Metrohm

Electrodes for Titration

Which electrode for which application?

Application	Specifics	Electrode	Order no.
Aqueous acid/ base titrations	General	Ecotrode Plus	6.0262.100
		Ecotrode Gel	6.0221.100
	Alkaline samples, Bayer liquors. Titrations performed at high temperatures	Unitrode	6.0259.100
	Acidity of alcoholic beverages	Unitrode *easy*Clean with Pt1000	6.0260.010
	Titrations with small sample volumes	Flat membrane pH electrode	6.0256.100
	Titrations in water having a low conductivity	Aquatrode Plus	6.0253.100
	Carbonate hardness, acid capacity of water, p- & m-value	Aquatrode Plus with Pt1000	6.0257.600
	Electroplating baths, etching baths, phosphate coating	Profitrode	6.0255.100
	Electroplating and etching baths containing fluoride or hydrofluoric acid	Solitrode HF	6.0223.100
	Protein-containing samples	Porotrode	6.0235.200
Non-aqueous acid/base titrations	Determination of the base number (TBN) of mineral oils, titrations with perchloric acid, cyclohexylamine, alcoholic HCl	Solvotrode *easy*Clean with $LiCl_{sat}$ in ethanol	6.0229.010
	Determination of the acid number (TAN) of mineral oils, titrations with alcoholic KOH, NaOH and TBAOH, potassiummethylate, free acids; hydroxyl number of oils and fats	Solvotrode *easy*Clean c(TEABr) = 0.4 mol/L in ethylene glycol)	6.0229.010 (+ 6.2320.000)
Redox titrations Arsenite, cerium sulfate, iron(III), iodine, potassium bromate, sodium nitrite, oxalic acid, permanganate, thiosulfate, titan(III), $Hg(NO_3)_2$	Titrations at constant pH value	Pt-Titrode	6.0431.100
	Redox titrations at varying pH value	Combined Pt-ring-electrode	6.0451.100
	Chemical oxigen demand in water (ferrometry)	Combined Au-ring-electrode	6.0452.100
	Penicillin, ampicillin	Combined Au-ring-electrode	6.0452.100
	Titrations in I_{pol} mode	Double Pt sheet electrode	6.0309.100
	Bromatometry, iodometry, cerimetry according to Ph. Eur. & USP	Pt-Titrode	6.0431.100
Karl Fischer Titrations	Water content according to Karl Fischer	Double Pt-wire electrode (HF-resistant version on request)	6.0338.100
Complexometric Titrations with EDTA, Complexon© III and IV	Back-titration of the Ba^{2+} excess with EDTA	Combined Ca^{2+}-ISE polymer membrane	6.0510.100
	Determination of Ca^{2+}, Mg^{2+} (Application Bulletin 125)	Combined Ca^{2+}-ISE polymer membrane	6.0510.100
	Determination of Al, Ba, Bi, Ca, Cd, Co, Fe, Mg, Ni, Pb, Zn (Application Bulletin 101)	Cu^{2+} ISE – crystal membrane	6.0502.140
Precipitation titrations Titrations with silver nitrate	Chloride in general, sodium chloride in food	Ag-Titrode	6.00430.100
	Chloride in dialysis and infusion solutions	Ag-Titrode with Ag_2S-coating	6.00430.100S
	Titrations according to Ph.. Eur. & USP	Ag-Titrode with Ag_2S-coating	6.00430.100S
	Determination of hydrogen sulfide, mercaptans, carbonyl sulfide, sulfides	Ag-Titrode with Ag_2S-coating	6.00430.100S
	Chloride, bromide, iodide and cyanide in electroplating baths	Ag-Titrode with Ag_2S-coating	6.00430.100S
	Fluoride/hydrofluoric acid in etching baths	F^--ISE crystal membrane	6.0502.150
Photometric titrations	Titration in aqueous and non-aqueous media; choice of eight wave lengths (470, 502, 520, 574, 590, 610, 640, 660 mn)	Optrode	6.1115.000
Surfactants in non-aqueous media Aromatic/aliphatic, hydrocarbons, ketones, chloroethanes, methylisobutylketone	Titration of anionic and cationic surfactants, titrations in chloroform, surfactant formulations containing oils, pH <10	Surfactrode Resistant	6.0507.130
	Titration of anionic and cationic surfactants, titration of washing agents, soaps, pH >10	Surfactrode Refill	6.0507.140
Surfactants in aqueous media	Titration of cationic surfactants	Cationic Surfactant	6.0507.150
	Titration of anionic surfactants	Ionic Surfactant	6.0507.120
	Titration of non-ionic surfactants, titration of pharmaceutical ingredients with sodium tetraphenylborate	NIO electrode	6.0507.010
Thermometric titrations	Titrations in aqueous and non-aqueous solutions without HF	Thermoprobe	6.9011.020
	Titrations in aqueous solutions containing HF	Thermoprobe HF	6.9011.040

Practical tips, care and maintenance of electrodes for titration

Ecotrode Plus	Ecotrode Gel	Unitrode	Aquatrode Plus	Profitrode	Solvotrode *easy*Clean	Ag/Pt/Au-Titrodes	Combined Ag/Pt/Au electrodes	Surfactrodes	Surfactant electrodes	Optrode
Fixed ground-joint diaphragm • Insensitive to contamination • Attractive price/performance ratio **Ordering Info:** 6.0262.100[1] iEcotrode Plus: 6.0280.300[2] dEcotrode Plus: 6.00201.300[3]	Twin-pore diaphragma • For routine measurements in similar samples • With lifetime indicator • Maintenance-free reference electrolyte (gel) **Ordering Info:** 6.0221.100[1] 6.00221.600 (with Pt-1000)[4]	Fixed ground-joint diaphragm • Very low alkali error • Insensitive to contamination • High-temperature resistance **Ordering Info:** 6.0259.100[1] 6.0258.600 (with Pt1000)[4] iUnitrode: 6.0278.300[2] dUnitrode: 6.00200.300[3] Unitrode *easy*Clean: 6.0260.010 (with Pt1000, 1.2 m fixed cable)	Fixed ground-joint diaphragm • Rapid response in iondeficient or weakly buffered solutions • Insensitive to contamination **Ordering Info:** 6.0253.100[1] 6.0257.600 (with Pt1000)[4] iAquatrode Plus: 6.0277.300[2] dAquatrode Plus: 6.00202.300[3]	Ground-joint diaphragm • For difficult matrices • Double-junction construction **Ordering Info:** 6.0255.100[1] (Fitting length = 113 mm) 6.0255.110[1] (Fitting length = 170 mm) 6.0255.120[1] (Fitting length = 310 mm) dProfitrode: 6.00204.300[3]	*easy*Clean diaphragm • For titrations in nonaqueous matrices • Rapid response in organic solvents • Electrically shielded **Ordering Info:** 6.0229.010 (1 m fixed cable) 6.0229.020 (2 m fixed cable) dSolvotrode: 6.00203.300[3]	Maintenance-free pH glass reference system • Also available as micro-electrodes with 6.4 mm diameter **Ordering Info:** Ag-Titrode: 6.00430.100[1] Pt-Titrode: 6.0431.100[1] Micro-Au Titrode: 6.0435.110[1] iAg-Titrode: 6.00470.300[2] iPt-Titrode: 6.0471.300[2] dAg-Titrode: 6.00404.300[3] dPt-Titrode: 6.00401.300[3]	Ceramic-pin diaphragm • For precipitation or redox titrations with change of pH value **Ordering Info:** Ag: 6.00450.100[1] Pt: 6.0451.100[1] Au: 6.0452.100[1] iAg: 6.00450.300[2] iPt: 6.0451.300[2] dAg: 6.00402.300[3] dPt: 6.00403.300[3]	For surfactant titrations in non-aqueous media **Surfactrode Resistant (6.0507.130)[1]** Resistant to chloroform and many other solvents. **Surfactrode Refill (6.0507.140)[1]** Refillable surfactant electrode, thus practically unlimited working life. Not resistant to chloroform. **Surfactrode refill paste: 6.2319.000**	For surfactant titrations in aqueous media **NIO electrode (6.0507.010)[1]** For titration of non-ionic surfactants **Ionic Surfactant (6.0507.120)[1]** Optimized for anionic surfactants **Cationic Surfactant (6.0507.150)[1]** Optimized for cationic surfactants	Power supplied by titrator via USB, no separate power adapter needed **Ordering Info:** 6.1115.000 Optional: 6.2166.000 USB power supply unit for titrators without USB connector.
										
Store in 6.2323.000 storage solution only. Do not wipe electrode. For cleaning/care 6.2325.000 pHit kit is recommended.	Store in 6.2308.000 KCl sat. Rinse with water or ethanol to remove contamination.	Use 6.2308.040 Idrolyte for titrations at temperatures 80...100 °C or to suppress protein precipitation by KCl. Rinse with water or ethanol. Do not wipe electrode. Unitrodes filled with c(KCl)=3 mol/L should be stored in 6.2323.000 storage solution. For cleaning/care 6.2325.000 pHit kit is recommended.	Store in 6.2323.000 storage solution only. Do not wipe electrode. For cleaning/care 6.2325.000 pHit kit is recommended.	Store in bridge electrolyte. Do not wipe electrode. For cleaning/care 6.2325.000 pHit kit is recommended. Lift sleeve ring for cleaning of ground-joint diaphragm. If the sleeve ring is blocked, immerse in hot water for a few minutes to dissolve adhering material. Spare ground-joint diaphragm for Profitrodes 6.0255.1X0: Order no. 6.1243.020	Store in reference electrolyte. Do not wipe electrode. In case of contamination with organic residues, immerse sensor in an appropriate solvent (for 30 min.). Condition glass membrane in dist. water before next titration. Alternative electrolyte: c(TEABr) = 0.4 mol/L in ethylene glycol (6.2320.000).	Store in distilled water only. Testing of the electrodes according to AB-048. Ag Titrodes also available with Ag_2S or Ag-halide coating.	Store in reference electrolyte. Testing of the electrodes according to AB-048. Ag ring electrodes also available with Ag_2S or Ag-halide coating.	Store dry. Allow a few titrations for conditioning of the Surfactrodes. Reactivate Surfactrode Resistant with fine-grained sandpaper if response is poor. Testing of the electrodes according to AB-305.	Store dry. Rinse with dist. water or 20% methanol in water. Wipe carefully with a methanol-soaked tissue to remove any adhering contamination. Do not use in organic matrices or at temperatures >40 °C. Testing of the electrodes according to AB-305.	Allow 5 minutes for warming up the LED.

[1] Electrodes with no cable and no temperature probe have plug-in head G
[2] An iConnect 2.854.0010 is required to connect an iTrode to the instrument.
[3] dTrodes can only be used with a digital measuring module at an OMNIS Titrator / Titration Module.
[4] Electrodes with no cable and with an integrated temperature sensor have plug-in head U

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