

8/16-CHANNEL POTENTIostat for HIGH RESOLUTION DATA LOGGER

Type: *CH-HRP

Description

The device consists of a combination of an **multi-channel potentiostat/converter** (BVT Technologies) and an external **USB Pico ADC high resolution data logger** (Pico Technology).

The **data logger** can be supplied in two versions: **ADC-20** (20 bits, **8 channels**) or **ADC-24** (24 bits, **16 channels**). For detailed specifications, see the attachment at the end of the document. The device allows measurements from up to 8 or from up to 16 independent channels. The basic output signal is a voltage in the range of **-2.5 to 2.5 V**. All channels are programmable (the output can be concentration, temperature, pressure...).



After connecting the device to a PC with Pico Technology's **Picolog 6 measurement program** installed, the voltage [V] can be processed using **math channels** and directly recorded in real time as **temperature, current, resistance, frequency, % and pressure**, see measurement example at the end of the document.

For temperature measurement, the device is compatible with resistance thermometers (Ni 1000, Ni 5000, Pt 1000. Power is provided via USB-B, the maximum electrical consumption of the device is 500 mA.

Physical Parameters of 8-channel potentiostat

- *Dimensions: 240 x 120 x 46 mm*
- *Input voltage of the USB power connector: 5 V*
- *Current consumption: 500 mA*
- *Operating temperature: 0-45 °C*
- *Degree of protection of the electronic assembly: IP00*

Physical Parameters of Pico ADC data logger (see details: www.picotech.com)

- *Supply voltage: 5 V*
- *Current consumption: 100 mA*
- *Output voltage range: ± 2.5 V*
- *Operating temperature: 0-45 °C*
- *Degree of protection of the electronic assembly: IP00*
- *20 or 24-bit resolution*
- *Measures up to 8 or 16 channels*
- *Inputs configurable as single-ended or differential*
- *Up to 7 input ranges (± 39 mV to ± 2.5 mV)*
- *Digital control outputs, USB isolation*

- *Multiple units can be run on a single PC*
- *PicoLog data acquisition software included, Software drivers and SDK included*
- *Compatible with Windows, macOS, Linux and Raspberry Pi OS*

Additional informations and SW:

Program *Picolog 6*: <https://www.picotech.com/downloads>

Information about the USB Pico ADC high resolution data logger:

<https://www.picotech.com/data-logger/adc-20-adc-24/precision-data-acquisition>

<https://www.picotech.com/data-logger/adc-20-adc-24/adc-20-24-picolog-6-software>

In the case of the ADC-24, additional channels unused by the potentiostat can be used for further measurements.

Device Usage

- Temperature measurement with different temperature sensor (resistance thermometers Ni 1000, ni 5000, Pt 1000)
- Voltage measurement
- Conductivity and resistance measurement
- Amperometry measurement

References

- Tomas Bertok, Erika Dosekova, Stefan Belicky, Alena Holazova, Lenka Lorencova, Danica Mislovicova, Darina Paprckova, Alica Vikartovska, Robert Plicka, Jan Krejci, Marketa Ilcikova, Peter Kasak, and Jan Tkac Mixed Zwitterion-Based Self-Assembled Monolayer Interface for Impedimetric Glycomic Analyses of Human IgG Samples in an Array Format *Langmuir*, 2016, 32 (28), 7070-7078 DOI: 0.1021/acs.langmuir.6b01456
- E. Dock, A. Christenson, S. Sapelnikova, J. Krejci, J. Emnéus, T. Ruzgas A steady-state and flow-through cell for screen-printed eight-electrode arrays, *Analytica Chimica Acta* 531 (2005) 165-172

Ordering Information

- The order is specified by whole product code: 8CH-HRP (8 channels) or 16CH-HRP (16 channels)
- Minimum order quantity - 1 Potentiostat + Data logger
- Delivery time is 4-6 weeks from receipt of order

Practical measurement example

Total measured record from the PicoLog 6 measurement program from measuring the dependence of the resistance of the thermistor (NTC 10 kΩ) on temperature.

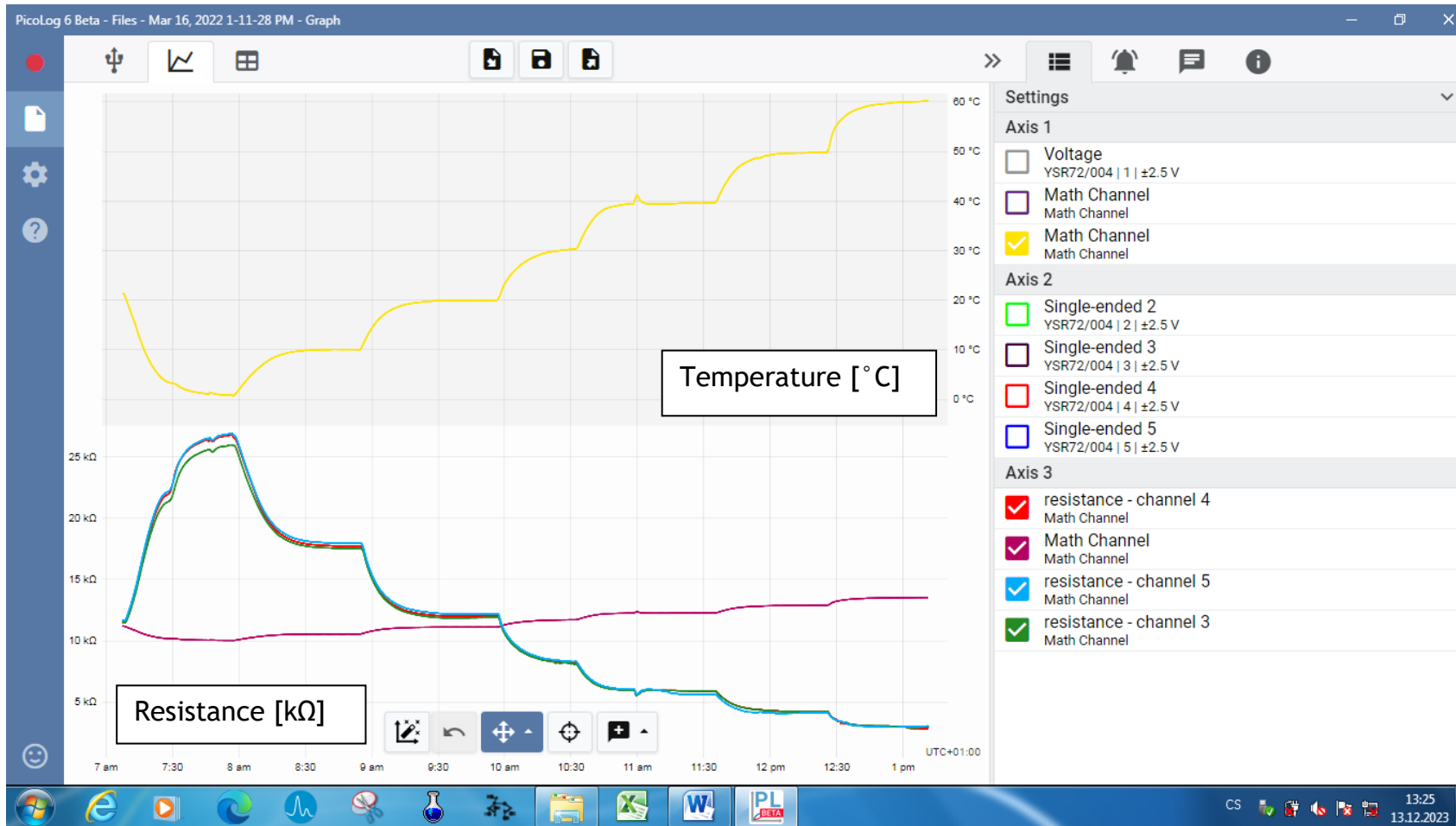


Fig. 1: The dependence of the resistance of the thermistor (NTC 10 kΩ) on temperature

Total measured record from the PicoLog 6 measuring program of 4 parallel amperometric measurements with glucose and lactate biosensors.

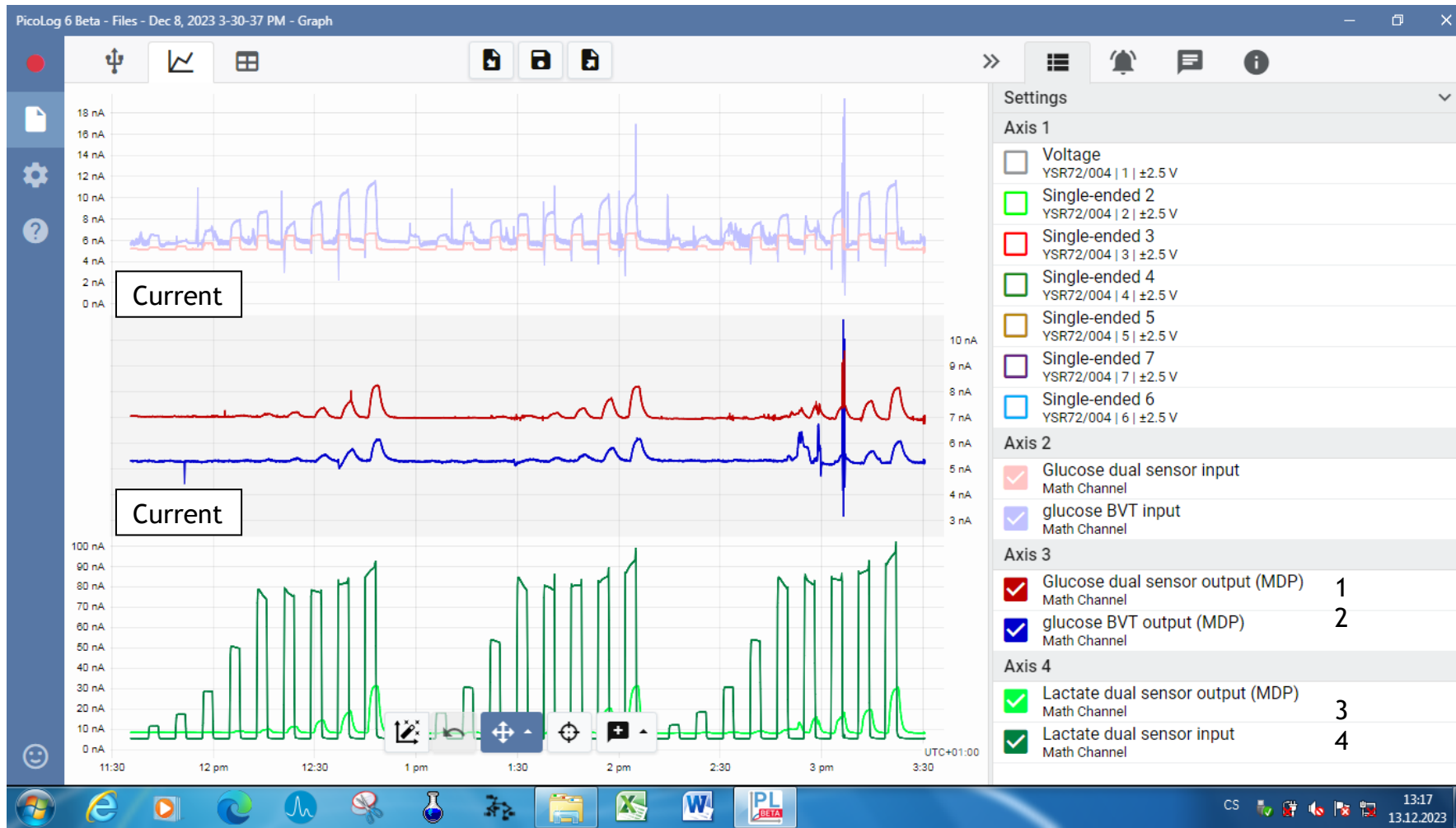
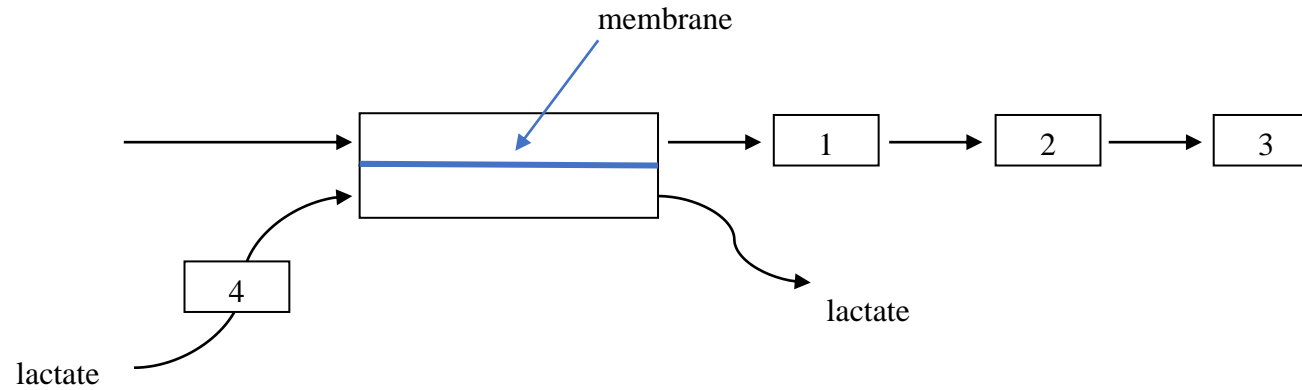


Fig. 2: Parallel amperometric measurements with glucose and lactate biosensors

Example of parallel measurement of lactate and glucose in a flow reactor (from Fig. 2)

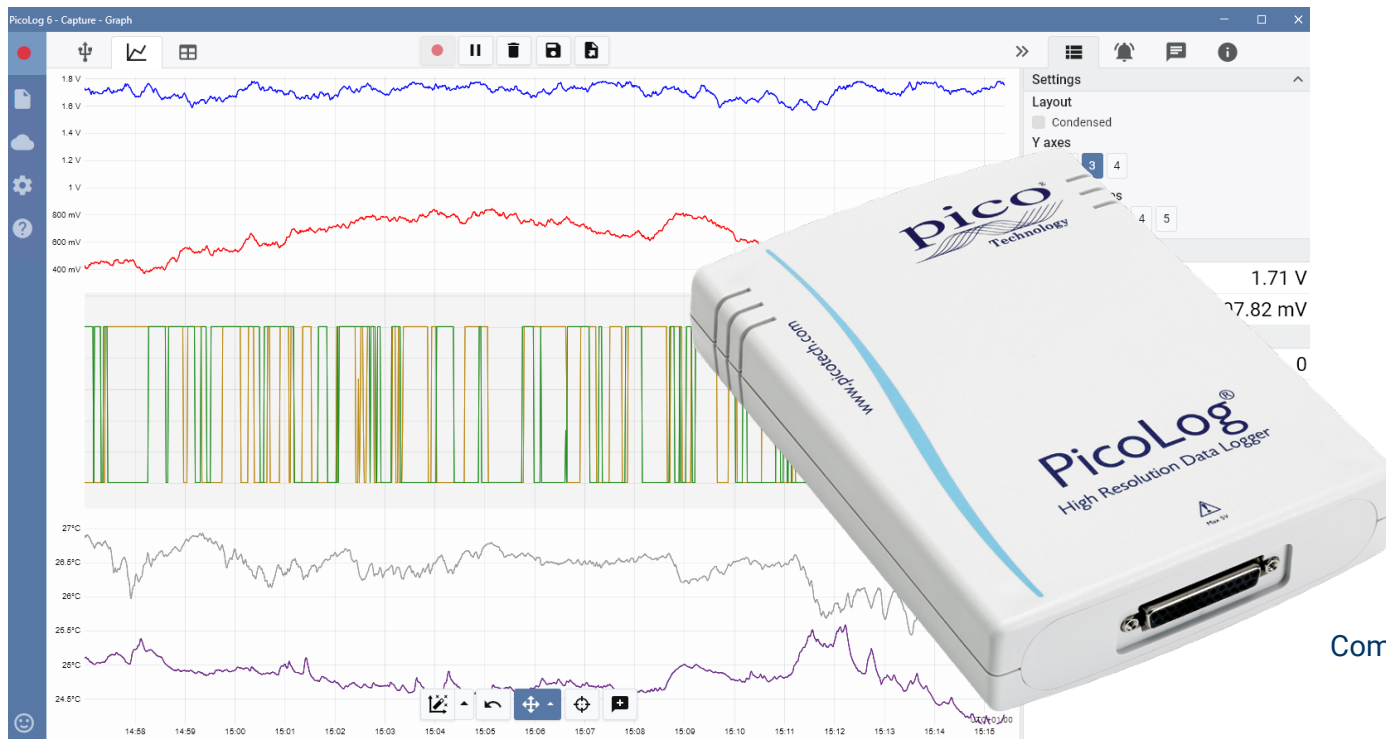
Scheme:



Attachment - see PicoLog documentation (below).

Datasheet: *CH-HRP

ADC-20 and ADC-24 High-resolution data logger



- Low cost, high precision**
- 20 or 24-bit resolution
- Measures up to 16 channels
- Inputs configurable as single-ended or differential
- Terminal board available for easy connections
- Up to 7 input ranges (± 39 mV to ± 2.5 V)
- Digital control outputs
- USB isolation
- Up to 15 measurements per second
- Powered from USB port
- Free PicoLog 6 Cloud[®] software
- Free PicoLog 6 Cloud account
- Multiple units can be run on a single PC
- Compatible with Windows, macOS, Linux and Raspberry Pi OS

High-resolution data acquisition

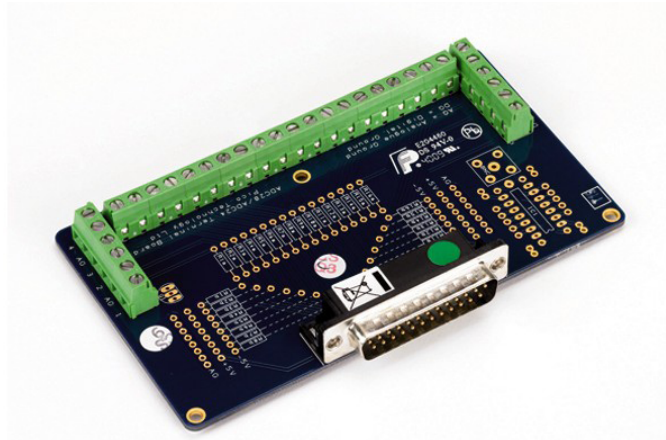
With up to 24-bit resolution, the ADC-20 and ADC-24 USB data loggers are able to detect small signal changes. Features such as true differential inputs, galvanic isolation and software-selectable sampling rates all contribute to a superior noise-free resolution and ensure that your measurements are reliable and accurate.

All Pico data acquisition products run PicoLog software that you can freely download from www.picotech.com/downloads. PicoLog is a complete data acquisition software package for Pico Technology data loggers. It provides a visual, easy-to-use interface for you to quickly set up simple or complex acquisitions and to record, view and analyze data.

Multipurpose data acquisition

Both the ADC-20 and ADC-24 feature true differential inputs for excellent noise rejection. For greater flexibility each differential input can also be configured as two single-ended inputs. With up to eight differential or 16 single-ended inputs on the ADC-24, this gives you complete control over which type of inputs you use. If you require more channels, you can use multiple PicoLog data loggers on the same PC.

With seven bipolar voltage ranges on the ADC-24 and two on the ADC-20 they are versatile enough to be used with a wide range of sensors and signal types. There's also an external terminal board with screw terminals to allow you to quickly connect and disconnect different sensors.



Additionally, the ADC-24 has four configurable digital input/output channels that can be used to control alarms or other devices. The flexibility of the ADC-20 and ADC-24 allows you to use these precision data loggers as an advanced multichannel data acquisition system with a low cost per channel.



No need for power supplies or batteries

The high-resolution ADC-20 and ADC-24 are powered directly by your PC – eliminating the need for batteries or a separate power supply, and making them ideal when you need a portable data logger.

The answer to your data acquisition needs

High resolution, true differential inputs, galvanic isolation, and selectable sampling rates combine to ensure that your measurements are always precise and accurate. Configurable inputs, digital inputs and outputs, and programmable voltage ranges give you a truly flexible answer to your data acquisition needs.

When you need the ultimate in high resolution and accuracy, the versatile ADC-20 and ADC-24 provide you with a portable answer with the performance and flexibility you need.

PicoLog software – straightforward from the start

PicoLog is a complete data acquisition software package for the ADC-20 and ADC-24 data loggers, and is fully compatible with Windows, macOS and Linux. With its clear and user-friendly layout, ideal for use with a mouse or a touchscreen, PicoLog allows you to set up the logger and start recording with just a few taps, whatever your level of data logging experience. Set up simple or advanced acquisitions quickly, and record, view and analyze your data with ease.

Device settings, Graph and Table

Easily set up and adjust acquisition and math channels on one or more data loggers and check their status at a glance. You can also select Graph view to see live data trend lines and Table view to see data in tabular form in real-time.

Cloud captures

Share your data for remote viewing

Graph view

Display your data in real time, as it is collected, on up to four independent Y axes simultaneously: set them up by dragging and dropping the entries in the Channels & Axes panel on the right.

Give instant feedback

We want to hear from you! Click here to contact Pico with your comments.

Capture controls

Separate Record, Pause and Reset buttons for easy operation.

Save and Export options

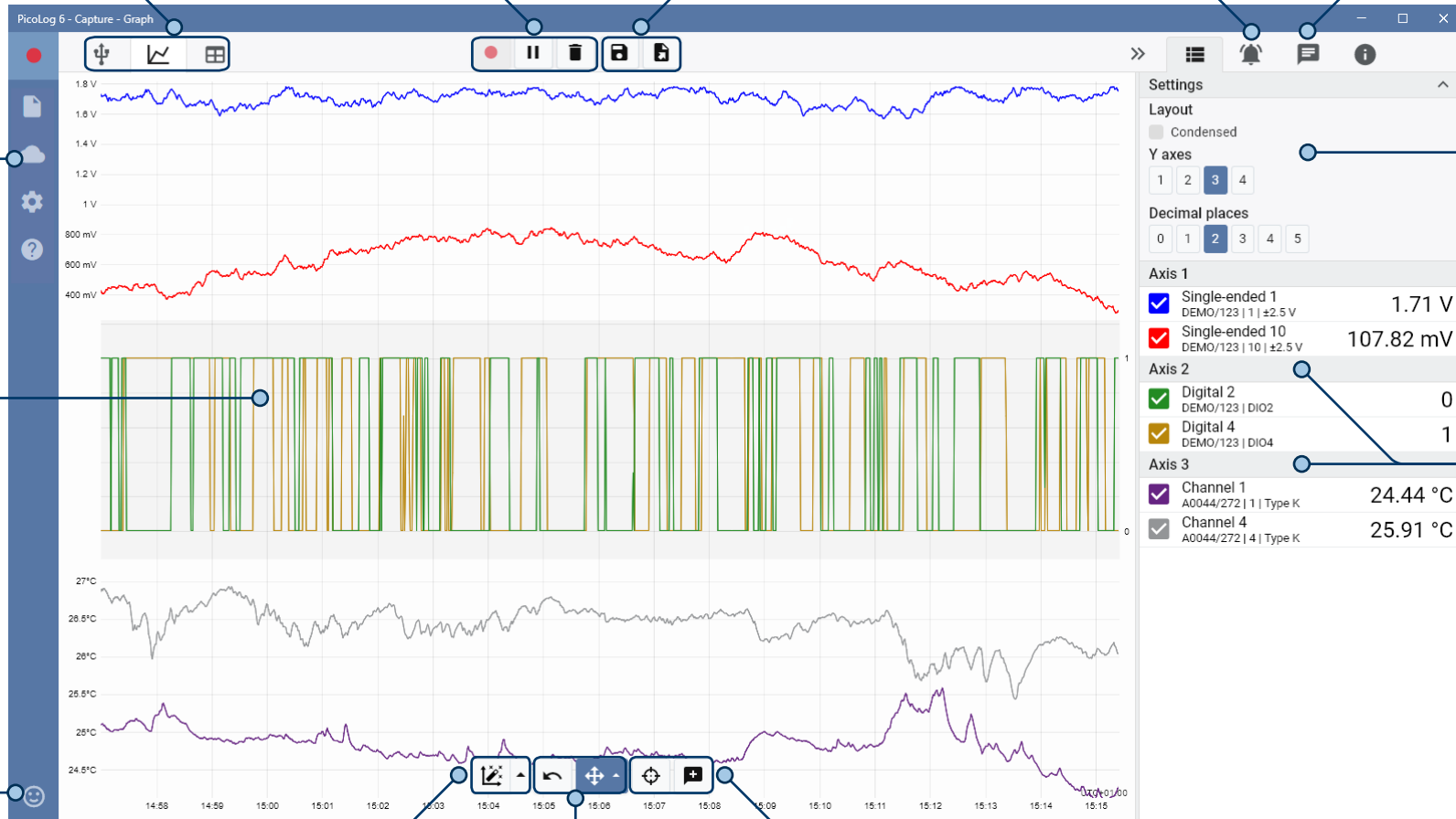
Copy your graph to the clipboard, save it as a PDF, export the raw data to a CSV file, or save the data and configuration as a robust .picolog database file.

Alarms

Set up alarms to alert you to a range of events. Alarms can take the form of sounds, visual notifications, graph annotations and more.

Notes & annotations

Add notes about the dataset as a whole or annotations about particular points on the graph.



Pullout information panel

Manage your channel and axis settings, alarms, notes and capture information in this easy-to-read layout. Close the panel to make more room for the capture graph, and reopen it at any time.

Multiple devices

Log data on up to 20 devices at the same time. Here, two separate data loggers are in use: one ADC-24 voltage input data logger and one TC-08 temperature data logger.

Data view

Display all the data collected so far or keep the graph scale the same and pan along as new samples appear.

Pan and zoom controls

Zoom in, zoom out, zoom to a selection or pan through the data with these tools. If you make a mistake, just click Undo.

Cursors and annotations

Use cursors to highlight the data value and time at any point on the graph, or click Add annotation to mark that point with a text note.

Introducing PicoLog Cloud

Building on the proven design of PicoLog 6, PicoLog Cloud is a free upgrade that introduces many great features, expanding the capabilities of your Pico data logger. Whether you're an established user or a newcomer, you will benefit from the following new additions:

- Live captures streamed directly to the new PicoLog Cloud
- Secure and reliable storage
- Viewing of live and saved captures from a remote computer running PicoLog Cloud, anywhere in the world
- Viewing of live and saved captures on any device (smart phone, tablet, PC) using an internet browser
- Free PicoLog Cloud account
- Compatibility with all current USB PicoLog loggers and PicoScope real-time oscilloscopes
- Straightforward setup with no network settings changes
- Continuous capture with or without network connection
- Source clients for Windows, Linux, macOS and Raspberry Pi OS

Stream live captures directly to the new PicoLog Cloud

In this update to PicoLog data logging software, your Pico data logger or oscilloscope not only captures to a local disk, but can now stream the capture directly to a secure online Cloud store. Did we mention our new cloud service is completely **free** for all new and existing customers?

This new major feature stays true to our vision of creating a data logging application with a simple user interface, and is equally straightforward for use by technical or non-technical users.

PicoLog Cloud is fundamentally the same application as before, but with enhancements to send the live capture data directly to your remote PicoLog Cloud space, and in addition view saved captures stored in the Cloud.

Secure and reliable cloud captures

Security is at the top of the priority list with PicoLog Cloud, and we use the latest and greatest security techniques and processes to ensure your online data and credentials stay safe. To achieve this, PicoLog Cloud employs an Identity Management Platform to manage the login authentication process, keeping your identity anonymized and your data captures safely yours.



In everyday terms, this means you log in with your email and password from one of the following email account providers: Microsoft, Apple or Google. If you don't have an account with one of those, you can create an anonymized account with another email address. To add an extra layer of security, make sure to use an email account that offers 2FA (two-factor authentication)

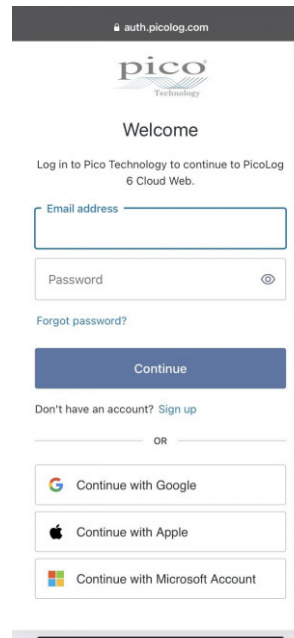
PicoLog Cloud storage is hosted on another industry-standard service known for excellent reliability and global access: Microsoft Azure. It means you can rely on quality of service (uptime) and multiple server locations back up your data against a server outage.

View live and saved captures anywhere in the world

Plugged into your PC or laptop, Pico's instruments have been harnessing the power of your computer's screen, processor, hard disk, keyboard and mouse for over three decades. But what if you can't be in the same room, factory, city or even country as your data-capturing equipment?

Now, PicoLog Cloud opens a window into your loggers and data, allowing other PCs to view and export your data from anywhere in the world. Of course, those PCs must be signed into your secure, personal PicoLog Cloud account to view any of your captures, live or saved.

To keep things simple and avoid making unwanted changes to a live capture, only the host PicoLog Cloud app can change the capture settings.



PicoLog Cloud[®]

Can I view captures on my smartphone or tablet?

PicoLog 6 has always been based on a framework that uses Chromium (Google's open-source browser) and Java, meaning it is already "browser ready".

It couldn't be easier to use! Navigate to the URL picolog.app in any browser and log into your PicoLog Cloud account. This gives you instant and secure access to all your live and saved Cloud captures on any internet-connected smart device, anywhere in the world. Some browsers such as Google Chrome and Microsoft Edge make it possible to "install" PicoLog Cloud as a PWA (progressive web app), so it will be available on your home screen or desktop and work like a regular app.



Continuous capture, with or without network connection

Should your host PC lose network connection during a capture, PicoLog Cloud instantly switches to use the PC's own hard drive until the network connection is restored. Any missing data is promptly synchronized back to the Cloud.

As always, PicoLog 6 in local capture mode is compatible with all PicoLog data loggers and all PicoScope real-time oscilloscopes (with a sample rate limit of 1 kS/s). PicoLog Cloud is compatible with the same instruments, except that the sample rate is limited to 1 S/s per channel.

Stream live Cloud capture data to your application with an API

Transferring captured data from a data logger software application to a third-party application while the capture is running has been one of the longest outstanding customer feature requests, and had been very difficult to implement until now. With PicoLog Cloud data residing on a server, we've developed a simple server-side API that allows programmers to request the live data in batches which is returned in a human- and database-readable ASCII format.

This feature is particularly useful to users who want to add extra functionality such as emailing alarms or captures, adding logger data to existing databases, or displaying data in a different way: fill tanks, percentage bars, throttle gauges, large numerical displays and so on!

Once the Cloud capture is set up and acquiring data, you enable public sharing for that capture to generate an unsearchable URL containing a unique ID for that capture on the PicoLog.app server. The API contains just two calls:

- Basic setup, channel IDs, last recorded value and channel names.
- Request a block of capture data with start and end time parameters for the specified channel(s)

```
https://api.picolog.app/v1/channel/622b238a-1778-4b51-84b-15a92c2ee60b
{
  "id": "1dc54c6cd5-08a9-4a12-af4f-b4fb05b3eaa4",
  "name": "Channel 1",
  "value": 23.66358184814453
},
{
  "id": "1d17b11962-0be0-4787-8e17-a8c7dba5539c",
  "name": "Channel 2",
  "value": 23.6638341442871
},
{
  "id": "1d9d7271d7-a861-4cc3-8e16-1f4c08ff48b8",
  "name": "Channel 3",
  "value": 23.645185479581055
},
{
  "id": "1d731bb0c-a883-4af7-a787-a787-364de5209715",
  "name": "Channel 4",
  "value": 23.71141242988957
},
{
  "id": "1d8fe2573c-623e-47f7-8b88-6789f48f60b1",
  "name": "Channel 5",
  "value": 23.57895851135254
},
{
  "id": "1dcd2c2d20-da80-4bd2-865c-af6268d17bfa",
  "name": "Channel 6",
  "value": 23.778282745361328
},
{
  "id": "1d48329cda-1735-4bd8-9d9d-135c37d6e6e2",
  "name": "Channel 7",
  "value": 23.778282745361328
}
```

The API is server-side and sends raw data to your custom application or database, so no special software needs to be installed. Almost all relevant programming languages can call the API URL, and simple code examples are available.

Although PicoLog Cloud is limited to 30-day captures in Cloud capture mode before it overwrites the oldest data, you can use this API to transfer and back up your data to a local or online database of your own.

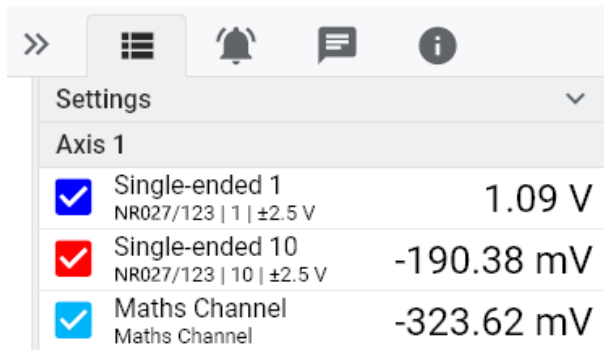
PicoLog Cloud capture specifications

- No limit to the number of stored captures
- Sample rate up to 1 S/s per channel in cloud mode
- Maximum capture duration is 30 days
- Capture can be set to continuous overwrite or stop after set duration
- Multiple host PicoLog Cloud captures can be used simultaneously on one user account
- View all your devices and captures from one place
- Remote clients can export into CSV, PDF and HDF5 files from live and saved captures

Math channels

Sometimes you need to use data from one or more measurement channels to graph and record a calculated parameter. You can use the PicoLog equation editor to set up simple math channels such as A-B or more complex functions such as log, sqrt, abs, round, min, max, mean and median.

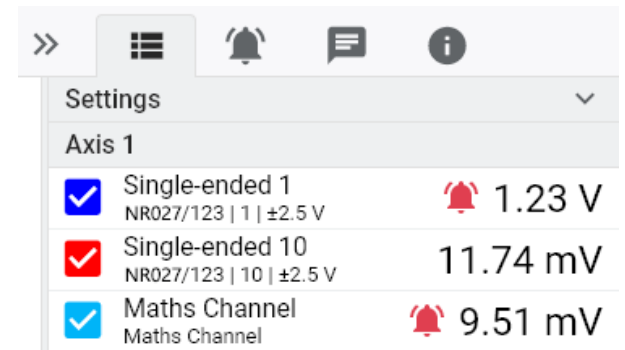
PicoLog treats math channels like any other channel, so you can still set alarms and annotate them.



Channel	Value
Single-ended 1 NR027/123 1 ±2.5 V	1.09 V
Single-ended 10 NR027/123 10 ±2.5 V	-190.38 mV
Maths Channel Maths Channel	-323.62 mV

Alarms

In PicoLog, you can set up alarms to alert you to various events. These can be as simple or as complex as you like: alarms can trigger on a signal threshold or disconnection of the data logger, or you can set up a logic expression of your own. Alarms can play sounds, display visual alerts, run applications or mark when the event occurred on the graph.



Channel	Value
Single-ended 1 NR027/123 1 ±2.5 V	1.23 V
Single-ended 10 NR027/123 10 ±2.5 V	11.74 mV
Maths Channel Maths Channel	9.51 mV

Intuitive logger and channel setup

The **Devices** view makes it easy to set up a multichannel acquisition system, with the option to use multiple different Pico data loggers simultaneously. PicoLog shows you an image of each connected device, so you can quickly and easily enable or disable channels and set up their properties.

On the right, you can see the ADC-24 logger set up for a combination of single-ended and differential inputs.



The screenshot shows the PicoLog interface in 'Capture - Devices' mode. On the left, there's a sidebar with icons for capture, settings, and help. The main area displays an ADC-24 logger (NR027/123) with a calculator icon. On the right, a 'Channels & Axes' panel lists several channels with their current values:

Channel	Value
Differential 15 - 16 NR027/123 15 - 16 ±2.5 V	-750.17 mV
Single-ended 9 NR027/123 9 ±2.5 V	532.07 mV
Single-ended 1 NR027/123 1 ±2.5 V	-422.71 mV
Single-ended 2 NR027/123 2 ±2.5 V	913.58 mV
Differential 5 - 6 NR027/123 5 - 6 ±2.5 V	228.47 mV

Robust file format

At the heart of PicoLog is the file system, which stores live capture data directly to a robust database, rather than to a single file that is vulnerable to corruption and data loss. If the computer is shut down and rebooted, PicoLog will only lose the data during the outage and will resume capturing when you restart the software.

This file system also means that the size of the dataset you can capture is virtually unlimited – the only restriction is the size of your computer's hard disk!

The .picolog file format is compatible across all operating systems, and there is no need to set up a file to save to before the capture is complete. You can also save mid-capture if you wish to share the data collected so far. Since anyone can download and install PicoLog for free, you can easily share saved data with co-workers, customers and suppliers for offline post-analysis.

PicoSDK®

Pico's software development kit, PicoSDK, is available free of charge and allows you to write your own software and interface to third-party software packages.

Pico also maintains repositories of example code on GitHub (github.com/picotech), showing how to use PicoSDK with software packages such as Microsoft Excel, National Instruments LabVIEW and MathWorks MATLAB, or with programming languages including C, C++, C# and Visual Basic .NET.

PicoSDK and the *ADC-20 and ADC-24 User's Guide* (which includes the Programmer's Guide) are available to download from www.picotech.com/downloads.

Try the PicoLog software today!



PicoLog's built-in demo mode allows you to try out the full functionality of the software with a choice of virtual devices and simulated live data. You also can use PicoLog to view previously saved data, even with no device connected. Visit www.picotech.com/downloads and select **PicoLog Data Loggers** to get your copy.

Specifications

Inputs and outputs	ADC-20	ADC-24																																																																											
Resolution	20 bits	24 bits																																																																											
Number of channels	4 differential / 8 single-ended	8 differential / 16 single-ended																																																																											
Conversion time per channel	660 ms, 340 ms, 180 ms, 100 ms, 60 ms																																																																												
Voltage ranges	±2500 mV ±1250 mV	±2500 mV ±1250 mV ±625 mV ±312 mV ±156 mV ±78 mV ±39 mV																																																																											
Gain error	0.2% of reading	0.2% (±2500 mV range) 0.1% (±39 mV to ±1250 mV ranges)																																																																											
Offset accuracy	400 µV (±2500 mV range) 36 µV (±1250 mV range)	400 µV (±2500 mV range) 36 µV (±1250 mV range) 20 µV (±625 mV range) 13 µV (±313 mV range) 9 µV (±156 mV range) 7 µV (±78 mV range) 6 µV (±39 mV range)																																																																											
	<i>Offsets typical with input source impedance ≤ 1 kΩ</i>																																																																												
Noise-free resolution	<table border="1"> <thead> <tr> <th rowspan="3">Conversion time per channel</th> <th colspan="7">Voltage range</th> </tr> <tr> <th colspan="5">ADC-24 only</th> <th colspan="2">ADC-20 and ADC-24</th> </tr> <tr> <th>±39 mV</th> <th>±78 mV</th> <th>±156 mV</th> <th>±313 mV</th> <th>±625 mV</th> <th>±1250 mV</th> <th>±2500 mV</th> </tr> </thead> <tbody> <tr> <td></td> <td colspan="7">Noise-free resolution (bits)</td> </tr> <tr> <td>660 ms</td> <td>17</td> <td>18</td> <td>19</td> <td>20</td> <td>20</td> <td>20</td> <td>20</td> </tr> <tr> <td>340 ms</td> <td>17</td> <td>18</td> <td>19</td> <td>19</td> <td>19</td> <td>20</td> <td>20</td> </tr> <tr> <td>180 ms</td> <td>16</td> <td>17</td> <td>18</td> <td>19</td> <td>19</td> <td>19</td> <td>19</td> </tr> <tr> <td>100 ms</td> <td>16</td> <td>17</td> <td>18</td> <td>18</td> <td>18</td> <td>19</td> <td>19</td> </tr> <tr> <td>60 ms</td> <td>15</td> <td>16</td> <td>17</td> <td>18</td> <td>18</td> <td>18</td> <td>18</td> </tr> </tbody> </table>							Conversion time per channel	Voltage range							ADC-24 only					ADC-20 and ADC-24		±39 mV	±78 mV	±156 mV	±313 mV	±625 mV	±1250 mV	±2500 mV		Noise-free resolution (bits)							660 ms	17	18	19	20	20	20	20	340 ms	17	18	19	19	19	20	20	180 ms	16	17	18	19	19	19	19	100 ms	16	17	18	18	18	19	19	60 ms	15	16	17	18	18	18	18
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Noise rejection	120 dB typical at 50/60 Hz																																																																												
Input impedance	Differential: 2 MΩ Single-ended: 1 MΩ																																																																												
ADC input bias current	50 nA max.																																																																												
Common mode input range, channel to common	±3.0 V (±2500 mV range) ±1.9 V (±39 mV to ±1250 mV ranges)																																																																												
Common mode input range, common to earth ground	±30 V																																																																												

Inputs and outputs	ADC-20	ADC-24
Common mode rejection ratio, channel to common	95 dB (DC to 60 Hz)	
Common mode rejection ratio, common to earth ground	> 125 dB (DC to 60 Hz)	
Overvoltage protection	±30 V between any input and common	
Digital I/O	None	4 bidirectional (3.3 V CMOS) Output level, high: > 2.40 V Output level, low: < 0.40 V Input level, high: > 2.20 V Input level, low: < 0.88 V
Isolation (input to input)	None	
Isolation (input to ground)	Galvanic up to ±30 V AGND and DGND isolated	
Reference output	+2.5 V ±2.5 mV @ 2 mA +5 V ±1.0 V @ 2 mA -5 V ±1.5 V @ 2 mA	
Environmental		
Temperature range, operating, for quoted accuracy	20 to 30 °C	
Temperature range, operating	0 to 45 °C	
Temperature range, storage	-20 to +60 °C	
Humidity range, operating	5 to 80 %RH, non-condensing	
Humidity range, storage	5 to 95 %RH, non-condensing	
General		
Software	PicoLog Cloud, PicoSDK (available from www.picotech.com/downloads) Example code (available from Pico's GitHub organization page, github.com/picotech)	
PicoLog user interface languages	English, French, Italian, German, Spanish, Korean, Japanese, Chinese (simplified), Russian	
PC requirements (PicoLog Cloud app)	Windows, macOS, Linux or Raspberry Pi OS. For supported OS versions, see PicoLog 6 Release Notes . Hardware as required by the operating system.	
PC requirements (viewer)	Any device with internet access, a web browser and a screen	
I/O connector	25-way D female	
Power requirements	Powered from USB port, 100 mA (max.) A 4.4 m (13.8 ft) USB cable is permanently attached to the logger	
Dimensions	135 x 184 x 36 mm (5.31 x 7.24 x 1.41 in)	
Weight	Approx. 505 g (17.8 oz)	
Compliance	European EMC and LVD standards FCC Rules Part 15 Class A	
Warranty	5 years	

Ordering information

Order code	Product name
PP308	ADC-20 8-channel, 20-bit-resolution precision data logger
PP311	ADC-20 data logger including terminal board
PP309	ADC-24 16-channel, 24-bit-resolution precision data logger
PP312	ADC-24 data logger including terminal board

Optional accessories

Order code	Product name
PP310	ADC-20/24 terminal board for the ADC-20/24 data loggers
CC008	Calibration service for ADC-20/24 data loggers



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