ADINSTRUMENTS

ML307 Conductivity Pod

Pod Series

Description

The Conductivity Pod is designed to work with PowerLab units (with Pod support), and conductivity electrodes for the monitoring of solution conductance.

System Compatibility

The Conductivity Pod connects to any PowerLab hardware units with Pod ports (8-pin DIN inputs). PowerLab and MacLab (except 4s, 8s and 16s) units without Pod ports require the FE305 Pod Expander.

The Conductivity Pod is supported by the following versions of ADInstruments software:

WINDOWS	MACINTOSH
• LabChart v6 or later	• LabChart v6 or later
• Chart v4.2 or later	• Chart v3.6.9 or later
• Scope v3.6.11 or later	• Scope v3.6.9 or later

Note: Earlier software versions do not support Pods.
Visit our website for information on operating system requirements.

Transducer Compatibility

The Conductivity Pod is recommended for operation with the MLT908, MLT915 or MLT916 electrodes. However, it can be used with most other types of two-electrode conductivity cells.

Applications

Monitoring of solution electrical conductance or resistance.

Theory of Operation

The Conductivity Pod measures the alternating current (AC) across a suitable conductivity cell by applying a AC potential across a pair of platinum plate electrodes that comprise the cell and outputs an analog voltage DC signal proportional to the conductivity (reciprocal resistance). The Pod has four gain settings with secondary amplification provided by the PowerLab range setting (see Specification section) to give a total of twelve input ranges.

The Pod incorporates a 20 Hz low pass filter to remove any high frequency interference. Further filtering options (down to 2 Hz) can be applied to the incoming signal with the PowerLab.

Operating Instructions

Connect the conductivity electrode to the BNC connector on the rear panel of the Conductivity Pod. Connect the 8-pin DIN cable from the rear panel of the Conductivity Pod to a PowerLab Pod port (or to one of the Pod ports of a Pod Expander connected to the PowerLab). Do not connect other devices such as Front-ends or Instruments to the corresponding BNC connector on the channel used by the Pod. When the LabChart or Chart software is activated the Conductivity Pod window (Figure 1) can be accessed from the Channel function pop-up menu. Sensitivity is adjusted with the Gain (coarse) and Range (fine control) menus. The raw conductivity signal (G) is reported in volts which must be converted to appropriate conductivity units (microSiemens, µS, or milliSiemens, mS), or specific conductance (κ, units of µS/cm or mS/cm). One Siemens is equivalent to a reciprocal ohm.

To calibrate the system in terms of specific conductance you must first prepare a solution with a known value (Table 1). Conductivity and specific conductance are related by the equation: $\kappa = G \times k$ where k is the cell constant (units of cm^{-1})

Calibration procedure

For monitoring of relative changes of conductivity, or for determination of endpoints of conductiometric titrations, the raw signal (in millivolts) can often be used without calibration. However, as conductivity cells themselves are typically only within about 10% of their nominal k value, you should always calibrate your cell before use if accurate specific conductance values are required.

Record data from a solution of known specific conductance (Table 1), for a few seconds using a Gain and Range setting so that the signal is about 50 – 90% of the full scale. Then disconnect the electrode and continue recording data for a few more seconds to obtain a zero reading. Use the Units conversion feature to enter the two known specific conductance values (one being zero, and the second from Table 1). Select mS/cm or µS/cm as the new unit name. Refer to the LabChart User's Guide for more information about Units Conversion. Your data will now be recorded with these calibration settings. Note that this procedure does not require an explicit determination of the cell constant, k. If you need to explicitly determine the cell constant, k, enter the Pod gain factor into the Units Conversion dialog (for example, if the gain is 10 mS/V then use 0 V = 0 mS and 1 V = 10 mS). Now record the conductivity of a standard KCl solution. The ratio of the known specific conductance (κ, from Table 1) and the actual solution conductivity (G) will give k: $k = \kappa / G$

The conductivity cell will typically appear to provide a small background signal due to cable capacitance. This can limit accuracy when very small signals (< 20 µS) are being measured with a k = 1 cell. For these measurements, a cell with k = 0.1 is recommended.

Stacking and Unstacking Pods

Pods stack by clicking into place on top of each other. To separate stacked Pods, push the top Pod towards the back and then pull them apart from the back. See picture on right.

Table 1.

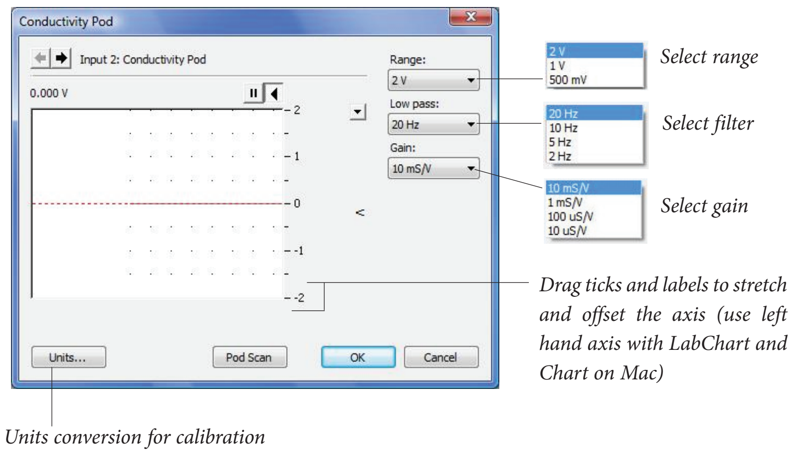
Specific conductance (µS/cm) of potassium chloride solutions

Temperature (°C)	KCl solution (mol/L)						
	0.0001	0.001	0.005	0.01	0.02	0.05	0.1
5				896	1740		8220
10				1020	1990		9330
15				1147	2240		10480
16				1173	2290		10720
17				1199	2350		10950
18				1225	2400		11190
19				1251	2450		11430
20				1278	2500		11670
21				1305	2550		11910
22				1332	2600		12150
23				1359	2660		12390
24				1386	2710		12640
25	14.94	147	718	1413	2768	6668	12880
26				1437	2819		14390
27				1462	2873		14620
28				1488	2927		14880
29				1513	2981		15130
30				1540	3036		15400

Table 2. Specific conductance (µS/cm) of 'water'

	Temperature (°C)						
	0	10	20	25	30	40	50
Ultra pure water	0.012	0.023	0.042	0.055	0.071	0.113	0.171
'De-ionised' water				<1 typical			
Drinking water				50 – 1000			
Sea water				53000			

Figure 1. Conductivity Pod Controls



Caution

Read “Statement of Intended Use” on our website or in “Getting Started with PowerLab” before use.

Specifications

Input range:

= Pod Gain × PowerLab Range

Pod Gain	PowerLab Range 500 mV	1 V	2 V
10 µS/V	5 µS	10 µS	20 µS
100 µS/V	50 µS	100 µS	200 µS
1 mS/V	500 µS	1 mS	2 mS
10 mS/V	5 ms	10 mS	20 mS

Error (factory default settings):	±2% of input range @ ≥1 mS/V
Error (after user calibration):	<1% of input range @ ≥1 mS/V
AC waveform amplitude:	200 mV p-p
AC waveform shape:	Triangular
AC waveform frequency	1300 Hz (approx)
Low-pass filter:	20 Hz, 2nd order Butterworth
Noise:	0.008 % full scale
Dimensions (l × w × h):	108 × 58 × 35 mm
Weight:	200 g
Input connector:	BNC

All specifications were tested at the time of printing and are subject to change.

Ordering Information:a

ML307 Conductivity Pod

For use with:

Conductivity Electrodes, cell constant k = 1:

MLT915	Dip-In Conductivity Electrode
MLT908	Flow Thru Conductivity Electrode (0.093 ml)
MLT916	Flow Thru Conductivity Electrode (0.017ml)