



4860

Standard Electronic Voltage Dividers



GENERAL

The 4860 series (control unit and capacitive HV divider with compressed gas and air caps) high precision standard voltage divider is used as a variable comparison standard in the differential method (bridge) measurement of high voltage instrument transformers.

The special active guard controlled design of this divider set results in highest accuracy.

This standard voltage divider is ideal for integration with the 2767 or 2769 test set in a full remote controlled instrument voltage transformer test system.

STANDARD VOLTAGE DIVIDER ARRANGEMENT

High voltage divider unit

The high voltage divider unit comprises a capacitive high voltage divider (compressed gas standard capacitor C1 and air capacitor C2) and an electronic device in series, constituting a variable electronic divider (see system diagram). Capacitive voltage divider C1/C2 divides the primary voltage U_{prim} to voltage U_1 , which the electronic device matches to the required secondary voltage U_{sec} . Voltage instrument transformers of less than 1 kV primary voltage can be connected directly to the electronic system via the adaptor box supplied with the divider.

Electronic device

The main components of this system are an input amplifier and a guard-potential control (up to 1010 V), an electronic divider and a power amplifier with the output stage. The

instrument is protected against setting errors, overvoltages and short-circuits. Errors message are indicated on the dot matrix.

FEATURES

- Universal comparison standard for any transformer ratios within a wide voltage range
- Very accurate voltage divider ratio (± 50 ppm ± 0.1 min)
- Max. measurement voltage only depends on compressed gas capacitor rated voltage
- For voltages less than 1000 V the electronic device can be used without additional divider
- Easy handling
- Suitable for all Tettex (2767, 2765, 2711/22 and 2711/23) and many other manufacturers of transformer test sets
- Direct replacement of earlier series 4850
- Existing compressed gas capacitors can generally be equipped to form a complete system.
- Complete system is **certificable**
- Remote control possibility via IEEE 488 or RS 232C interface
- Upgradeable to an **automatic test system** by combination with a type 2767
- A more cost-effective solution than inductive voltage standard transformers, especially for high rated voltage systems.

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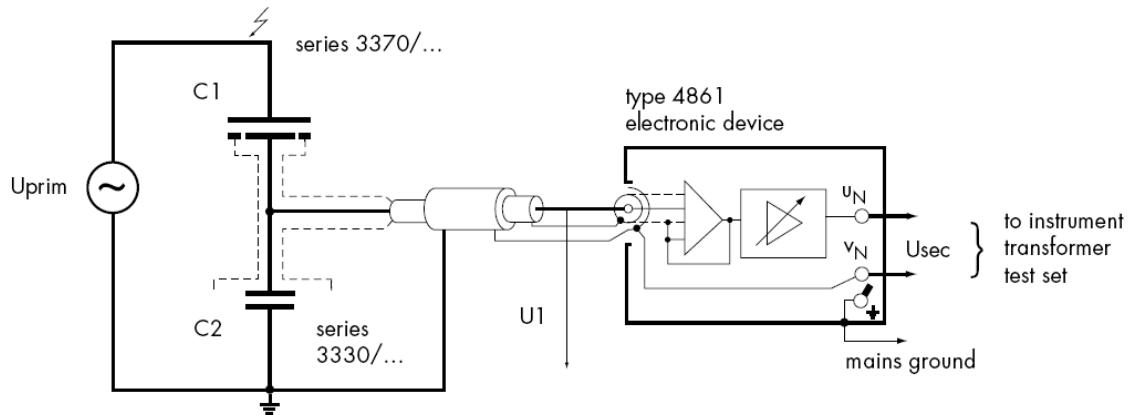
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BASIC TEST SET-UP



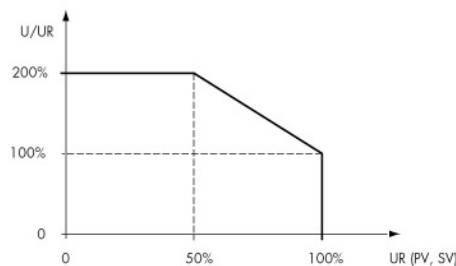
Measurement circuit with capacitive divider for > 1 kV primary voltage

Capacitive divider ratio

$$CR = 1 : \frac{C1 + C2}{C1} = 1 : \frac{U_{prim}}{U1}$$

Excitation

$$\frac{U}{UR} = \frac{U_{prim}}{PV} = \frac{U_{sec}}{SV}$$



Legend for abbreviations used

- PV Primary rated voltage
- SV Secondary rated voltage
- CR Capacitive divider ratio (C-Ratio)
- U_{prim} Primary voltage
- U_{sec} Secondary voltage
- $U1$ Electronic divider input voltage
- U Test voltage (primary or secondary)
- UR Rated voltage (primary or secondary)
- U/UR Excitation

ELECTRONIC STANDARD VOLTAGE DIVIDER

Series 4860 standard systems

Type	Measurement range (U_{prim})	C1 Type (gas) [Serie/pF/kV]	C2 Type (air) [Serie/pF]	Divider ratio CR
4861	1 ... 1010 V*	-	-	1:1*
4861/100	1 ... 100 kV	3370 NK/100/100	3330/9900	1:100
4861/200	1 ... 100 kV	3370 NK/100/200	3330/9900	1:100
	2 ... 200 kV	3370 NK/100/200	3330/10000 + 3330/9900	1:200
4861/300	1 ... 100 kV	3370 NK/50/300	3330/4950	1:100
	3 ... 300 kV	3370 NK/50/300	3330/10000 + 3330/4950	1:300
4861/400a	4 ... 400 kV	3370 NK/50/400	3330/10000 + 3330/9950	1:400
4861/400b	1 ... 100 kV	3370 NK/50/400	3330/4950	1:100
	4 ... 400 kV	3370 NK/50/400	3330/10000 + 3330/9950	1:400
4861/600a	6 ... 600 kV	3370 NK/33.3/600	3330/10000 + 3330/9946	1:600
4861/600b	1 ... 100 kV	3370 NK/33.3/600	3330/3296	1:100
	6 ... 600 kV	3370 NK/33.3/600	3330/10000 + 3330/9946	1:600
4861/800a	8 ... 800 kV	3370 NK/50/800	3 x 3330/10000 + 3330/9950	1:800
4861/800b	1 ... 100 kV	3370 NK/50/800	3330/4950	1:100
	8 ... 800 kV	3370 NK/50/800	3 x 3330/10000 + 3330/9950	1:800

* range covered by any other type e.g. 4861/300

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TYPE 4861 STANDARD VERSION

This version has up to two fixed voltage divider ratios set by TETTEX Instruments, which the user cannot change. The complete standard voltage divider is therefore certifiable.

TYPE 4862 CUSTOMIZED VERSION

The user can set two ratios and change them whenever he likes. This standard divider is not certifiable.

TECHNICAL SPECIFICATION

Electronic system types 4861

Input

- Max. input voltage U_1 1010 V
- Input resistance $> 10 \text{ G}\Omega$
- Input capacitance $< 0.1 \text{ pF}$
- Measurement signal frequency 45 ... 65 Hz (16 2/3 Hz on request)
- Max. guard capacitance (for guard potential control) 10 nF

Output

- Max. output voltage U_{sec} 250 V
- Max. power output for $U/UR = 100\%$ 5 VA
- Max. output current for $U_{\text{sec}} 50 \text{ V}$ 0.4 A
- Max. load capacitance 10 nF

System parameters

Rated primary voltage PV

- Direct input range 0.010 ... 1.010 kV
- With capacitive divider (0.010 ... 1.010) x 1/CR [kV]
- Adjustment factors $x1, x1/3, x1/3$

Rated secondary voltage SV

- Input range 5 ... 250 V
- Adjustment factors $x1, x1/3, x1/3$

Capacitive divider ratio CR

- Input range 1 : 1 ... 1 : 10
- Resolution 1-10

Important!

Max. measurement voltage = max. permissible rated voltage of compressed gas capacitor.

General data

- Power supply 230/115 V, 50/60 Hz
- Power requirement approx. 100 VA
- Storage and transport Temperature $-20 \dots +70^\circ \text{C}$
- Dimensions (W x H x D) 500 x 310 x 470 mm (19.7 x 12.2 x 18.5)
- Weight 34 kg (74.8 lb)

Error limits

Intrinsic error (electronic device)

- In operating range 20 ... 200 % U/UR
- Test frequency 50 or 60 Hz $\pm 1\%$
- At reference conditions $\pm 50 \text{ ppm} \pm 0.1 \text{ min}$
- At rated operating conditions $\pm 100 \text{ ppm} \pm 0.2 \text{ min}$

Reference and rated operating conditions according to IEC 359, class I.

Additional errors

- With extended operating range 5 ... 20% U/UR $\pm 50 \text{ ppm}; \pm 0.1 \text{ min}$
1 ... 5% U/UR $\pm 100 \text{ ppm}; \pm 0.2 \text{ min}$
- With extended frequency range 45 ... 65 Hz $\pm 50 \text{ ppm}; \pm 0.1 \text{ min}$
- With capacitive divider
- C-divider calibrated and supplied by TETTEX Instruments as per standard system table: no additional errors
- Existing type 4850 electronic device replaced by type 4861: no additional errors
- System calibrated and commissioned by TETTEX Instruments on customer's premises: additional errors on enquiry

Series 3370 gas capacitors (C1)

Technical specification as in leaflets 3370 and 3380. The low-voltage connection is provided with a triaxial socket for use of the capacitor as a capacitive voltage divider (series 3370)... Optional triaxial/coaxial adaptor no. 008140-72 enables C/tan δ measurements.

Series 3330 air capacitors (C2)

- Max. operating voltage (rms) 1000 V
- Capacitance values 1900 ... 10'000 pF
- Dimensions (L x W x H) 360 x 360 x 450 mm (14.2 x 14.2 x 17.7 in)
- Weight 2000 pF $\approx 24 \text{ kg}$ (52.8 lb)
4000 pF $\approx 27 \text{ kg}$ (59.4 lb)
5000 pF $\approx 29 \text{ kg}$ (63.8 lb)
10000 pF $\approx 35 \text{ kg}$ (77.0 lb)

ORDER SPECIFICATION

Standard supply

Standard voltage divider as per standard system type series 4860, comprising:

- Electronic device Type 4861
- Compressed gas capacitor* series 3370 NK
- Air capacitors series 3330
- Adaptor box for direct connection, no. 014235-00
- Measuring cable, 10 m no. 014107-00
- Measuring cable, 1.5 m no. 013685-00
- Measuring cable, 0.5 m no. 014108-00
- Ground cable, 16 mm², 10 m no. 016351-00
- Power cable
- Power voltage 230 or 115 V, 50/60 Hz
(please specify with order)
- Including RS 232C interface type 4861/2

*The compressed gas capacitor has to be ordered separately.

Options

- IEEE 488 interface type 4861/1
- Cable data-links for:
 - IEEE 488 interface, 4m type 5993
 - RS 232C interface, 3m type 5991
 - RS 232C interface (fibre optic data-link) type 5992
- Triax/coax adapter for compressed gas capacitor (for C/tan δ measurement) no. 008140-72

Replacement of series 4850 electronic device by type 4861

The connections are compatible with the existing unit. Determine and set the capacitiv divider ratio.

IMPORTANT

Adaption and commissioning of the standard voltage divider by TETTEX Instruments is essential to ensure its required accuracy.

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