

# 2763 / 2767 / 2769

## Automatic Instrument Transformer test Set

*Datasheet*



# HAEFELY

Current and voltage – our passion

Designed by



# General Description

The 2767 automatic current and voltage transformer test set is a modern, fully automatic instrument for fast, 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.

## 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
- 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

## Applications

Designed for use in:

- For remote-controlled measurement - IEEE 488 interface
- Laboratories
- Manufacturing processes
- Quality control procedures
- Official meteorology stations

## Options

- For remote-controlled measurement – IEEE 488 interface
- Wide range of accessories (see order specifications)

## Measurement Systems

HAEFELY 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.

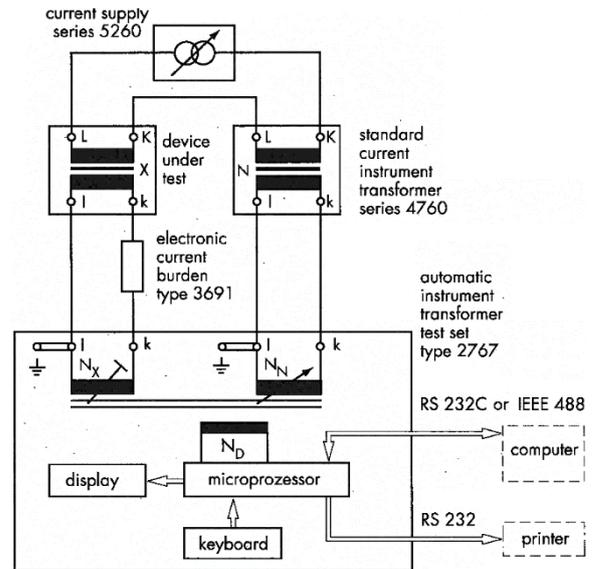
## Technical Specifications

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:



### 1. CURRENT TRANSFORMER MEASUREMENT PART

X-input (test transformer)

- Rated secondary currents  
I<sub>SXR</sub> 0.1 - 1 - 2 - 5 A
- Max. operating range 1 ... 210 % I<sub>SXR</sub>
- Inherent burden < 1 VA (at rated current)

N-input (standard transformer)

- Rated secondary current  
I<sub>SNR</sub> 0.1 - 1 - 2 - 5 A
- Max. operating range 1... 210 % I<sub>SNR</sub>
- Inherent burden < 2.5 VA (at rated current)

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

Ratio matching factor of test and standard transformers (correction)

$$k = \frac{I_{PXR}}{I_{SXR}} : \frac{I_{PNR}}{I_{SNR}}$$

All entered values for IPR and ISR are checked and the optimum input parameters (N<sub>x</sub>, N<sub>N</sub>), are set by a microprocessor.

Input limit values	50 mA ... 1000 kA
Rated primary current I <sub>PXR</sub> , I <sub>PNR</sub>	
Rated secondary current I <sub>SXR</sub> , I <sub>SNR</sub>	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)  $U_{SXR}$ ,  $U_{SNR}$  additional with factors  $\times 1/\sqrt{3}$ ,  $\times 1/3$
- Max. operating range ( $U_{SX}$ ,  $U_{SN}$ ) at  $U_{SXR} = 3 \dots 140 \text{ V} : 3 \dots 280 \text{ V}$   
 $U_{SNR} = > 140 \dots 300 \text{ V} : 10 \dots 400 \text{ V}$
- Inherent burden at  $U_{SXR}$ ,  $U_{SNR} = 100 \text{ V} < 1 \text{ VA}$   
 $140 \text{ V} < 0.5 \text{ VA}$

Ratio matching factor of test and standard transformers (correction)

$$k = \frac{U_{PXR}}{U_{SXR}} : \frac{U_{PNR}}{U_{SNR}}$$

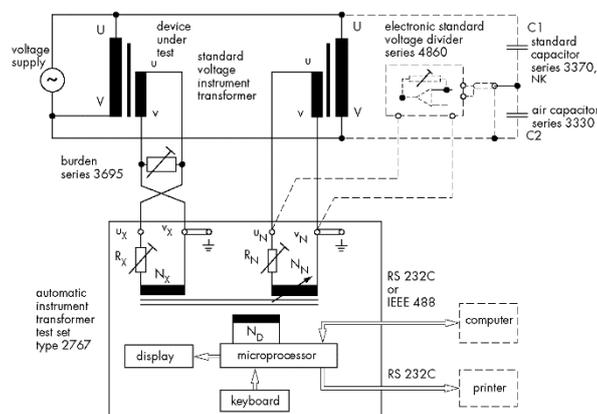
Permissible limits for k:  $0.5 \leq k \leq 10$   
 (accuracy depends on k-factor)

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

Input limit values

- Rated primary voltage  $U_{PXR}$ ,  $U_{PNR}$   $3 \text{ V} \dots 10'000 \text{ kV}$
- Rated secondary voltage  $U_{SXR}$ ,  $U_{SNR}$   $3 \dots 300 \text{ V}$   
 (continuously adjustable)

Test circuit for voltage instrument transformer



## 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

Conversion

$$RCF = \frac{1}{1+F} = \left\{ F = \frac{F [\%]}{100} \right\}$$

Measurement ranges for phase displacement (PHASE ANGLE)

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

Conversion  $1 \text{ crad} = 34.4 \text{ min}$

Current measurement ranges (EXCITATION)

Display of test specimen current  $I_{PX}$  or  $I_{SX}$  as absolute values in [A] or [%] of rated current.

Voltage measurement ranges (EXCITATION)

Display of test specimen voltage  $U_{PX}$  or  $U_{SX}$  as absolute values in [V] or [%] of rated voltage.

Resolution

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

Measurement frequency ranges

$45 \dots 65 \text{ Hz} / 15 \dots 18 \text{ Hz}$  (with reduced accuracy)

Measurement times at 50 Hz

- First measurement  $< 3 \text{ s}$
- Subsequent measurements  $< 1 \text{ s}$

## 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,  $2 \times 16$  characters (height 7 mm) for measurement frequency, entry instructions and error messages

Mains supply	230 V or 115 V, 50/60 Hz
Power input	approx. 35 VA
Temperature range	+ 5 ... + 40 °C
Dimensions (W x H x D)	500 x 310 x 470 mm (19.7 x 12.2 x 18.5 in)
Temperature Range	+5 to +40°C
Humidity	5 to 80% r.h. non condensing
Weight	40 kg (88 lb)

F [%]	± 19.99	± 1.999	± 0.1999
RCF	0.8334 ... 1.2499	0.98040 ... 1.02040	0.99800 ... 1.0200

δ [min]	± 680	± 199.9	± 19.99	± 1.999
δ [crad]	± 19.99	± 1.999	± 0.1999	

I <sub>x</sub> [A]	0.000 ... 1.999	2.00 ... 19.99	20.0 ... 199.9	200 ... 1999
I <sub>x</sub> [kA]	2.00 ... 19.99		20.0 ... 199.9	200 ... 1999
I <sub>x</sub> [%]	0.000 ... 199.9		200 ... 210	

U <sub>x</sub> [V]	0.0 ... 199.9		200 ... 1999
U <sub>x</sub> [kV]	2.00 ... 19.99	20.0 ... 199.9	200 ... 1999
U <sub>x</sub> [%]	Determined by U <sub>PXR</sub> and U <sub>SXR</sub> and operating range 3 ... 400 V		

## Accuracy

Extract of limits of error for current transformer and voltage transformer measurements at reference conditions resulting in highest accuracy. Full accuracy specifications see instruction manual.

Ratio error [%] or RCF	Current ratio error	± 0.3% rdg ± 15 ppm ± 1 dig
	Voltage ratio error	± 1% rdg ± 80 ppm ± 1 dig
Phase Angle [min], [crad]	Current phase error	± 1% rdg ± 0.034 min ± 1 dig ± 1% rdg ± 10 urad ± 1 dig
	Voltage phase error	± 3% rdg ± 0.17 min ± 1 dig ± 3% rdg ± 50 urad ± 1 dig
Excitation [A], [V], [%]	Current and voltage	± 0.5% rdg ± 0.5 % f <sub>s</sub>

PT: 10 – 400 V, k=1

CT: 10 ... 210%, k=1, Ratio error <0.2%, Phase error < 20 min

## 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 mm<sup>2</sup>, 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- 5 A 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

## Global Presence

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# HAEFELY

Current and voltage – our passion



HIGH VOLTAGE



INSTRUMENTS



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