**Automatic Instrument Transformer Test Set**

The type 2767 automatic current and voltage transformer test set is a modern, fully automatic instrument for fast and accurate measurement of instrument transformer errors. Increasingly severe quality control requirements call for a higher degree of operating comfort and absolute reliability of the measuring equipment employed. Based on the latest design technology, this instrument sets new standards of quality, reliability, convenient operation and simple maintenance.

Its measurement ranges for current/voltage errors, phase displacement and current/voltage excitation are fully up to international standard requirements.

This measuring instrument has been tested by PTB (Physical Technical Federal Authority) in Germany. It fulfills all requirements according to the PTB test rules for measuring instrument transformers and is approved for calibration.

**OPTIONS**

- Remote-controlled measurement via IEEE 488 interface
- Wide range of accessories (see order specification)

**DESIGNED FOR USE IN:**

- Laboratories
- Manufacturing processes
- Quality control procedures
- Official metrology stations

**FEATURES**

- Current and voltage transformer measurements with a single instrument
- Fully automatic measurement and digital display of current/voltage ratio errors, phase displacement, test current and voltage
- Measurements are possible on instrument transformers of practically any primary and secondary current and voltage ratings
- Test & standard transformers may have different ratios
- A cost-effective solution:
  - Different transformers can be tested using one single standard transformer
  - Different standard and test transformer ratios are matched without use of an external divider
- Interactive parameter entry simplifies operation
- Plain-language display of error messages on a 2 x 16 character dot-matrix
- Short measurement times, and dynamic averaging
- Very high accuracy, and low inherent burden
- Connection for external printer (RS 232 interface)
- Specifications conform to the standards/recommendations of IEC 60044 and IEC 61869, ANSI/IEEE C57.13 and VDE 0414, part 2
- Including RS 232 interface for computer connection and optional IEEE488 GPIB interface

**COMPLETE MEASUREMENT SYSTEMS**

HAEFELY HIPOSTRONICS also designs and supplies computer controlled current and voltage transformer measurement facilities for specific customer requirements.

- Type 2767 combined test set for current and voltage instrument transformers
- Series 4760 standard current transformer (current comparator)
- Type 2763 is a test set for current instrument transformers only
- Type 2769 is a test set for voltage instrument transformers only
- Series 4820 standard voltage instrument transformer or series 4860 electronic standard voltage divider with high-voltage capacitive divider
- Type 3691 or 3695 programmable electronic burden
- In addition, TETTEX INSTRUMENTS can supply all necessary peripherals (e.g. computer and printer) for external control and data recovery.
- Series 5260 power supplies, current only or combined current and voltage.
TECHNICAL SPECIFICATIONS

The type 2767 test set measures transformer ratio errors by the differential method. A major advantage of this is that balancing of winding turns at the differential transformer (current comparator) and compensation via an additional winding enable fully accurate measurement although the test and standard transformer have different ratios.

Measurements are initiated simply by entering the rated test and standard transformer data, for which the built-in microprocessor has a particularly convenient man-machine interface. Current or voltage errors, phase displacement, test current or test voltage are measured continuously and displayed in digital form.

A dynamic averaging facility is provided for measurements at low current or voltage, which ensures that accuracy and display stability are maintained even at poor signal/noise ratios.

Test circuit for current instrument:

![Test Circuit Diagram]

Permissible limits for k: \(0.5 \leq k \leq 500\) (accuracy depends on k-factor)

Ratio matching factor of test and standard transformers (correction)

\[
k = \frac{I_{\text{PR}}}{I_{\text{SNR}}} : \frac{I_{\text{PNR}}}{I_{\text{SNR}}}
\]

All entered values for \(I_{\text{PR}}\) and \(I_{\text{SNR}}\) are checked and the optimum input parameters \((N_X, N_N)\), are set by a microprocessor.

Input limit values

- Rated primary current \(I_{\text{PR}}, I_{\text{SNR}}\) 50 mA ... 1000 kA
- Rated secondary current \(I_{\text{SNR}}\) 50 mA ... 5 A (continuously adjustable)

2. VOLTAGE TRANSFORMER MEASUREMENT PART

X and N-inputs (test and standard transformers)

- Rated secondary voltage (max. rated range values)
  \(U_{\text{SXR}}, U_{\text{SNR}}\) 140, 300 V
  additional with factors \(x \frac{1}{\sqrt{3}}, x \frac{1}{3}\)
- Max. operating range \((U_{\text{SXR}}, U_{\text{SNR}})\)
  \(U_{\text{SXR}} = \begin{cases} 3 \ldots 140 V & : 3 \ldots 280 V \\ > 140 \ldots 300 V & : 10 \ldots 400 V \end{cases}\)
- Inherent burden
  \(U_{\text{SXR}}, U_{\text{SNR}} = 100 V < 1 VA\)
  \(140 V < 0.5 VA\)

Ratio matching factor of test and standard transformers (correction)

\[
k = \frac{U_{\text{PR}}}{U_{\text{SXR}}} : \frac{U_{\text{PNR}}}{U_{\text{SNR}}}
\]

Permissible limits for k: \(0.5 \leq k \leq 10\) (accuracy depends on k-factor)

All entered values for \(U_{\text{PR}}\) and \(U_{\text{SNR}}\) are checked and the optimum input parameters \((N_N, R_X, R_N)\) are set by a microprocessor.

Input limit values

- Rated primary voltage \(U_{\text{PR}}, U_{\text{SNR}}\) 3 V ... 10’000 kV
- Rated secondary voltage \(U_{\text{SNR}}\) (continuously adjustable)

\(3 \ldots 300 V\)

1. CURRENT TRANSFORMER MEASUREMENT PART

X-input (test transformer)

- Rated secondary current \(I_{\text{SXR}}\) 0.1 - 1 - 2 - 5A
- Max. operating range 1 ... 210 % \(I_{\text{SXR}}\)
- Inherent burden \(< 1 VA\) (at rated current)

N-input (standard transformer)

- Rated secondary current \(I_{\text{SNR}}\) 0.1 - 1 - 2 - 5A
- Max. operating range 1 ... 210 % \(I_{\text{SNR}}\)
- Inherent burden \(< 2.5 VA\) (at rated current)
3. CURRENT AND VOLTAGE TRANSFORMER MEASUREMENT PART

Measurement ranges for current/voltage errors (RATIO ERROR) and Ratio Correction Factor (RCF)

Display of F [%] or RCF as required

\[ \text{RCF} = \frac{1}{1 + F} = \frac{F}{100} \]

Measurement range is for phase displacement (PHASE ANGLE)

Display of [min] or [crad], as required

1 crad = \((0.01 \times 180/\pi \times 60)\) min \(\approx 34.4\) min

Current measurement ranges (EXCITATION)
Display of test specimen current \(I_{P} \) or \(I_{S} \) as absolute values in [A] or [%] of rated current.

Voltage measurement ranges (EXCITATION)
Display of test specimen voltage \(U_{P} \) or \(U_{S} \) as absolute values in [V] or [%] of rated voltage.

Resolution
- Current/voltage error \(0.0001\% = 1 \times 10^{-6} \) (1ppm)
- Phase angle \(\delta\) 0.001 min or 0.0001 crad
- Test current 0.001 A or 0.1 % ISNR
- Test voltage 0.1 V or 0.1 % USNR
- Measurement frequency 0.1 Hz

Measurement frequency ranges 15...18 Hz / 45 ... 65 Hz

Measurement times at 50 Hz
- First measurement \(< 3\) s
- Subsequent measurements \(< 1\) s

DISPLAYS

- 6-digit LCD measured-value displays (height 18 mm) of:
  - RATIO ERROR (current / voltage error)
  - PHASE ANGLE (phase displacement)
  - EXCITATION (test current / voltage)

- LCD dot-matrix, 2 x16 characters (height 7 mm) for measurement frequency, entry instructions and error messages

Mains supply 230 V or 115 V

Power input approx. 35 VA

Dimensions (W x H x D) 500 x 310 x 470 mm

Temperature Range +5 to +40°C

Humidity 5 to 80% r.h. non-condensing

Weight 40 kg (88 lb)

This instrument is designed in accordance with the safety requirements of VDE 0411 /part 1 and IEC 348 (safety class 1).

<table>
<thead>
<tr>
<th>F [%]</th>
<th>± 1.999</th>
<th>± 1.999</th>
<th>± 0.1999</th>
</tr>
</thead>
<tbody>
<tr>
<td>RCF</td>
<td>0.8334</td>
<td>1.2499</td>
<td>0.98040</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>(\delta) [min]</th>
<th>± 680</th>
<th>± 199.9</th>
<th>± 199.9</th>
<th>± 199.9</th>
<th>± 199.9</th>
</tr>
</thead>
<tbody>
<tr>
<td>(\delta) [crad]</td>
<td>± 199.9</td>
<td>± 199.9</td>
<td>± 199.9</td>
<td>± 199.9</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>(I_{L}) [A]</th>
<th>0.000...1.999</th>
<th>2.00...19.99</th>
<th>20.0...199.9</th>
<th>200...1999</th>
</tr>
</thead>
<tbody>
<tr>
<td>(I_{L}) [mA]</td>
<td>2.00...19.99</td>
<td>20.0...199.9</td>
<td>200...1999</td>
<td></td>
</tr>
<tr>
<td>(I_{L}) [%]</td>
<td>0.000...199.9</td>
<td>200...210</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>(U_{L}) [V]</th>
<th>0.0...199.9</th>
<th>200...1999</th>
</tr>
</thead>
<tbody>
<tr>
<td>(U_{L}) [kV]</td>
<td>2.00...19.99</td>
<td>200...1999</td>
</tr>
</tbody>
</table>

Limits of error at current transformer measurements
- For operating range 1 ... 210 % of rated current
- Measurement frequency 50 or 60 Hz
- Reference conditions as per IEC 359

Limits of error at voltage transformer measurements
- For operating range \(U_{S} = 3 \ldots 400\) V
- Measurement frequency 50 or 60 Hz
- Reference conditions as per IEC 359

Explanation of limit of errors specification
- % rdg = % error of reading
- % fs = % error of value full-scale

The above limits of error also apply for test and standard transformers of different ratios. Limits of error at rated operating conditions see specifications as per instruction manual. Reference and rated operating conditions as per IEC 359, rated range of use 1.
### ORDER SPECIFICATIONS

**STANDARD SUPPLY**

Type 2767 automatic instrument current and voltage transformer test set in a 19" case (including RS 232C printer interface).

- **Ground cable**: 16 mm², 10 m
- **Power cable**
  - Mains: 230 or 115 V 50/60 Hz (please specify with order)
  - Including RS 232C interface
  - Type 2763 is a test set for current instrument transformers only
  - Type 2769 is a test set for voltage instrument transformers only

**OPTIONS FOR TYPE 2767/2763/2769**

For remote control by external computer:

- IEEE 488 interface type 2767/1

**OTHER OPTIONAL SUPPLIES**

- **Bus cable for IEEE 488 interface**, 4 m
- **Standard current transformers (current comparators)**, current ratings as follows:
  - up to 1'000 A/1-5A type 4761
  - up to 5'000 A/1-5A type 4764
- **Standard voltage transformers up to 220 kV/100V** series 4820
- **Electronic standard voltage divider** series 4860
- **Programmable electronic current burden** type 3691
- **Programmable electronic voltage burden** type 3695
- **Power supplies current only or combined current and voltage** series 5260

---

### Example of a test certificate:

**AUTOMATIC INSTRUMENT TRANSFORMER TEST SET -- TETEX INSTRUMENTS**

---

### OPTIONS:

**Europe**

Haefely Test AG
Birsstrasse 300
4052 Basel
Switzerland

+ 41 61 373 4111
sales@haefely.com

**China**

Haefely Test AG Representative Beijing Office
8-1-602, Fortune Street
No. 67, Chaoyang Road, Chaoyang District
Beijing, China 100025

+ 86 10 8578 8099
+ 86 10 8578 9908
sales@haefely.com.cn

**North America**

Hipotronics, Inc.
1650 Route 22 N
Brewster, NY 10509

United States

+1 845 279 3644
+1 845 279 2467
sales@hipotronics.com