

# MRC7300A

## Three Phase Transformer Measuring Bridge For Resistance- and Ratio- Measurements

Transformer  
measuring devices

Transformer Measuring Bridge

With the precision measuring bridge MRC7300A it is possible to safely determine winding resistances, transformation ratios and phase angles of distribution transformers up to 100 MVA and more. Further it is possible to automatically move the tap changer of the H.V. winding to the next position and make a measurements on all taps.

The MRC7300A 3-phase measuring bridge can be use by transformer manufacturers, electricity supply companies and repair companies having to carry out on-site measurements under unfavourable conditions.

Resistance values ranging from 100  $\mu\Omega$  to 2000  $\Omega$  can easily be measured and logged with the internal measuring current of a maximum of 20 A up to a power of approximately 100 MVA and more. To allow a comparison of the measured values to previous measurements a conversion of the temperature of the test object is provided in order to compare measurements of a detached transformer carried out in the winter and measurements carried out in another season.

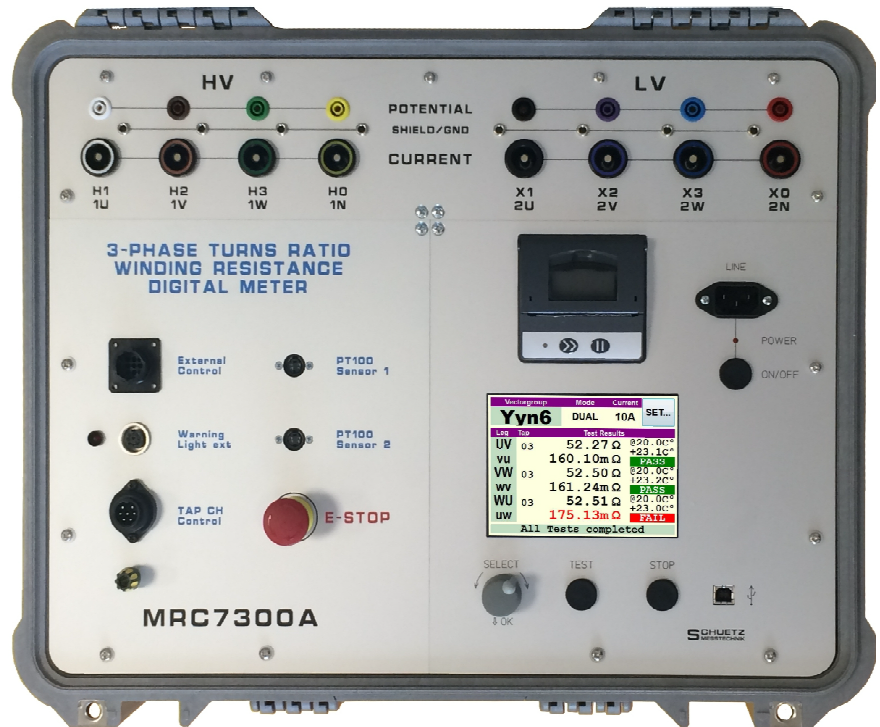
The provided Kelvin clips and lugs as well as all cables required allow an easy and safe connection of the measuring bridge to the test object. The tap changer can be moved and measured step by step by means of the automatic system which is connected to the tap changers signalling control of the transformer.

The measuring range is between 0.9:1 and 10,000:1 in the case of the transformation ratio; the resolution of the angle measurement is 0.1 degrees. The logging of all measured values is performed by a separate printer, computer or via the internal memory.

The magnetic loading of the transformer is performed quickly due to a relatively high starting voltage (ca. 60V).

The unloading of the core is very safe, as the energy is destroyed in the MRC7300A by a ballast resistor and varistors except for a negligible rest.

Surge arresters protect the MRC7300A from peak voltages. During the moving of the tap changer to the next tap, with the measuring current still flowing, the measuring circuits are disconnected from the test object to protect the inputs amplifiers.



### Phase selection device:

The measuring bridge MRC7300A contains a phase selection device. With this device it is possible to connect the complete transformer with all of its high and low voltage windings so that reconnection to other windings between the individual measurements is not necessary. This not only saves time but also increases safety. Either by using the front panel keyboard or by using the serial interface, complex programs which are logged correspondingly can be started by pressing a few keys or entering a few commands.

For many measurements it is necessary to know the vector group, e.g. in the case of the transformation ratio measurement and the dual measuring method. Depending on the vector group and also on the corresponding commands, the automatic selection of the LV winding to a HV winding is required. 34 vector groups are permanently programmed in the MRC7300A, more can be added if necessary.

The internal phase selection device allows the measurement of the three magnetising currents and the measurement of two temperatures via PT100.

### Features

- Automatic measurement without any manual interaction
- Resistance measurement with high accuracy and up to 20 A current
- Ratio measurement including phase angle and magnetising current
- Dual measuring method for faster measurements
- Tap changer control measures all transformer taps automatically
- Temperature measurement and compensation to 20 °C for Cu or Al
- USB port to get full external control over the instrument
- Thermo printer

### Questions?

phone: +49 (0)3328 / 3179 - 0

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## Three Phase Transformer Measuring Bridge

The phase selection device is designed for best interference immunity. To make it EMC-safe, in particular with regard to the great number of terminals, all relays are bistable. It maintains its control state, which can be checked at any time, even in the case of a supply failure. Suddenly opened or by a power or line failure are avoided. Even in this critical case the transformer's energy is deloaded in the internal damping resistor.

### Dual measuring method:

With the phase selection device you can use the dual measuring method. In this method, windings on the HV and the LV side which are on the same leg are serially connected. To measure both windings you only have to load and unload the core once which saves time.

### Tap changer measurements:

You can connect the step-by-step system of the tap changer on the front panel of the MRC7300A via an adapter. The basic method (resistance measurement) is as follows:

In the case of a measurement a floating contact is closed for one second when the measurement is completed. This must start the step-by-step system. The tap changer signalling switch must give a response within this second. Then the next tap is driven and measurement is carried out. If it doesn't, the measurement or the series of measurements is stopped, the last measured value (or the only one if no tap changer was connected) is displayed and is logged.

In the case of transformers ratio measurement an automatic tap-to-tap measurement is possible. Here, the magnetising current can be measured at each tap, too.

### Increase of measuring current:

The maximum measuring current the MRC7300A can provide is 20 A. This value is reached in most cases, only a very high winding resistance limits the current. To reach a high measuring stability, the MRC7300A is provided with a special measuring current.

Sometimes it is necessary to increase the measuring current in order to measure extreme low-resistance objects such as

filament-heating transformers. A special high current add-on can be connected to measure the winding resistance (Option).

### Safety:

A warning accessory is available which warns the user and allows him to work at the test object (e.g. reconnection) by means of red and green lights, respectively. If the warning light is activated no measurement is possible if it is defect or disconnected.

## Transformer measuring devices

### Transformer Measuring Bridge

#### Displayed result for RATIO

##### Measurements

| Vectorgroup         | Ratio | Voltage      | SET...                               |
|---------------------|-------|--------------|--------------------------------------|
| <b>Yzn5</b>         | Turns | 160V         | SET...                               |
| Phase               | Tap   | Test Results |                                      |
| <b>U</b>            | 01    | 10.030:1     | -0.2°<br>35.2mA<br>-0.2% <b>PASS</b> |
| <b>V</b>            | 01    | 10.042:1     | -0.1°<br>32.3mA<br>-0.1% <b>PASS</b> |
| <b>W</b>            | 01    | 10.011:1     | -0.1°<br>34.9mA<br>-0.3% <b>FAIL</b> |
| All Tests completed |       |              |                                      |

#### Displayed result for RESISTANCE

##### Measurement

| Vectorgroup         | Mode | Current      | SET...             |
|---------------------|------|--------------|--------------------|
| <b>Yyn6</b>         | DUAL | 10A          | SET...             |
| Leg                 | Tap  | Test Results |                    |
| <b>UV</b>           | 03   | 52.27 Ω      | @20.0C°<br>+23.1C° |
| <b>vu</b>           |      | 160.10m Ω    | <b>PASS</b>        |
| <b>VW</b>           | 03   | 52.50 Ω      | @20.0C°<br>+23.2C° |
| <b>wv</b>           |      | 161.24m Ω    | <b>PASS</b>        |
| <b>WU</b>           | 03   | 52.51 Ω      | @20.0C°<br>+23.0C° |
| <b>uw</b>           |      | 175.13m Ω    | <b>FAIL</b>        |
| All Tests completed |      |              |                    |

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## Resistance measurement

|                        |  |
|------------------------|--|
| Range                  | 0,01 $\mu\Omega$ – 2000 $\Omega$ autoranging |
| Test object limits:    | about 100 MVA depending on type              |
| Max. error             | $\pm 0.1$ % of MV $\pm 5$ digit              |
| Measuring Current,max. | 20 A max.                                    |
| Loading Voltage,max.   | 60 V   |
| Loading Time           | fast due to high loading voltage             |
| Measuring Power,max.   | 420 VA                                       |
| Demagnetisation Time   | about 10..20 % of loading time               |

## Ratio measurement

|                       |   |
|-----------------------|---|
| Range                 | 0.900 – 10,000 auto ranging               |
| Max. error            | $\pm 0.1$ % of actual value $\pm 5$ digit |
| One measuring voltage | 230 VAC (other on demand e.g. 250VAC)     |
| Measuring frequency   | 50 Hz or 60 Hz (user selectable)          |

## Phase angle measurement

|            |              |
|------------|--------------|
| Max. error | $\pm 0.25$ ° |
|------------|--------------|

## Magnetising current measurement

|            |                |
|------------|----------------|
| Range      | 1 mA – 1000 mA |
| Max. error | $\pm 1$ %      |

## Temperature measurement

|                |  |
|----------------|--|
| Range          | - 20 °C to + 100 °C, linearized (for PT 100)                               |
| Max. error     | 0.2 °K (without probe error)   |
| Type of sensor | PT 100 temperature probe   |
| Application    | #1: Temperature for TC-Compensation<br>#2: Temperature on other test point |

## Start of measurement

by using keypad and via USB

## Interfaces

USB  
CSV data format by read out program  
Thermo Printer

## Size/Weight

H22 W52 D43 cm / approx. 16 kg

## Power Supply

90 .. 250 VAC 45 .. 65 Hz

## Transformer measuring devices

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#### Available enhancements

- **PT 100 1/10 DIN – temperature probe:**  
4-pole MiniDIN connector  
cable length 1,5 m  
 $F = \pm(0,03^{\circ}\text{C}+0,0005\cdot|t|)$

#### Available accessories

- **Cable** various length, with Kelvin lugs or Kelvin clamps
- **DKD – calibration certificate** from the ‚Deutscher Kalibrierdienst‘

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