5 Stirred thermostatic baths and circulators

A cost-effective range of multi-purpose systems combining Grund's legendary quality and reliability. Features temperature control for a wide range of laboratory applications.

- Accurate and stable temperature control - for example, and use in hot or cold environments
- Robust design - for longevity and reliability
- Simple operation - for easy use
- Complete range - suitable for laboratory needs, each model

Applications
- General laboratory use
- Calorimetry
- High-temperature analysis
- Temperature control

Model selection (continued)
- All models are available with digital or analog control
- Temperature range: -10°C to +120°C
- Accuracy: ±0.01°C

For more details on the models, please refer to the Grund Thermostatic Baths and Circulators catalog.
showcase 1 – entry level example
Model GD100-P12
- Digital thermostat: range 0 to 100°C, stability ±0.2°C
- Stainless steel tank
- Built-in circulation pump
- Easy-to-use keypad
- Large display

showcase 4 – budget example
Economy model with digital thermostat control unit and plastic tank for straightforward applications requiring accurate temperature control.
- Digital thermostat: range 0 to 100°C, stability ±0.1°C
- Simple operation
- Easy to use
- Low cost

*Some features may vary depending on the model and configuration.
built-in computing & data logging
full bus programmability

Single key convenience functions for ease of use, press the ‘funt’ key and the present display reading is stored and subtracted from all future readings. This powerful feature has a host of uses such as removing lead lead resistance, obtaining deviation levels, or measuring relative to alternative voltage points setting a fixed ground level connection.

Touch and Hold
The Touch and Hold function is invaluable when taking measurements in awkward situations where it may be difficult to see the multi-channel display. With touch and hold enabled, the display is automatically frozen every time a stable reading is achieved. A further press of the TH/HD key unfreezes the display.

Digital filtering for better noise performance
The 7100 uses non-invasive digital filtering which is highly effective in eliminating unwanted noise, but responds rapidly to changes in the reading. When working with very noisy or unstable measurements, the characteristics of the digital filter can be adjusted to suit the application.

Full protection for the instrument and the user
The 7100 incorporates separate protection against damage from accidental overloads on all ranges including 10 Amps. In addition, the 7100 meets the stringent safety requirements of IEC-584 and IEC-1010-1 for measurements up to 1kV.

Linear scaling with offset (Ax+B)
This function enables a reading to be multiplied by a scale factor (A) and an offset (B) by one simple key press. This means, for example, that the electrical output of a thermometer can be scaled to give a direct readout of the physical parameter e.g. temperature or weight. It is particularly useful with 4,20mA current loops.

Limits comparison
This function enables the reading to be compared against high and low limits set by the user. The display then shows a code of ‘H’ (high), ‘L’ (low) or ‘P’ (pass) at the end of the display.

Percentage deviation (%)
This function enables the reading to display the percentage deviation of a reading from a nominal value chosen by the user. It is invaluable for measuring tolerance or stability.

Min-Max storage
The Min-Max function stores the highest and lowest values of a set of readings. This facility has many uses such as checking full power supply glitches, including peak temperature excursions and avoiding ‘missed’ readings when using the Loggor function.

Logarithmic measurements (dB)
This function allows measurements to be displayed in the form 20log(A). This in zero reference scaling allows voltages to be displayed in dB or dBm relative to any required reference.

Auto-matic data logging
The 1969 can store up to 100 readings at any sequential time interval from 1 reading per second up to 1 reading every 3 hours. A simple recall sequence allows the readings to be scanned onto the display whenever required. Alternatively results can be downloaded using the RS-232 or GPIB interface.

As a result, besides the less related measurement, sequential data can be handled automatically without disrupting your work. Manual storage of readings is also available and can be used for paper and personnel making a series of measurements.

Storage can also be triggered from the RS-232 or GPIB interfaces.

Full bus control via RS-232 or GPIB
The 1969 is designed for complete bus control. Every function of the instrument can be controlled using either the RS-232 interface or the GPIB interface (option). The RS-232 interface, which is fitted as standard, is compatible with the TIA-443 system. The RS-232 interface enables up to 32 instruments to be daisy-chained together and to be individually addressed and controlled using a simple RS-232 port of a PC.

Compatible with IEEE-488.2
The GPIB interface is an option. When installed, a rear panel switch allows the user to choose between RS-232 or GPIB control. The GPIB interface conforms fully with both IEEE-488.1 and IEEE-488.2. The 2 standard commands are the most important when programming systems incorporating a number of instruments.

5½ digit performance at a 4½ digit price
higher resolution, accuracy & functionality

Greater resolution and accuracy
The 1969 is a true 5½ digit meter with a scale length of 2,100,000 counts. This gives it the highest resolution relative to 4½ digit meters, but much higher effective accuracy as well.

Greater sensitivity and higher input impedance
With a maximum resolution of 5µV, 1µA and 1kΩ, the 1969 is in line with more sensitive than a 4½ digit meter. This extra sensitivity enables accurate measurements to be made in areas previously impossible such as thermocouple junctions, switch contact resistance or capacitors leakage.

Industry standard 100mA input impedance applies to all 8 voltage ranges, but the lower four can alternatively be selected at greater than 100kΩ impedance to eliminate errors when measuring high impedance circuits.

True RMS AC functions
The 1969 provides True RMS AC response which gives accurate measurements regardless of the waveform shape.

The wide bandwidth voltage attenuator provides high accuracy within the audio band and gives extended response to avoid distortion when measuring switching waveforms.

Auto or manual ranging
The 1969 offers fully automatic ranging on all functions including current. Alternatively any range can be selected and held manually.

4 terminal Ohms for improved stability
Resistance measurements can be made in either 2 terminal or 4 terminal mode. High impedance sensing ensures that the meter switches automatically between modes.

For true resistance measurements, 4 terminal mode offers much higher accuracy and repeatability.

The resistance function also provides selectable avalanche protection as well as diode test capabilities.

Closed case calibration
The 7100 allows its calibration constants to be permanently entered in EEPROM. Consequently it can be recalibrated without ever opening the case.

Storage of front-panel set-ups
The 7100 can store up to six front panel set-ups to non-volatile memory.

In addition to the range and function each setup defines the active computing or logging functions along with their parameters.

This facility is particularly valuable when similar tests need to be repeated at intervals.
Technical Specifications

INPUT CHARACTERISTICS
- Input Current: 150 µA
- DC MIN: >=500 µA before input
- DC MAX: 500 µA
- AC MIN: 0 to 500 µA
- AC MAX: 500 µA

ACCURACY
- 1% over the full range
- 0.5% over the full range
- 0.25% over the full range
- 0.1% over the full range

DC VOLTS
- Range: 0 to 10 V
- Accuracy: ±0.1 V
- Resolution: ±0.01 V
- Input Impedance: 1 MΩ
- Maximum Input: 10 V

RESISTANCE (Ohms)
- Range: 0 to 10 kΩ
- Accuracy: ±0.1 kΩ
- Resolution: ±0.01 kΩ
- Maximum Input: 10 mA

COMPUTING FUNCTIONS
- Digital Filter: 50 Hz filter
- Span & Hold: 1 second hold
- Average: 10 readings
- Linear scaling: ±10%
- I/O Ports: 5

INTERFACES
- AC Input: 240 VAC, 50/60 Hz
- DC Input: 12 VDC
- RS-485

GENERAL
- Temperature Range: -40°C to 85°C
- Humidity: 5% to 95%
- EMC: FCC Class B
- Dimensions: 60 x 60 x 30 mm
- Weight: 230 g
Array Microphone Type 40PL

Product Data

Typical Applications
- Multi-channel measurements
- Sound field analysis
- Sound power measurements
- Concurrent spatial and transient measurements

The G.R.A.S. Array Microphone Type 40PL (Fig. 1) is a low-cost microphone for general purpose measurements in arrays and mosaics. It has a wide useful frequency range reaching up to 20 kHz (Fig. 2) and a large dynamic range topping at around 130 dB.

It has an integrated CCP preamplifier and is delivered with a built-in TEDS chip which enables it to be programmed as a complete unit. The Type 40PL requires a constant current power supply, e.g., the G.R.A.S. CCP Supply Type 12AL or any other CCP-compatible power supply.

Close manufacturing tolerances together with the advantages of the TEDS chip provide the Type 40PL with a high degree of interchangeability, a major advantage when used in multimeeter forming arrays and mosaics.

![Array Microphone Type 40PL with integrated CCP preamplifier](image)

### Specifications

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nominal Sensitivity (20 kHz)</td>
<td>10 mV/Pa ±3 dB</td>
</tr>
<tr>
<td>Frequency Response (20 kHz)</td>
<td>0.1 dB – 50 kHz</td>
</tr>
<tr>
<td>Upper Limit of Dynamic Range</td>
<td>150 dB re. 20 Pa</td>
</tr>
<tr>
<td>Lower Limit of Dynamic Range</td>
<td>-120 dB re. 20 Pa</td>
</tr>
<tr>
<td>Thermal noise</td>
<td>0 dB re. 1 mW/Pa</td>
</tr>
<tr>
<td>Microphone Size</td>
<td>56 mm (2.20 inches)</td>
</tr>
<tr>
<td>Weight</td>
<td>5.5 g (0.2 oz)</td>
</tr>
<tr>
<td>Power supply</td>
<td>2 mA to 20 mA typically 4 mA</td>
</tr>
</tbody>
</table>

### Notes

1. CCP means for Constant Current Power and describes G.R.A.S. power supplies that maintain a constant rms of current for driving CCP transducers like this microphone.
2. Temperature Electronic Data Chart - according to IEC 61413.

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**WARRANTY INFORMATION**

- Honeywell warrants products only as long as the defective materials and workmanship. Honeywell's standard product warranty applies unless agreed to otherwise by Honeywell in writing. Please refer to your order acknowledgment or consult your local sales office for specific warranty details. Warranted goods are returned to Honeywell during the period of coverage. Honeywell will repair or replace, at its option, any products found to be defective in material or workmanship.

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