



4861

High Precision Standard Electronic Voltage Dividers

Datasheet



HAEFELY

Current and voltage – our passion

Designed by



General Description

The 4860 series (measuring unit and highly accurate HV divider combining compressed gas and air capacitors). High precision standard voltage divider is used as a 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 unmatched, high accuracy.

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

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, combine to form a variable electronic

divider. Capacitive voltage divider C1/C2 divides the primary voltage U_{prim} to voltage U_1 , which is matched by the electronic device to the required secondary voltage U_{sec} .

Voltage instrument transformers of less than 1 kV primary rated voltage can be connected directly to the electronic device via the adaptor box supplied with the divider.

4861 – Standard version. This version has up to two fixed voltage divider ratios set by HAEFELY, which the user cannot change. The complete standard voltage divider is therefore certifiable.

4862 – Customized version. The user can set two ratios and change them whenever needed. This standard voltage divider is not certifiable.

Features	Advantages
<ul style="list-style-type: none"> Universal comparison standard for any instrument transformer ratio within a wide range of voltages 	<ul style="list-style-type: none"> <input checked="" type="checkbox"/> Highest versatility – Extended voltage measurement, from V to MV.
<ul style="list-style-type: none"> Very accurate voltage divider ratio (± 50 ppm, ± 0.1 min) 	<ul style="list-style-type: none"> <input checked="" type="checkbox"/> Accuracy at best level – The 4860 series is prepared for accuracy testing of voltage instrument transformers with most stringent accuracy requirements – 4860 series is qualified for use as standard voltage transformers in metrology institutes.
<ul style="list-style-type: none"> Max. measurement voltage is dependent only on rated voltage of compressed gas capacitors 	<ul style="list-style-type: none"> <input checked="" type="checkbox"/> Highest flexibility – No additional voltage limitation due to use of an electronic device.
<ul style="list-style-type: none"> For rated primary voltages less than 1000 V, the electronic device can be used without additional divider 	<ul style="list-style-type: none"> <input checked="" type="checkbox"/> Modularity – The electronic device can be easily configured for stand-alone use, at highest accuracy.
<ul style="list-style-type: none"> Suitable for all Tettex (2767, 2765, 2711/22 and 2711/23) and many other manufacturers' transformer test sets (bridges) Direct replacement of earlier series 4850 Existing compressed gas capacitors can generally be equipped to build a complete divider system 	<ul style="list-style-type: none"> <input checked="" type="checkbox"/> Compatibility – The 4860 series can be integrated with various instrument transformers test sets and fitted on existing high voltage units for replacement, modernization and expansion projects.
<ul style="list-style-type: none"> The complete system is certifiable 	<ul style="list-style-type: none"> <input checked="" type="checkbox"/> Traceability – In full chain calibration (on request).
<ul style="list-style-type: none"> Remote control possibility via IEEE 488 or RS 232C interfaces 	<ul style="list-style-type: none"> <input checked="" type="checkbox"/> Upgradeable to an automatic test system – By combination with a device type 2767 or 2769.
<ul style="list-style-type: none"> Technical solution basing on a capacitive high voltage divider unit 	<ul style="list-style-type: none"> <input checked="" type="checkbox"/> More cost effective solution than inductive voltage standard transformers, especially for systems with high voltage ratings.

Applications

- Voltage instrument transformers (LV/MV/HV)
- Metrology institutes
- Research and development

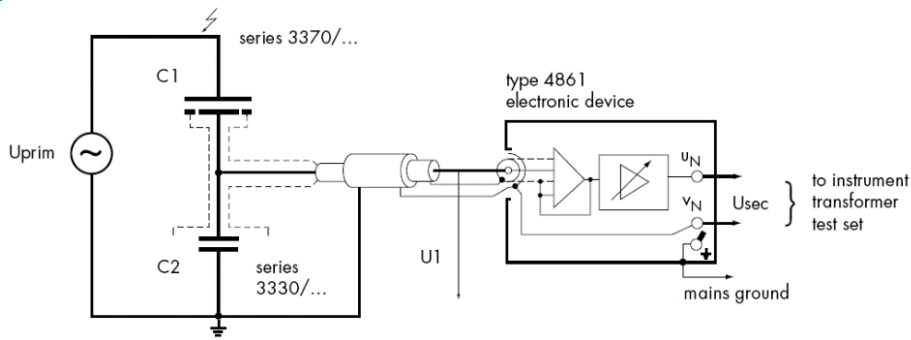
Scope of Supply

- 1 Electronic device, type 4861
- 1 Compressed gas capacitor*, series 3370 NK
- Air capacitors, series 3330
- 1 Triax/4mm adapter box for direct connection
- 1 Triax/Coax. adapter for compressed gas capacitor (C/tan δ)
- 1 Measuring cable, 10 m
- 1 Measuring cable, 1.5 m
- Measuring cables, 0.5 m, for air capacitors interconnection
- Ground cable 16 mm², 10m
- 1 Mains cable 2P+E, for device 4861
- 1 RS 232C interface, for device 4861
- 1 Set of spare fuses
- Test Certificates
- Operating Manuals
- 1 Year warranty

* The compressed gas capacitor has to be ordered separately.

Technical Data

Basic test setup



Measurement circuit with capacitive divider for primary voltage greater than 1 kV

Legend

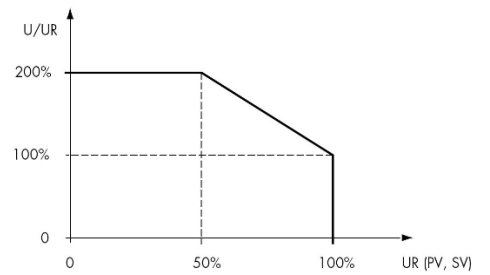
- PV Primary rated voltage
- SV Secondary rated voltage
- CR Capacitive divider ratio (C-Ratio)
- U_{prim} Primary voltage
- U_{sec} Secondary voltage
- U1 Electronic divider input voltage
- U Test voltage (primary or secondary)
- UR Rated voltage (primary or secondary)
- U/UR Excitation

Capacitive divider ratio

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

Excitation

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



Series 4860 Standard Systems

Type	Measurement range (U _{prim})	C1 Type (gas capacitor) [Serie/pF/kV]	C2 Type (air capacitor) [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	3x 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
4861/1200b	1 ... 1200 kV	3370 NK/20/1200	2 x 3330/10000 + 3330/3980	1:1200

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

Electronic System – Type 4861 (or 4862)

Input

Max. input voltage U ₁	1010 V
Input resistance	> 10 GΩ
Input capacitance	< 0.1 pF
Measurement signal frequency	45 ... 65 Hz
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 _{sec} ≤ 50 V	0.4 A
Max. load capacitance	10 nF

System parameters – 4860 series

Rated primary voltage (PV)

Direct input voltage range (CR = 1)	0.010 ... 1.010 kV
Resolution	0.001 kV
Input voltage with C-Divider (CR < 1)	1/CR x (0.010 ... 1.010 kV)
Adjustment factors	x1; x1/√3; x1/3

Rated secondary voltage (SV)

Rated voltage range	5 ... 250 V
Resolution	1 V
Adjustment factors	x1; x1/√3; x1/3

Capacitive divider ratio (CR)

Setting range	1:1 ... 1:10000
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Accuracy Specification

Intrinsic error (electronic device 4861)

Operating range	20 % ... 200 % U/UR	
Frequency range	50 or 60 Hz ±1 %	
Accuracy	at reference conditions ⁽¹⁾	at rated operating conditions ⁽¹⁾
Ratio	±50 ppm	±100 ppm
Phase angle	±0.1 min	±0.2 min

Additional errors

Extended operating range	5 % ... 20 % U/UR	1 % ... 5 % U/UR	
Ratio	±50 ppm	±100 ppm	
Phase angle	±0.15 min	±0.5 min	
With extended frequency range	45 ... 65 Hz		
Ratio	±50 ppm		
Phase angle	±0.1 min		
With external high voltage divider unit	C-divider calibrated and supplied by HAEFELY as per standard systems table	Existing type 4850 electronic device replaced by type 4861 (or 4862)	Divider system calibrated and commissioned by HAEFELY on customer's premises
Ratio	no additional errors	no additional errors	additional errors on enquiry
Phase angle			

⁽¹⁾ Reference and rated operating conditions according to IEC 359, class I.

Environmental, Mechanical and Power Supply

Device Type	4861 (4862)
Operating temperature	+5 °C ... +40 °C
Storage temperature	-20 °C ... +70 °C
Humidity	20 ... 80 % r.h., non-condensing
Dimensions (W x D x H)	500 x 310 x 470 mm (19.7 x 12.2 x 18.5 in)
Weight	34 kg (approx. 75 lb.)
Power supply Spec.	115/230 V, 50/60 Hz, 100 VA
Device Type	Series 3370 – Compressed gas capacitors (C1)
Technical specification	For full specification see 3370 series product datasheet
Application-specific notes	Important ! Max. measurement voltage = max. permissible rated voltage of gas capacitor. The low-voltage connection is provided with a triaxial socket for use of the gas capacitor as a capacitive voltage divider (series 3370). The triaxial/coaxial adapter included in scope of supply enables C/tan δ measurements.
Device Type	Series 3330 – Air capacitors (C2)
Max. operating voltage (rms)	1000 V
Capacitance values	1900 ... 10'000 pF
Dimensions (W x D x H)	360 x 360 x 450 mm (14.2 x 14.2 x 17.7 in)
Weight	2'000 pF ≈ 24 kg (52.8 lb.) 4'000 pF ≈ 27 kg (59.8 lb.) 5'000 pF ≈ 29 kg (63.8 lb.) 10'000 pF ≈ 35 kg (77.0 lb.)
Applicable Standards	
General	IEC, VDE, ANSI
CE conformity	EMC Directive 2014/30/EU and RoHS Directive 2011/65/EU

Global Presence

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HAEFELY

Current and voltage – our passion



HIGH VOLTAGE



INSTRUMENTS



EMC

precision.

swiss made.