

# ATRT-03 S2

automatic, 3-phase transformer turns ratio tester



Vanguard Instruments  
A DOBLE COMPANY





# ATR-03 S2

## 3-phase transformer turns ratio tester

### Product Overview

The ATRT-03 S2 can be used as a standalone unit or can be computer-controlled. It can be operated locally using its alpha-numeric keypad and rotary switch. Information is displayed on a back-lit LCD screen (128 x 64 pixels) that is viewable in both bright sunlight and low-light levels. Test reports can be printed in the field on the unit's built-in 4.5-inch wide thermal printer. The ATRT-03 S2 is capable of storing up to 112 test records and 128 test plans in Flash EEPROM memory. Test records or test plans can be stored or transferred to and from a PC via the available interfaces (RS-232C port, USB port, USB Flash drive port).

The ATRT-03 S2 is Vanguard's third generation, microprocessor-based, automatic, three phase, transformer turns-ratio tester. This lightweight and rugged portable unit is designed for transformer testing at utility power substations.

The ATRT-03 S2 determines the transformer turns-ratio using the IEEE C57.12.90 measurement method. The ATRT-03 S2 outputs an excitation test voltage to the transformer's primary windings. The induced secondary voltage is sensed and the transformer turns-ratio is calculated. The ATRT-03 S2 can measure turns-ratios from 0.8 to 15,000. The transformer turns-ratio, excitation current, and phase-angle readings are displayed on the large backlit LCD. The built-in transformer type detection feature allows the ATRT-03 S2 to detect and test 130 transformer types defined by ANSI, CEI/IEC and Australian standards.

### Transformer Test Voltages

To prevent an accidental wrong test-lead hook-up (e.g., when the operator reverses H and X leads), the ATRT-03 S2 outputs a low-level test voltage to verify the hook-up condition before applying the full test voltage to the transformer. Three test voltages (8 Vac, 40 Vac, 100 Vac) allow the ATRT-03 S2 to test CT's and PT's, as well as power transformers.

### Auto-Detect Transformer Configuration

The ATRT-03 S2 can automatically detect 130 specific vector groups for different transformer types defined by ANSI, CEI/IEC, and Australian standards.

### Internal Test Record Storage

Up to 112 test records can be stored in the ATRT-03 S2's Flash EEPROM memory. Each test record may contain up to 99 turns-ratio, excitation current, phase angle and nameplate voltage readings. Test records can be recalled locally or transferred to a PC via the available interfaces (RS-232C port, USB port, USB Flash drive port).

### Power Sources

The ATRT-03 S2 can be powered from a single-phase 100-240 Vac 50/60 Hz power source. A built-in safety ground detection circuit can detect and display a ground fault problem with the AC input source.

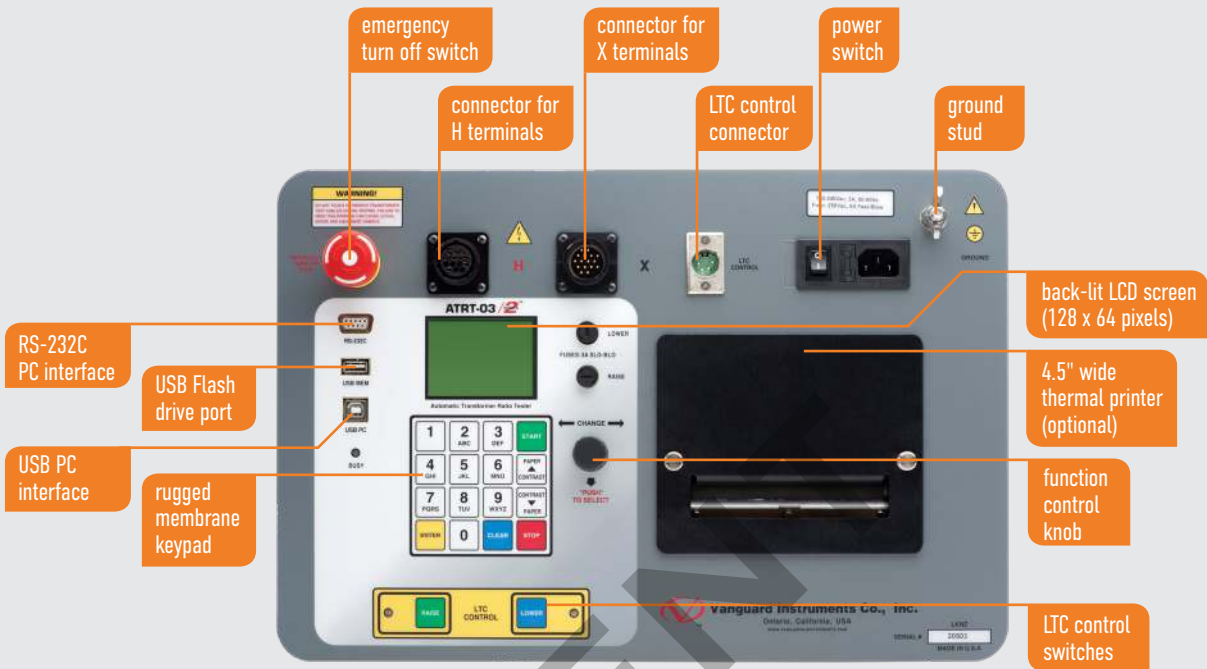
### outstanding features

- Ratio range: 0.8 – 15,000 : 1
- Capable of detecting 130 different 3-phase transformer types defined by ANSI, IEC, and Australian standards
- 3 test voltages: 8Vac, 40Vac, and 100Vac
- Phase angle and excitation current measurement
- RS-232C and USB PC interfaces
- Optional 4.5" wide thermal printer

### ordering information

| Part No. | Description                          |
|----------|--------------------------------------|
| 9003-UC  | ATR-03 S2, cables, and PC software   |
| 9003-SC  | ATR-03 S2 shipping case              |
| 9003-PR  | ATR-03 S2 thermal printer option     |
| TP4-CS   | TP4 thermal printer paper (24 rolls) |

# ATRT-03 S2 Features



## Transformer Test Plans

The ATRT-03 S2 can store up to 128 transformer test-plans in its Flash EEPROM. A test-plan is comprised of the transformer nameplate voltages for each tap setting. The calculated turns-ratio based on the nameplate voltages is compared with the measured turns-ratio to derive the percentage error and Pass/Fail results. By using a test plan, a transformer can be quickly tested and turns-ratio Pass/Fail reports can be reviewed. Test plans can be created with the PC software and can be transferred to the ATRT-03 S2 via the available interfaces (RS-232C port, USB port, USB Flash drive port).

## User Interface

The ATRT-03 S2 features a back-lit LCD screen (128 x 64 pixels) that is viewable in both bright sunlight and low-light levels. The test results screen displays the transformer turns-ratio, excitation current, phase angle, and percentage error. The unit is controlled via a rugged, 16-key, membrane keypad and a digital rotary switch.

## Computer Interface

In computer-controlled mode, the unit can be controlled via the RS-232C or USB interface using the included TTRA S2 transformer analysis software. This Windows®-based application can be used to run tests and to store test results on a PC. Test results can also be exported to Excel, PDF, and XML formats for further analysis.

## Transformer Load Tap Changer Control

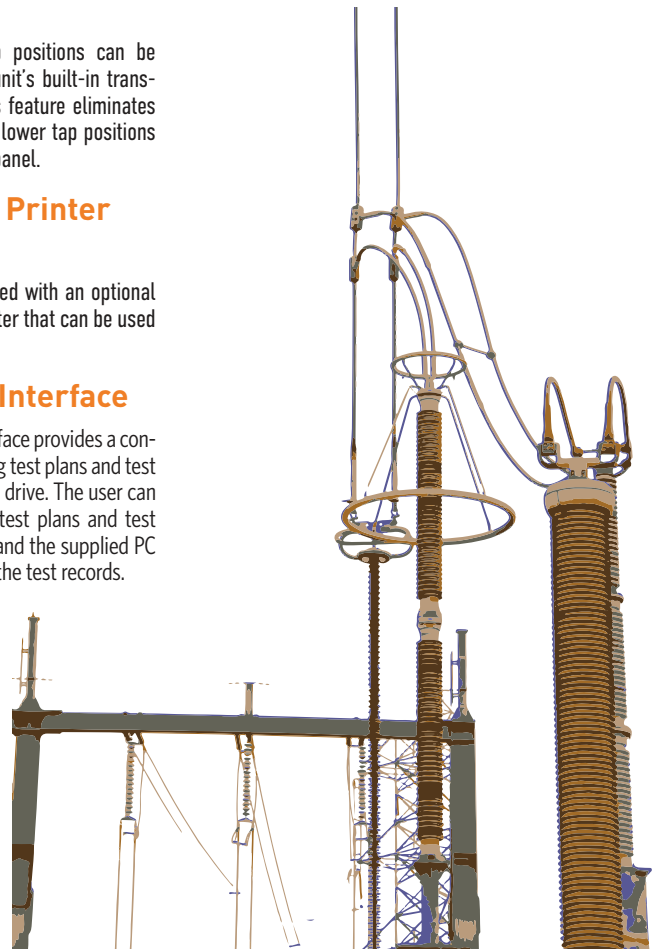
Voltage regulator or LTC tap positions can be changed remotely using the unit's built-in transformer load tap changer. This feature eliminates the need to manually raise or lower tap positions from the transformer control panel.

## Built-in Thermal Printer Option

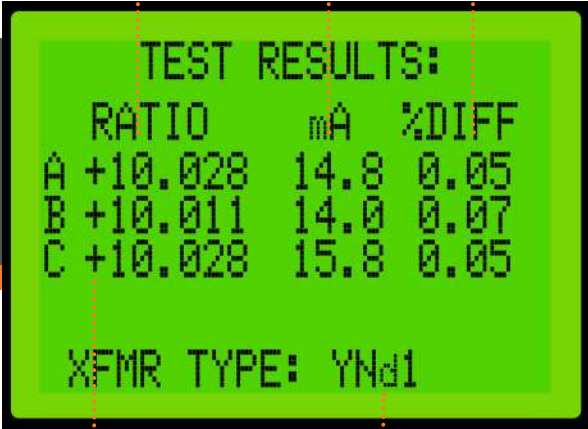
The ATRT-03 S2 can be outfitted with an optional built-in 4.5" wide thermal printer that can be used to print test results.

## USB Flash Drive Interface

A built-in USB Flash drive interface provides a convenient method for transferring test plans and test records to or from a USB Flash drive. The user can store up to 999 transformer test plans and test records on a USB Flash drive, and the supplied PC software can be used to view the test records.



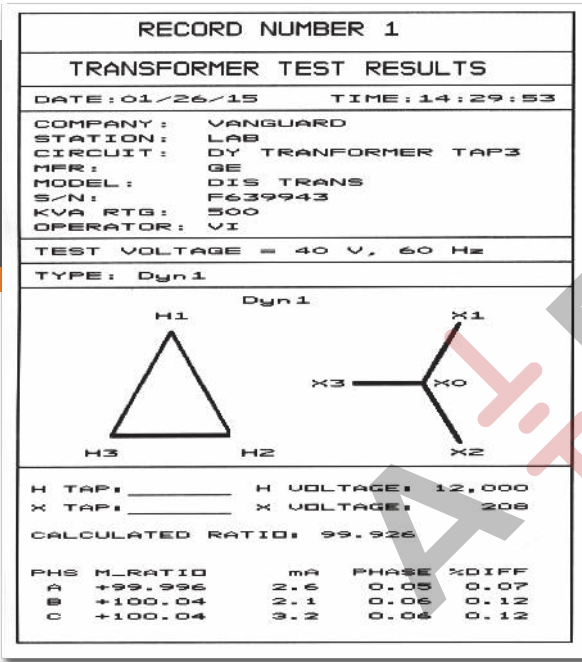
Measured Ratio for Phase A, B, and C      Excitation Current Reading      Percentage Error



Winding Polarity

Transformer Type

# typical 3-phase test results screen



# thermal printer output (printer optional)

With the built-in thermal printer option (part no. 9003-PR), test results can be quickly printed in the field without the need to connect the unit to a PC.

## Vanguard Instruments Company, Inc.

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**TRANSFORMER TURNS RATIO REPORT**

Filename: test001.lst    Date: January 26, 2015    Time: 04:02 PM    Page (1/1)

Company: VANGUARD  
 Location: LAB  
 Circuit: DY TRANSFORMER TAP3  
 Operator:  
 Comment:

MFR: GE  
 Device: Transformer  
 Type: Dyn1  
 Model: DIS TRANS  
 Rating: 500  
 Serial #: F839943  
 Max Deviation %: 3  
 Test Voltage: 40V

| HIGH-VOLTAGE WINDING (H) | LOW-VOLTAGE WINDING (X) | VECTOR GROUP | INTERNAL JUMPER | HIGH VOLTAGE WINDING | LOW VOLTAGE WINDING | VEAS RATIO              | TURNING RATIO                                   | NOTES |
|--------------------------|-------------------------|--------------|-----------------|----------------------|---------------------|-------------------------|---|-------|
|                          |                         | Dyn1         |                 | H1-H3                | X1-X0               | $\frac{V_{H1}}{V_{X1}}$ | $\frac{V_{H1}}{V_{X1}} + \frac{V_{H2}}{V_{X2}}$ |       |
|                          |                         |              |                 | H2-H1                | X2-X0               | $\frac{V_{H2}}{V_{X2}}$ | $\frac{V_{H2}}{V_{X2}} + \frac{V_{H3}}{V_{X3}}$ |       |
|                          |                         |              |                 | H3-H2                | X3-X0               | $\frac{V_{H3}}{V_{X3}}$ | $\frac{V_{H3}}{V_{X3}} + \frac{V_{H1}}{V_{X1}}$ |       |

| TEST | H VOLT | H TAP | X VOLT | X TAP | C-RATIO | M-RATIO      | DEV [%] | P/F | I[mA] | DEGREE | RES |
|------|--------|-------|--------|-------|---------|--------------|---------|-----|-------|--------|-----|
| 1    | 12000  |       | 208    |       | 99.9260 | A: + 99.996  | 0.07    | P   | 2.600 | 0.050  |     |
|      |        |       |        |       |         | B: + 100.042 | 0.12    | P   | 2.100 | 0.060  |     |
|      |        |       |        |       |         | C: + 100.043 | 0.12    | P   | 3.200 | 0.060  |     |

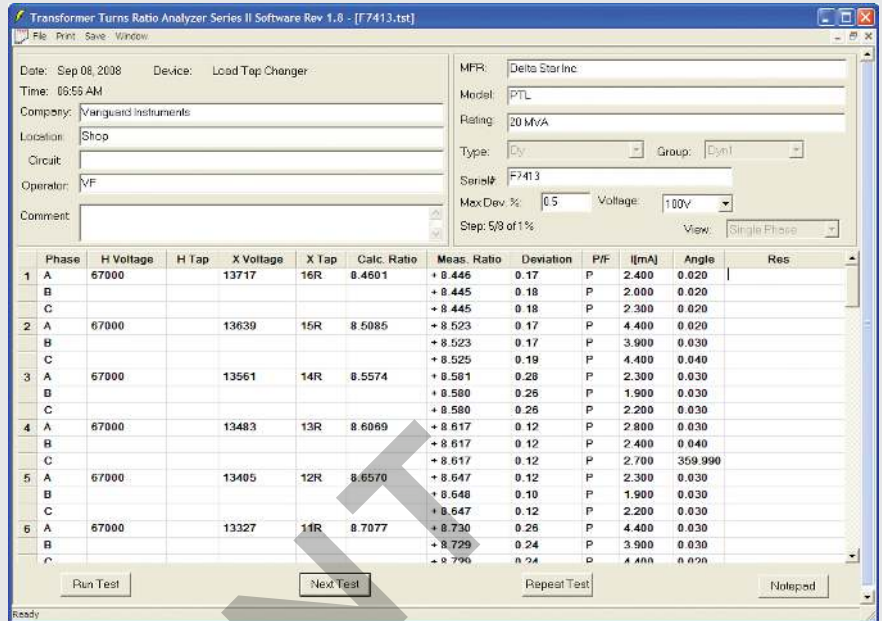
# desktop printer output

Test reports can be generated with the included TTRA S2 PC software. Test records can be exported to Excel, PDF, and XML formats for further analysis.
























# TTRA S2 Software

The ATRT-03 S2 comes with the Vanguard Transformer Turns Ratio Analysis Series 2 (TTRA S2) PC software. The TTRA S2 software can be used to test winding turns ratios of transformers, voltage regulators, and load-tap changers. Test plans can be created using the TTRA S2 application and then transferred to the ATRT-03 S2. Test records can be exported to Excel, PDF, and XML formats for further analysis.

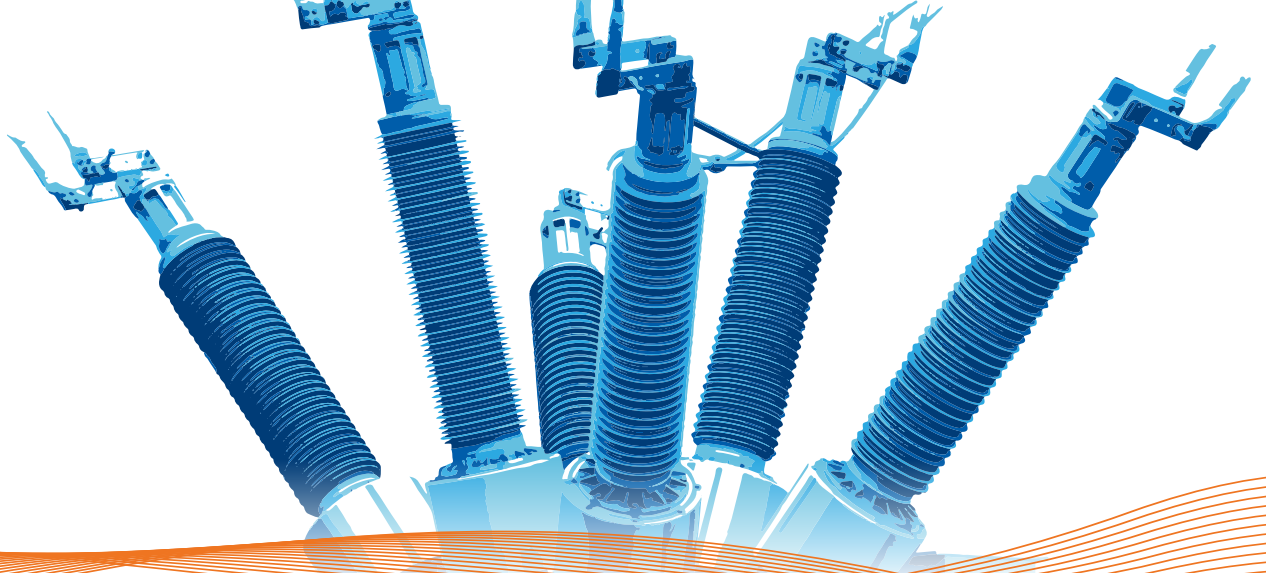
The latest version of the TTRA S2 software can always be downloaded free from the Vanguard web site at [www.vanguard-instruments.com](http://www.vanguard-instruments.com). Please note that you will need to create a free account on our site in order to download software or firmware.



## ATR-03 S2 technical specifications

|   |   |  |  |
|---|---|--|--|
|  <b>physical specifications</b>      | <b>Dimensions:</b> 18"W x 7"H x 15" D (45.7 cm x 17.8 cm x 38.1 cm)<br><b>Weight:</b> 20 lbs. (9.0 Kg)  |  <b>input power</b>                | 100 – 240 Vac,<br>50/60 Hz   |
|  <b>measuring method</b>             | ANSI/IEEE C57.12.90   |  <b>ratio measuring range</b>      | 0.8 – 15,000 : 1   |
|  <b>typical turns-ratio accuracy</b> | <b>8 Vac:</b> 0.8 – 1,000 ( $\pm 0.08\%$ ), 1,001 – 4,000 ( $\pm 0.1\%$ ), 4,001 – 15,000 ( $\pm 0.25\%$ )<br><b>40 Vac:</b> 0.8 – 1,000 ( $\pm 0.05\%$ ), 1,001 – 4,000 ( $\pm 0.1\%$ ), 4,001 – 15,000 ( $\pm 0.2\%$ )<br><b>100 Vac:</b> 0.8 – 1,000 ( $\pm 0.05\%$ ), 1,001 – 4,000 ( $\pm 0.1\%$ ), 4,001 – 15,000 ( $\pm 0.2\%$ ) |  <b>current reading range</b>      | 0 – 1 Ampere, accuracy: $\pm 0.1\text{mA}$ , $\pm 2\%$ of reading ( $\pm 1\text{mA}$ ) |
|  <b>test voltages</b>                | 8 Vac @ 1.0A, 40 Vac @ 0.2A, 100 Vac @ 0.1A   |  <b>phase angle measurement</b>    | 0 – 360 degrees<br>accuracy: $\pm 0.2$ degree ( $\pm 1$ digit)                         |
|  <b>display</b>                      | back-lit LCD screen (128 x 64 pixels)<br>viewable in bright sunlight and low-light levels   |  <b>computer interfaces</b>        | One RS-232C port, one USB port   |
|  <b>printer</b>                      | optional built-in 4½" wide thermal printer  |  <b>internal test plan storage</b> | stores up to 128 transformer test plans;<br>plans can be transferred to PC.            |
|  <b>pc software</b>                  | Windows®-based transformer turns-ratio analysis software is included with purchase  |  <b>external data storage</b>      | up to 999 test records on external USB flash drive (drive not included)                |
|  <b>internal test record storage</b> | stores 112 complete transformer test records, each record holding the test record header and up to 99 readings  |  <b>humidity</b>                   | 90% RH @ 40°C (104°F)<br>non-condensing  |
|  <b>safety</b>                       | designed to meet IEC 61010 (1995),<br>UL 61010A-1, and CSA-C22.2 standards  |  <b>altitude</b>                   | 2,000 m (6,562 ft)<br>to full safety specifications                                    |
|  <b>temperature</b>                  | <b>Operating:</b> -10°C to +50°C (+15°F to +122°F)<br><b>Storage:</b> -30°C to +70°C (-22°F to +158°F)  |  <b>ltc contact</b>                | 240 Vac, 2A  |
|  <b>cables</b>                       | one 15 ft (4.6m) single phase set, one 15 ft (4.6m) 3-phase set, one 25 ft (7.6m) extension set, one safety ground, one RS-232C, one USB, cable bag   |  <b>warranty</b>                   | one year on parts and labor  |
|  <b>options</b>                      | shipping case, 30' (9.14 m) 3-phase H and X leads, 30' (9.14 m) single phase H and X leads  |  |  |

**NOTE :** the above specifications are valid at nominal voltage and ambient temperature of +25°C (+77°F). Specifications are subject to change without notice.



## Instruments designed and developed by the hearts and minds of utility electricians around the world.

Founded in 1991 and located in Ontario, California, USA, Vanguard Instruments™ offers a wide range of diagnostic test equipment that accurately and efficiently measures the health of critical substation equipment, such as transformers, circuit breakers, and protective relays.

Our first product was a computerized, extra high voltage (EHV) circuit breaker analyzer, which became the forerunner of an entire line of EHV circuit breaker test equipment. Over the years, our portfolio has grown tremendously to include microcomputer-based precision micro-ohmmeters; single- and three-phase transformer winding turns-ratio testers; transformer winding-resistance meters; mega-ohm resistance meters; and a variety of other application-specific products.

Our instruments are rugged, reliable, accurate, and user friendly. They eliminate tedious and time-consuming operations, while providing fast, complex test-result calculations. Using our equipment helps reduce errors and eliminates the need to memorize long sequences of procedural steps.

In 2017, Vanguard Instruments became a part of Doble Engineering Company, an energy industry leader in hardware, software, and services that diagnose and monitor the health of critical assets.



**Vanguard Instruments**  
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