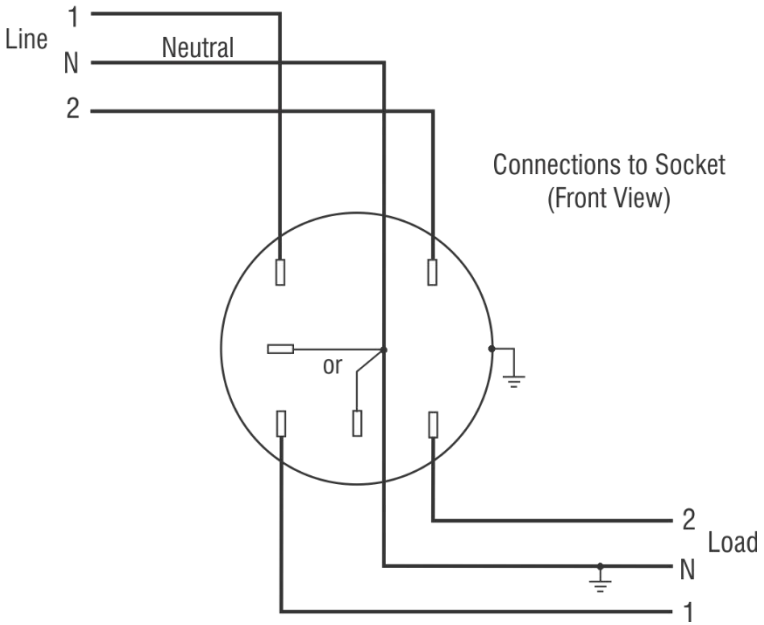


120 volts line-to-neutral
208 volts line-to-line

Form 12S



Meter Internal Wiring
(Front View)

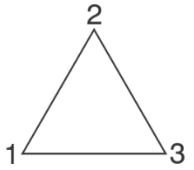


Connections to Socket
(Front View)

Form 12S (25S) (3Δ)

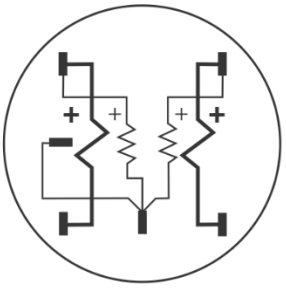
(25S) Delta

Three-Phase
Three-Wire Delta

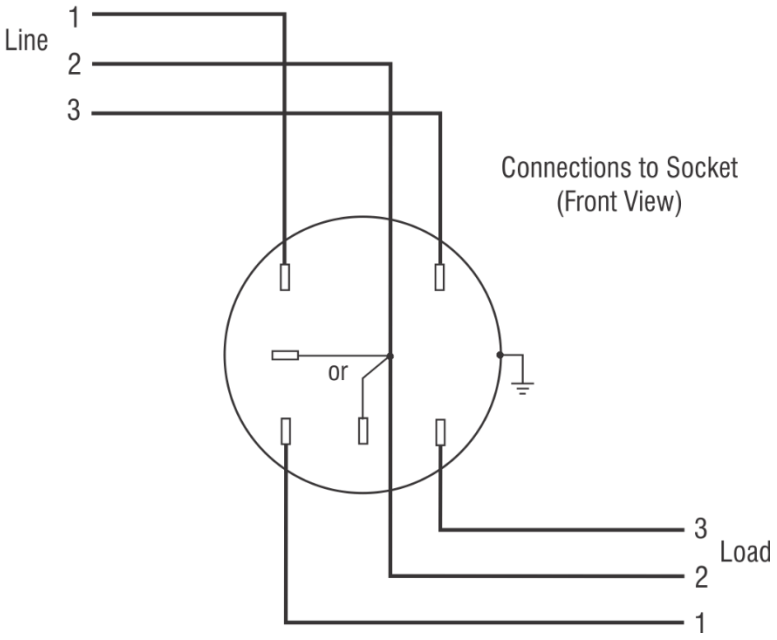


240 volts line-to-line
or 480 volts line-to-line
or 120 volts line-to-line

Form 12S



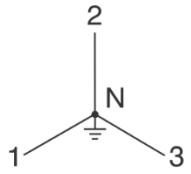
Meter Internal Wiring
(Front View)



Connections to Socket
(Front View)

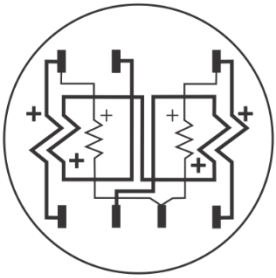
Form 14S (4Y)s

Three-Phase Four-Wire Wye

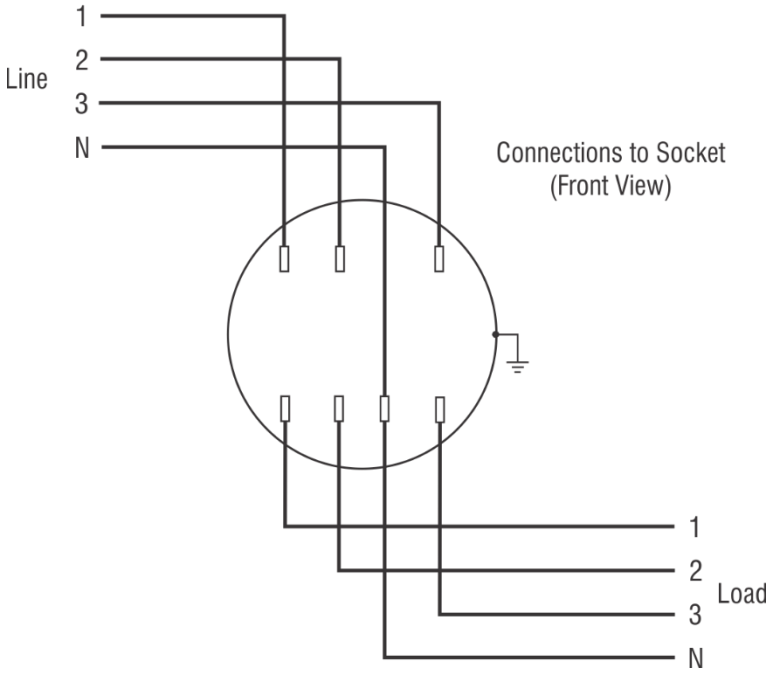


208 volts line-to-line
120 volts line-to-neutral
or
480 volts line-to-line
277 volts line-to-neutral

Form 14S

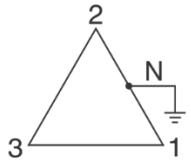


Meter Internal Wiring
(Front View)



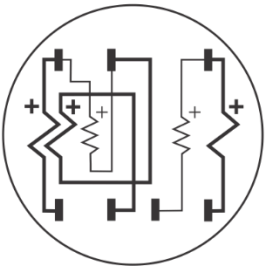
Form 15S (4Δ)

Three-Phase Four-Wire Delta

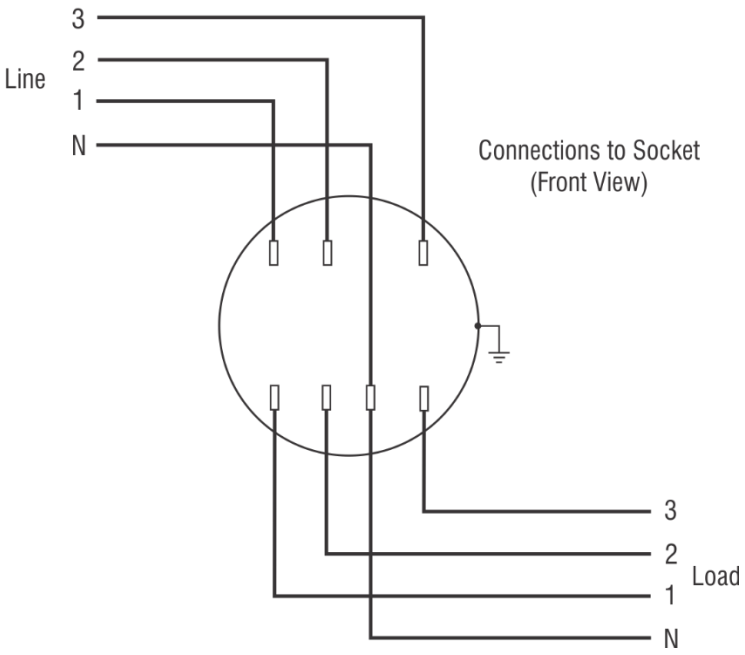


240 volts: 1 to 2, 2 to 3, 3 to 1
120 volts: 1 to neutral, 2 to neutral
208 volts: 3 to neutral

Form 15S

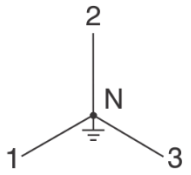


Meter Internal Wiring
(Front View)



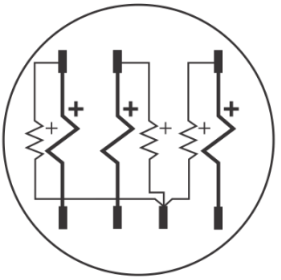
Form 16S (4Y)

Three-Phase Four-Wire Wye

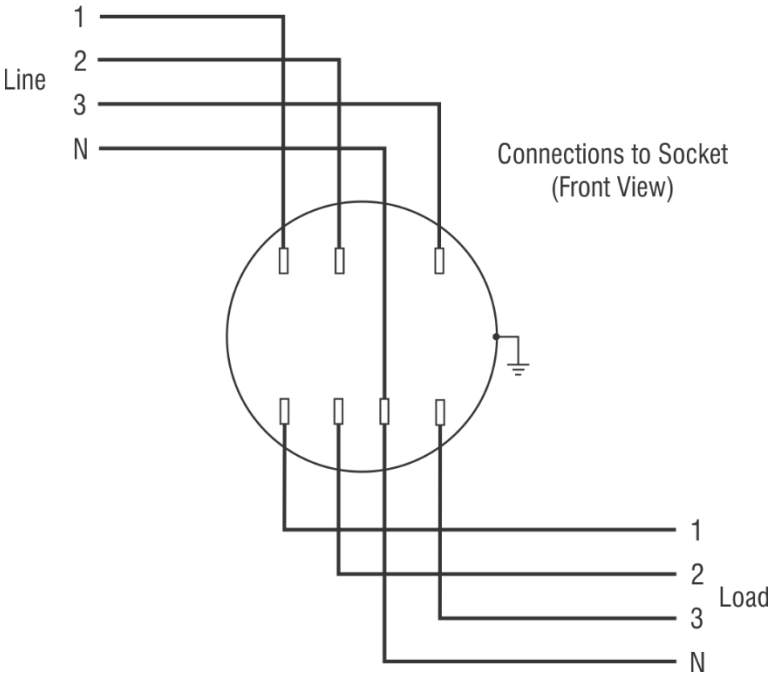


208 volts line-to-line
120 volts line-to-neutral
or
480 volts line-to-line
277 volts line-to-neutral

Form 16S



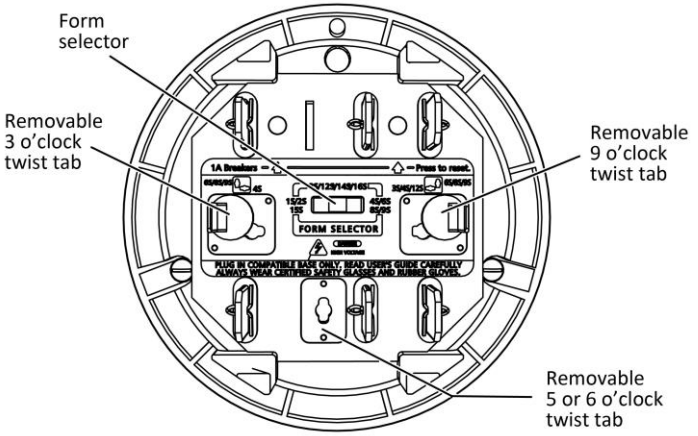
Meter Internal Wiring
(Front View)



Appendix C

Form Configurations

Below are shown various back tabs configurations for the test socket that you could configure according to the meter base being used.



Forms	3 o'clock	6 o'clock	9 o'clock	Form Selector
1S, 2S				
3S, 12S		or		
4S				
6S, 8S, 9S, 36S, 46S, (Fitzall 5S, 6S, 36S, 45S)				
15S				
14S, 16S				

Appendix D

Troubleshooting

If the MT-1/WT1 seems to be having operational issues, consult the following list to help determine the source of the problem. You can also refer to our support page for more information (https://probewell.com/support/). If the problem persists, please contact Probewell Lab Inc.'s technical services.

ISSUE	DESCRIPTION	FIX
SOCKET DOES NOT START AT POWER ON	The socket is not powering on and cannot connect to its web server.	• Check if the fan inside the socket is running. • Make sure the Form Selector is set according to the meter base being used. • Verify that the meter base's voltage is between 100 and 480 VAC. • The meter base must be able to provide at least 150 VA. • Do not plug the tester into a test board.
METER UNDER TEST DOES NOT WORK	The meter is not powering on after the form was selected.	• Make sure the selected **form** matches the one indicated on the meter nameplate. • Turn the MT-1/WT1 off and on again. • Check the meter's insertion. • The meter could be defective. Try another meter.
NO PULSE FOUND (SOLID-STATE METERS)	On the web interface, you only see "Check meter parameters" and it does not proceed to the "TESTS" page	• Make sure the sensor is positioned over the meter's IR pulse emitter. • Some meters need to be set in test mode to emit a proper pulse for testing. See the meter's user manual.

ISSUE	DESCRIPTION	FIX
METER NOT INSTALLED	The socket is not detecting the meter current elements and the web page interface displays a "meter not installed" message.	• Make sure the meter tabs are fully plugged into the MT-1/WT3's front jaws. • Check if the MT-1/WT3 socket's front jaws are clean and in good condition. • Check if the meter's contacts are clean and in good condition. • Try another meter. • Turn the MT-1/WT3 off and on again.
METERCAM NOT SYNCHRONIZED WITH THE DISK	The Metercam is not detecting the black flag on the disk correctly.	• Make sure the Kh corresponds with the one indicated on the meter's nameplate. • Reposition the Metercam and start the test over again.
METERCAM KEEPS SCANNING WITHOUT FINDING THE DISK	The Metercam is not detecting the black flag on the disk of the meter being tested.	• Check if the disk is turning. • Check if the meter's disk is in the Metercam disk zone. • Check that the suction cups are adhering properly to the meter face. Lightly moisten the suction cups if necessary.

Appendix E

Customer Service

Warranty and repairs

If your MT-1/WT3 becomes defective while under warranty (two years after original date of purchase), Probewell Lab Inc. will repair or replace it. If the unit becomes defective after the warranty has expired, Probewell Lab. Inc. will repair it, charging the cost of labor and spare parts.

Before returning a unit for repair

Please do not return your MT-1/WT3 without first contacting customer service at 1 866-626-1126 or sending an email to info@probewell.com. You will be given detailed shipping instructions.

Technical questions

If you have any technical questions regarding the MT-1/WT3's operation, contact our technical support team at 1-866-626-1126 or send an email to support@probewell.com.

Appendix F

Recommendations

Probewell Lab Inc. suggests that you respect the following recommendations to get maximum use out of the MT-1/WT3 and its accessories for many years to come. **Any unauthorized modifications or broken seals will immediately void the warranty and any further services.**

MT-1/WT3

- Do not try to open the MT-1/WT3 socket; there are no serviceable parts inside.
- Never block the air vents on the MT-1/WT3 socket.
- Never expose this equipment to bad weather or direct rain.
- Keep the front jaws and rear tabs clean. Use lubricant for electric contacts. **Do not** use abrasive materials.
- Never use **solvent** to clean the MT-1/WT3. Use a soft moist cloth with non-abrasive soap to clean the surface.
- Handle the MT-1/WT3 with care.

Metercam and Optical Pickup

- Do not try to open; there are no serviceable parts inside.
- Never expose this equipment to bad weather or direct rain. Do not expose to direct sunlight for long periods of time.
- Keep the Metercam's back window and suction cups clean. **Do not** use abrasive materials. Use a soft moist cloth with non-abrasive soap to clean the surface. Use mineral oil to soften hardened suction cups.
- Handle both pickups with care. Use one of the side pouches inside the carrying bag to store the Metercam and the Optical Pickup.

Notes

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