



Voltammetric Analyzer

Model 4330

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1 General Description

Model 4330 is an advanced voltammetric analyzer widely used for the electrochemical trace analysis of heavy metals. This technique, that represents the progress in polarographic methods, allows for the detection of any specie which can be reduced and oxidized. Model 4330 allows for the use of Hanging Drop Mercury Electrode, Rotating Disk Electrode or static electrodes with an intuitive and quick electrode replacement procedure. The use of solid electrodes widens the detection possibilities of classical polarography: many static electrodes are available and many more can be manufactured to fit your needs. Model 4330 can work both as galvanostat or potentiostat. The variety of available measurement techniques along with AMEL's long term experience in voltammetric analysis paves the way to a wide range of possible applications, making AMEL's voltammetric analyzer the most flexible tool for the analysis of waters, industrial fluids, beverages, food, pharmaceuticals and organic compounds given an appropriate digestion method. The instrument is controlled by the supplied software, which includes a complete analytical module.

2 Metrological Properties

2.1 Counter Electrode

Voltage Output	$\pm 12V$ max
Current Output	$\pm 12mA$ max
Slew Rate	1mV/s to 10V/s
Protection	Thermal, overload and short-circuit



2.2 Working Electrode

Current Measure	From 1nA to 10mA Full Scale in 8 ranges
Current Resolution	From 1pA at 1nA Full Scale to 1 μ A at 10mA Full Scale
Measuring Accuracy	$\pm 0,2\%$ & $0,1\%$ (conversion at Full Scale)

2.3 Reference Electrode

Input Impedance	> 1T Ω
Input Capacitance	< 20pF (1m cable)
Biasing Current	< 2pA at 25°C
Common Mode Rejection	> 50dB full frequency response
Voltage Range	± 10 V max

2.4 Polarization Capability

Voltage	± 4 V max
Current	± 10 mA max
Voltage Resolution	1mV
Current Resolution	1pA
Accuracy	$\pm 0,2\%$ & $0,1\%$ (conversion at Full Scale)

2.5 Response Time

Potentiostatic Rise Time	10 μ s resistive load (1000 Ω)
Galvanostatic Rise Time	25 μ s resistive load (1000 Ω)

2.6 Meters and Interfaces

A/D Converter	16 BIT
D/A Converter	16 BIT
Temperature Meter	0 to +100°C with PT1000 probe (0,1°C resolution and $\pm 0,2^\circ$ C accuracy)
pH Meter	-2,000 to +16,000pH (0,001pH resolution and $\pm 0,005$ pH accuracy)
Sampling Rate	200 μ s

2.7 Digital Interface

Connection	USB with full instrument control (baud rate 57600 – N – 8 – 1)
Memory	EEPROM 64kB – SRAM 32kB
Digital Burette	Model 235 with 1000 μ L calibrated syringe (optional)
Peristaltic Pump Control	Start/stop and direct/reverse flow



2.8 Cell Connections

Working Electrode	Hanging Drop Mercury Electrode (110 x Ø6mm capillary - Ø0,1mm) Rotating Disk Electrode (100 to 5000rpm) Solid Electrode Tips
Counter Electrode	Platinum wire (Ø0,8 x 5mm) with 2mm ball ending
Reference Electrode	Ag/AgCl (3M KCl electrolyte)
Stirrer	Magnetic or overhead propeller (computer controlled)

2.9 Power Supply and Dimensions

Voltage Mains	115 or 230V AC ±10% 50/60Hz
Power Consumption	40VA max
Dimensions (L x W x H)	270 x 320 x 350mm
Weight	8kg

3 Implemented Electrochemical Techniques

3.1 Detection

AD	Amperometric Detection
PD	Potentiometric Detection
DSA	Double Step Amperometry
DSV	Double Step Potentiometry
PAD	Pulsed Amperometric Detection

3.2 Voltammetric

LSV	Linear Scan Voltammetry
CYV	Cyclic Voltammetry
SWV	Square Wave Voltammetry
NPV	Normal Pulse Voltammetry
ACV	Alternating Current Voltammetry
DPV	Differential Pulse Voltammetry
DNV	Differential Normal Pulse Voltammetry
DAV	Differential Alternate Pulse Voltammetry

3.3 Stripping

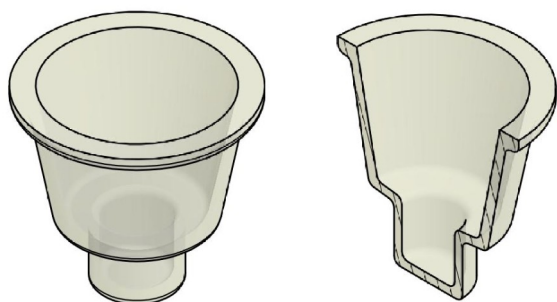
LSS	Linear Scan Stripping
ACS	Alternate Current Stripping
SWS	Square Wave Stripping
DAS	Differential Stripping

- DPS Differential Pulse Stripping
 DNS Differential Normal Pulse Stripping
 PSA Potentiometric Stripping Analysis
 CCSA Constant Current Stripping Analysis

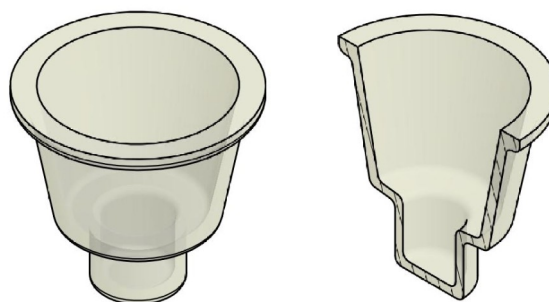
4 Accessories and Spare Parts

Each instrument comes with all the cables needed for installation along with two Pyrex cells (430/GC), two magnetic stirrer bars (430/SB), one platinum counter electrode (805/SPG/6JZ) and one silver chloride reference electrode (373/SSG/6JZ), a complete set of 5 cables for cell connections (191/5BN2), grid and USB cables (191/GPC & 191/USB).

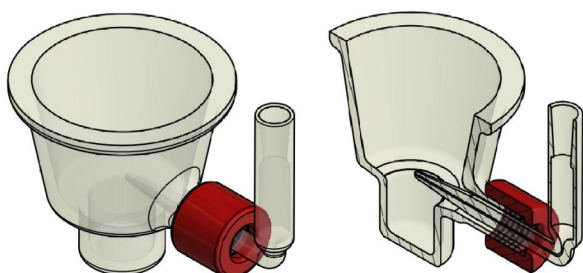
The following cells can be used with Model 4330 Voltammetric Analyser. Electrodes can be chosen among ones available in AMEL's catalogue keeping in mind that only 6JZ model fit the NS6 conical tapered fittings of the voltammetric cell.



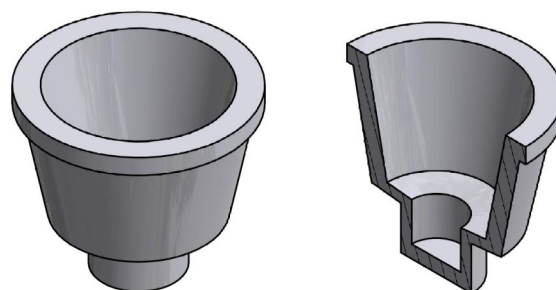
Pyrex cell 430/GC



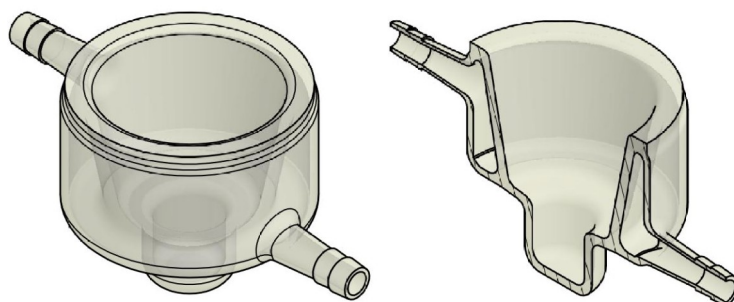
Quartz cell 430/QZ



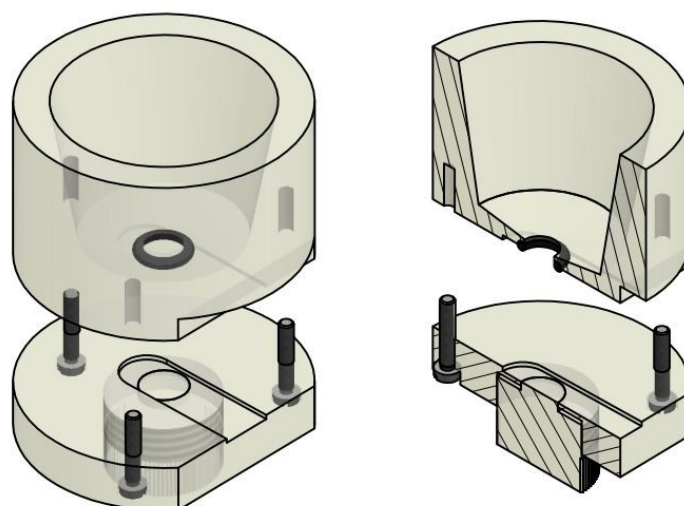
Pyrex cell with Ligin capillary 430/LC



PTFE cell 430/TE



*Pyrex cell with thermostatic jacket **430/TJ**
(Ø9mm thermostat piping)*



*PMMA cell for screen printed electrodes **4330/PX***



*Microcell for small volumes (1-5mL) **430/MC***



Listed below working, reference and counter electrodes that can be used with Model 4330 Voltammetric analyzer, please refer to AMEL's electrodes catalogues for more information.

Working Electrode:

4330/MV Hanging Drop Mercury Electrode

RDE Rotating Disk Electrode

RDE/GC/3 3mm Glassy Carbon tip for Rotating Disk Electrode

RDE/AU/3 3mm Gold tip for Rotating Disk Electrode

493/6JZ Conical tapered (NS6) support for 492/X series tips

492/GC/3 Glassy Carbon disk tip (Ø3mm)

492/PG/3 Pyrolytic Graphite disk tip (Ø3mm)

492/CU/2 Copper disk tip (Ø2mm)

492/CU/3 Copper disk tip (Ø3mm)

492/AG/01 Silver disk tip (Ø0,1mm)

492/AG/05 Silver disk tip (Ø0,5mm)

492/AG/08 Silver wire tip (Ø0,8x10mm) – compliant with GOST standards

492/AG/1 Silver disk tip (Ø1mm)

492/AG/3 Silver disk tip (Ø3mm)

492/PT/1 Platinum disk tip (Ø1mm)

492/PT/2 Platinum disk tip (Ø2mm)

492/PT/3 Platinum disk tip (Ø3mm)

492/AU/1 Gold disk tip (Ø1mm)

492/AU/2 Gold disk tip (Ø2mm)

492/NI/3 Nickel disk tip (Ø3mm)

492/TI/3 Titanium disk tip (3mm)

492/BI/3 Bismuth disk tip (3mm)

492/PD/3 Palladium disk tip (3mm)

DPR/C110 Screen Printed Electrodes for 4330/PX cell (25pcs)

Reference Electrode:

303/SCG/6JZ Calomel reference electrode

373/SSG/6JZ Silver Chloride reference electrode

Counter Electrode:

805/SPG/6JZ Platinum tip counter electrode

805/SPG/6JZ-C Platinum tip counter electrode with glass jacket and ceramic frit

pH Electrode:

411/CGG/6JZ Combined pH electrode



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The following spare parts and accessories are meant for everyday use and maintenance.

435/LFP	Propeller stirrer
435/LF	Paddle for propeller stirrer
430/SB	Magnetic stirrer bar
430/LU	Luggin capillary for 430/LC cell
430/MHS	PTFE cap for NS6 conical tapered fitting
9811	Saturated KCl solution 250mL
430/PV	Manual vacuum pump for Hanging Drop Mercury Electrode
430/GT	Mercury trap for 430/PV manual vacuum pump
191/CP	Screen Printed Electrodes cable
191/5BN2	Set of 5 WE, RE and CE cables for 4330 and 4330/P
191/GPC	Grid power cable
191/USB	USB cable