

# ClearTest<sup>®</sup>

## TRANSFORMER TESTER CT-300

*WITH AUTOMATIC SELF TEST*

### Operating & Instruction Manual



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Depot**



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## SAFETY

**WARNING:** The ClearTest Transformer Tester shall only be used on equipment known to be deenergized and/or discharged.

**CAUTION:** Using the ClearTest Transformer Tester on the secondary side of transformers may generate high voltages on the primary side. Stay clear of all primary connections while testing.

**OPERATIONAL IMPAIRMENT:** If the CT-300 is used in a manner not described in this instruction manual, the protection and effective operation of this equipment may be impaired.

## INTRODUCTION

The CT-300 ClearTest Transformer Tester is a versatile tool for quick and easy checks of transformers and the connections made to them. The transformer connections can include bundled secondaries or a cable run from the transformer to the meter.

In the field, the CT-300 is used to test the primary and secondary sides of new or reworked, deenergized single or three phase transformer installations.

In the shop the tester is used for quick screening of incoming and outgoing transformers (including their internal fuses and breakers). It tests both 1Ø and 3Ø transformers including PT's and other instrument transformers.

## HOW IT WORKS

The CT-300 is used in the field for testing connected transformers and their connected primary and secondary leads for both shorts or opens. Unlike a simple ohmmeter, the CT-300 measures transformer winding inductance and can differentiate true shorts from other low resistance windings or connected equipment such as meters.

**NOTE:** The CT-300 will detect most typical transformer defects including partially shorted windings such as turn-to-turn or layer-to-layer which result in an improper ratio.

### **BEFORE TESTING:**

- 1. DO NOT CONNECT TO ENERGIZED EQUIPMENT**
- 2. REMOVE SECONDARY LOAD**
- 3. REMOVE ALL PRIMARY UNDERGROUND CABLES**
- 4. PRESS AND HOLD TEST BUTTON FOR EACH CONNECTION - DO NOT HOLD THE TEST BUTTON FOR MORE THAN ONE CONNECTION**

## TESTING THE CLARTEST TRANSFORMER TESTER

The CT-300 will automatically perform a complete self-test of the batteries, lights, beeper and all electronics when you press and hold the TEST button and is indicated by all lights and the beeper turning on. This self-test takes about one second to complete, after which the tester will begin testing whatever the leads are connected to. This self-test checks everything except for the test leads and internal fuse. To test the leads and fuse, short the test leads together and press the TEST button. A SHORT light after completion of the normal self-test indicates that the leads and fuse are good.

If the unit fails to operate, check or replace both batteries. If this self-test sequence is not completed, the unit will not perform any further testing and must be returned to the factory for service.

## USING THE CT-300

For single phase transformers, use these figures as guidelines to get started. For 3Ø transformers, refer to the following page.

When all connections are proper and the transformer itself is good, the CT-300 will beep and show OK. The OPEN indication light indicates a bad connection or an open transformer winding. A SHORT light indicates a short from phase to neutral or phase to phase in the transformer or the connections to it.

**NOTE:** Disconnect primaries or remove primary fuses before testing secondaries.

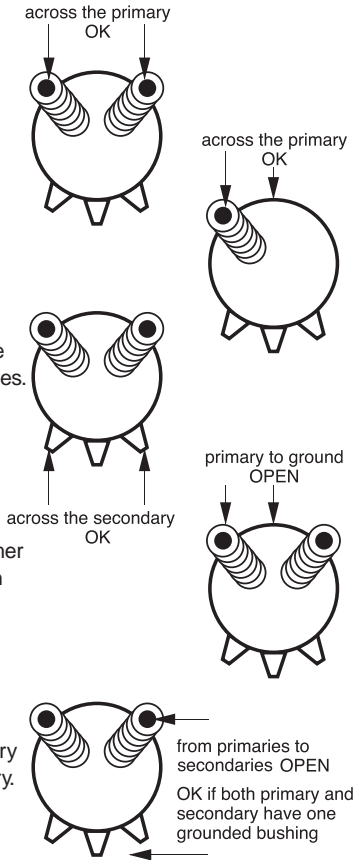
### RESULTS:

- OK:** Transformer coil is OK with no shorts or opens.
- SHORT:** Transformer has internal short or load is connected.
- OPEN:** Check connections. Transformer coil is open or check for blown fuse or breaker.

As a quick test in the shop, the CT-300 can be used to screen transformers by checking both primary and secondary windings and connections. Test for SHORTs on both primary and secondary windings and from primary to secondary. Test for OPENs on both primary and secondary windings to check for open windings or open breakers and fuses.

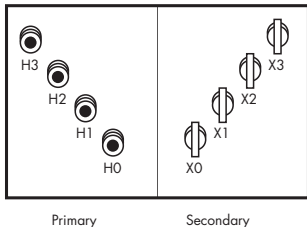
**This instrument is intended for quick and simple testing of transformers and the connections made to them. Do not energize visibly damaged equipment such as a leaking transformer even if the CT-300 indicates OK.**

## Test Connections for CT-300



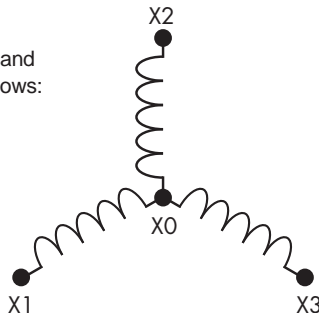
Remove secondary ground strap to verify primary isolated from secondary with OPEN indication.

For 3Ø transformers, the CT-300 test leads are connected from each phase to neutral and across each pair of phases. When all connections are proper and the transformer itself is good, the CT-300 will beep and show OK. The OPEN indication indicates a bad connection or an open transformer winding. A SHORT indication indicates a short from phase to neutral or phase to phase in the transformer or the connections to it.



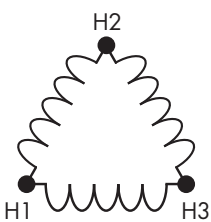
For Y (wye) connections, test the primary and secondary sides of the transformer as follows:

- X1 - X2     OK
- X2 - X3     OK
- X1 - X3     OK
- H1 - H2     OK
- H2 - H3     OK
- H1 - H3     OK
- H1 - H0     OK
- H2 - H0     OK
- H3 - H0     OK
- H1 - X1 }    Transformer OK if both H0
- H2 - X2 }    and X0 are grounded,
- H3 - X3 }    otherwise OPEN
- H0 - X0     SHORT, if both sides are
- grounded, otherwise OPEN



Y Connection

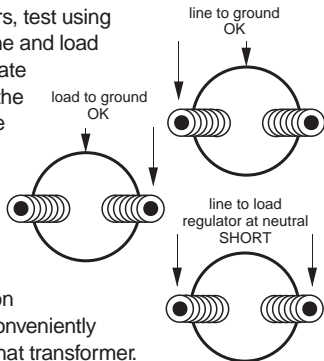
For Δ (delta) connections, test the primary and secondary sides the same as the Y (wye) except omit the connections to X0 and H0.



Delta Connection

## TESTING DISTRIBUTION VOLTAGE REGULATORS

For typical distribution voltage regulators, test using these figures as guidelines. Both the line and load bushings tested to ground should indicate the reading shown in the figures. With the regulator in the neutral position, the line and load are internally connected with the resulting test indicating SHORT.



## TESTING DISTRIBUTION TRANSFORMERS FROM METER SOCKETS

An overhead or underground distribution transformer can sometimes be more conveniently tested from a meter socket served by that transformer.

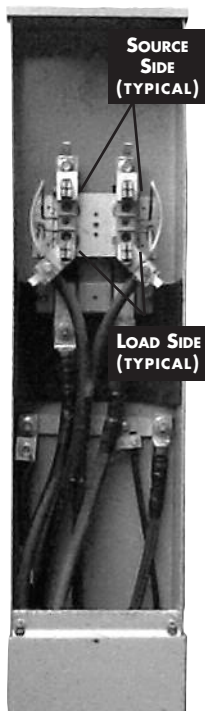
The CT-300 shall only be used on equipment known to be deenergized. Test both the load and source sides of the meter socket for the presence of voltage before using the CT-300.

Using the CT-300 on the secondary side of transformers may generate high voltages on the primary side. Stay clear of all primary connections while testing. The CT-300 will test the secondary side of a transformer connected to the meter socket. Connect the CT-300 across the two source side receptacles and from each receptacle to ground and test.

**NOTE:** This procedure will not work if other loads are connected to the same transformer.

The wiring on the load side of the meter socket going into the main breaker can also be tested for shorts or crossed phases. Connect the CT-300 across the two load side receptacles and from each receptacle to ground. The absence of shorts or crossed phases will be indicated by an OPEN reading. If the main breaker is not open, connected loads within the building may cause a SHORT or OK indication.

The meter socket connections shown are typical. Local standards may specify different connections.



## BATTERY REPLACEMENT

The CT-300 is powered by two 9V lithium or alkaline batteries. They are easily and quickly replaced by removing the battery cover on the back of the unit. Always replace the two batteries together.

**NOTE:** For user safety there is a non-replaceable 600V internal fuse inside the instrument. If the instrument is connected to an energized transformer, the fuse will blow. The instrument must then be returned to the factory for repair.

## DIMENSIONS

4.0 in. W x 7.8 in. L x 2.3 in. H (10.1 cm x 19.5 cm x 5.9 cm)

## WEIGHT

1.6 lbs, (727 g)

## BATTERY

9V alkaline 1604A, IEC 6LR61 or 9V lithium ANSI-1604LC

**SHORT:** Power factor < 0.3 to 0.5, current dependent

**OPEN:** Current < 10  $\mu$ A

**TRANSFORMER OK:** Power factor  $\geq$  0.3 TO 0.5, current dependent

## ENVIRONMENTAL CONDITIONS

**CONDITIONS:** Indoor and outdoor use

**ALTITUDE:** Up to 6,566 ft. (2000M)

**OPERATING TEMPERATURE:** -20°F to +140°F (-29°C to +60°C)

**HUMIDITY:** 95% to +60°C (non-condensing)

**POLLUTION DEGREE:** PD2

**ENCLOSURE MATERIAL:** ABS UL 94-HB

**PRINTED CIRCUIT BOARDS:** FR-4 UL 94-V0

### ClearTest Transformer Tester CT-300

**WARNING:** Use Only on Equipment Known to be Deenergized and/or Discharged. To test leads and internal fuse, short leads together and check for blinking SHORT light. Connect the test leads to the device under test. Push the test button and observe the lights. An OK indication verifies no direct shorts or opens. OPEN indicates an open connection or a high resistance leakage path. SHORT indicates a very low resistance. Using this tool on the secondary side of transformers may generate high voltages on the primary side. Refer to instructions. Check the batteries if the unit fails to operate. Replace with 9V alkaline or lithium types only. This unit contains a 600V fuse which is not replaceable. Return to factory for service.

**DANGER:** Failure to follow these directions or the instructions may expose the user to high voltage, severe injury or death.

HD Electric Company, Waukegan, IL U.S.A.  
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# TERMS AND CONDITIONS OF SALE

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**6. EXCUSE OF PERFORMANCE (FORCE MAJEURE):** HDE shall not be liable for delays in performance or for non-performance due to acts of God; acts of Buyer; war; fire; flood; weather; sabotage; strikes; labor disputes; civil disturbances or riots; governmental requests, restrictions, allocations, laws, regulations, orders or actions; unavailability of or delays in transportation; default of suppliers; or unforeseen circumstances or events beyond HDE's reasonable control. Deliveries or other performance may be suspended for an appropriate period or cancelled by HDE upon notice to Buyer in the event of any of the foregoing, but the balance of this agreement shall otherwise remain unaffected. If HDE determines that its ability to supply the total demand for the Goods, or to obtain material used directly or indirectly in the manufacture of the Goods, is hindered or limited or made impracticable due to causes set forth herein, HDE may allocate its limited supply of such materials (without obligation to acquire special supplies of any such Goods or materials) among itself and its purchasers on such basis as HDE determines to be equitable without liability for any failure of performance which may result therefrom.

**7. CHANGES:** HDE reserves the right to change designs and specifications for standard Goods without prior notice to Buyer, but not with respect to custom Goods being made for Buyer. HDE shall have no obligation to install or make such change in any Goods manufactured prior to the date of such change.

**8. ASSIGNMENT:** Buyer shall not assign its rights or delegate its duties hereunder or any interest herein without the prior written consent of HDE, and any such assignment, without such consent, shall be void.

**9. INSTALLATION:** Buyer shall be responsible for receiving, inspecting, testing, storing, installing, starting up and maintaining all Goods.

**10. INSPECTION/TESTING:** Buyer, at its expense, agrees that it will promptly inspect the Goods upon receipt thereof, and in no event later than thirty (30) days from the date of receipt of the Goods. Buyer shall deliver to HDE within fifteen (15) days of inspection, but in no event later than forty-five (45) days from the date of receipt of the Goods, written notice of any and all deficiencies, defects, variations from specifications or complaints of any kind with respect to the quantity, quality, condition, shipment, performance, price or appearance of the Goods so received by Buyer. In the event no such written notice is received by HDE, Buyer shall be deemed conclusively to have inspected and accepted all such Goods unconditionally and to have waived any and all rights and claims, including without limitation any right to reject the Goods or to claim damages in respect thereof. Buyer may not return goods without first advising HDE of the reasons therefor, obtaining from HDE a material authorization number and observing such instructions as HDE may give in authorizing such return. In the event a return is authorized by HDE, a restocking for any Goods requiring repackaging or maintenance a twenty percent (20%) restocking fee shall be assessed to Buyer in the final credit amount.

**11. SERVICES:** If this agreement requires HDE to perform or provide any services, HDE (including without limitation its successors, assigns, agents or any person or entity acting at HDE's direction) shall not be responsible for any damages, claims, liabilities or expenses of any nature arising out of such services.

**12. U.S. EXPORT CONTROL LAWS:** All Goods sold to Buyer by HDE hereunder are subject to U.S. Export Control Laws. Buyer hereby agrees not to sell or divert any goods contrary to such laws.

**13. COMPLIANCE:** Seller/Contractor shall comply with all applicable federal, state or local laws, rules, regulations, or orders. Seller/Contractor shall comply with Executive Order 11246, as amended by Executive Order 11375, and the applicable provisions of the Office of Federal Contract Compliance Programs (OFCCP), 41 CFR Part 60, which are incorporated herein by reference. Buyer shall comply with all applicable federal, state, or local laws, rules, regulations or orders including but not limited to the Foreign Corrupt Practices Act of 1977, as amended. HDE reserves the right to delay or refuse delivery of requests for reasonable assurances of Buyer's compliance are not tendered as requested.

**14. MISCELLANEOUS:** These terms and conditions supersede all other communications, negotiations and prior oral or written statements regarding the subject matter hereof. No change, modification, rescission, discharge, abandonment, or waiver of these terms and conditions shall be binding upon HDE unless made in writing and signed on its behalf by its duly authorized representative. No conditions, printed or trade, course of dealing or performance, understanding or agreement purporting to modify, vary, explain, or supplement these terms and conditions shall be binding unless hereafter made in writing and signed by Seller. No modification shall be effected by HDE's receipt or acceptance of Buyer's purchase orders, shipping instructions, forms, or other documentation containing terms at variance with or in addition to those set forth herein, all of which are objected to by HDE. Any such modifications or additional terms are specifically rejected by HDE. No waiver by HDE with respect to any breach or default of any right or remedy or no course of dealing, shall be deemed to constitute a continuing waiver of any other breach or default of any other right or remedy, unless such waiver be expressed in writing and signed by HDE. All typographical or clerical errors made by HDE in any quotation, acknowledgment or publication are subject to correction. Validity and performance relating to the interpretation and effect of this agreement shall be governed by the laws of the state of Illinois without regard to its conflict of law principles.

**15. DISPUTE RESOLUTION:** In the event of any dispute INCLUDING, BUT NOT LIMITED TO, BREACH OF CONTRACT, BREACH OF WARRANTY, CLAIMS BASED IN TORT, NEGLIGENCE, PRODUCT LIABILITY, FRAUD, MARKETING, STATE OR FEDERAL REGULATIONS, ANY CLAIMS REGARDING THE ENFORCEABILITY OF THIS LIMITED WARRANTY, AND THE WAIVER OR CLASS ACTION TRIALS BETWEEN BUYER AND SELLER, either party may choose to resolve the dispute by binding arbitration, as described below, instead of in court. THIS MEANS IF EITHER BUYER OR SELLER CHOOSES BINDING ARBITRATION, NEITHER PARTY SHALL HAVE THE RIGHT TO LITIGATE SUCH CLAIM IN COURT OR HAVE A JURY TRIAL. DISCOVERY AND APPEAL RIGHTS ARE LIMITED IN BINDING ARBITRATION. Buyer and Seller agree that the proper venue for Arbitration is not to be chosen by Buyer or Seller or any actions arising in connection herewith shall be only in the state and district and the parties agree to submit such jurisdiction. No action, regardless of form, arising out of transactions relating to the agreement, may be brought by either party more than two (2) years after the cause of action has accrued. The U.N. Convention on Contracts for the International Sales of Goods shall not apply to this agreement.

**16. CLASS ACTION WAIVER:** BINDING ARBITRATION MUST BE ON AN INDIVIDUAL BASIS. THIS MEANS NEITHER BUYER NOR SELLER MAY JOIN OR CONSOLIDATE CLAIMS IN ARBITRATION BY OR AGAINST OTHERS, OR LITIGATE IN COURT OR ARBITRATE ANY CLAIMS AS A REPRESENTATIVE OR MEMBER OF A CLASS OR IN A PRIVATE ATTORNEY GENERAL CAPACITY. ADMINISTRATION OF ARBITRATION: The binding arbitration must be administered by the American Arbitration Association ("AAA") in accordance with its Commercial Arbitration Rules and all Supplementary Procedures for Consumer-Related Disputes (including but not limited to the rules for the resolution of disputes in this agreement) which is governed by the Federal Arbitration Act ("FAA") (9 USC § 1, et seq.) and will govern the interpretation and enforcement. The binding arbitration shall be held at a location determined by AAA or at such other location mutually agreed. In addition to the terms stated above, the following will apply to the binding arbitration: (1) the arbitrator, and not any federal, state, or local court or agency, will have exclusive authority to resolve any dispute relating to the interpretation, applicability, enforceability or formation of this Agreement including any claim that all or any part of this Agreement is void or voidable; (2) the arbitrator shall apply Illinois law consistent with the FAA.

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