



Basel Precision Instruments



# Low-Noise High-Resolution (LNHR) DAC

outstanding resolution and noise performance

Model	LNHR DAC	LNHR DACII-12 <b>NEW</b>	LNHR DACII-24 <b>NEW</b>
Product #	SP927	SP1060-12	SP1060-24
Number of independent DAC channels	8	12	24
Resolution	24-bit		
Output voltage range	$\pm 10$ V		
Output voltage step size	1.2 $\mu$ V		
Output voltage noise	100 Hz bandwidth: typical 0.4 $\mu$ Vrms (0.1 Hz to 890 kHz) 100 kHz bandwidth: typical 3.7 $\mu$ Vrms (5 Hz to 100 kHz)		
Output current	$\pm 1$ mA nominal		
		up to $\pm 10$ mA on two DAC channels	up to $\pm 10$ mA on four DAC channels
Output bandwidth	75 Hz	switchable between 100 Hz and 100 kHz for each DAC channel	
Predefined standard waveforms		Sine, triangle, sawtooth, ramp, pulse, gaussian-noise	
Arbitrary waveform generation		2 AWG channels	4 AWG channels
Ramping function		4 independent ramp generators	



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Grounding	Output ground is isolated from housing and computer interface		
External bias voltage between DAC output ground & housing	20 V max		
Output impedance	500 $\Omega$	50 $\Omega$	
Temperature drift (for entire output voltage range of $\pm 10$ V)	< 10 ppm/ $^{\circ}\text{C}$	< 1 $\mu\text{V}/^{\circ}\text{C}$ + 1.5 ppm/ $^{\circ}\text{C}$	
Drift over 8 hours at constant temperature	< 10 $\mu\text{V}$		
Dimensions	48 x 10 x 43 cm		

### New features offered by LNHR DACII-12 and LNHR DACII-24

- 12 or 24 independent DAC channels
- selectable bandwidth of 100 Hz (LBW) or 100 kHz (HBW) for each DAC channel
- up to 10 mA output current on two DAC channels for each 12 channel DAC-board
- external and internal synchronization for each 12 channel DAC-board
- four independent and versatile RAMP-generators
- predefined waveforms (via AWG): sine, triangle, sawtooth, ramp, pulse, Gaussian-noise
- two user-defined 24-bit arbitrary waveform generators (AWG) per 12 channel DAC-board
- AWG memory: 34'000 points; update-rate at 10  $\mu\text{s}$  per point or longer

### Applications

Applying ultra-stable DC bias-voltages and high-resolution sweep-voltages with very low fluctuations in sensitive experiments:

- driving high-ohmic gates in low-temperature quantum experiments
- applying source-drain voltages in quantum transport measurements
- controlling samples with high sensitivity to electrostatic charge, such as Josephson junctions or quantum dots

### Grounding, noise management and device protection

The LNHR DAC is designed to optimize the grounding scheme for low-noise setups and to protect the device:

- ground loops are avoided; DAC channel output ground is isolated from the housing and computer interface; ground is provided by the shield of the cable coming from the experiment
- low-noise measurements are performed with the DAC connected to the mains AC voltage without a need for batteries; power supply (transformer and rectifier) is isolated in a separate box at the back of the instrument minimizing interference
- DAC channels are connected directly to the device; excellent noise and resolution specs render further filtering and dividing unnecessary
- the DAC is built for devices with high sensitivity to electrostatic charge; in the unlikely event of power failure or computer crash the device is protected by the DAC



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## Gate Leakage Current Measurement Box

monitor gate leakage during a running experiment without increasing noise or deteriorating stability

<b>Model</b>	<b>SP1046</b>
Number of channels per box	6
Detection Range	pA to 10 $\mu$ A
Gain	1 V/nA or 1 V/ $\mu$ A
Bandwidth	10 Hz
With remote control and current overload alarm	

