



Electrode for Automatic Titrator



Titration & Electrodes

Electrodes are necessary for automatic potentiometric titrator.
The variety of electrodes and its combination with reagents enables various titrations.



•Indicator electrode

The reading potential of glass electrode or metal electrodes change with a constant relation to a concentration of solution when measuring pH or redox potential of the solution.

•Reference electrode

A reference electrode is a standard electrode to measure the electromotive force of an indicator electrode which has the ability to maintain a constant electric potential irrespective of pH of solution or concentration of oxidizing agent and reducing agent.

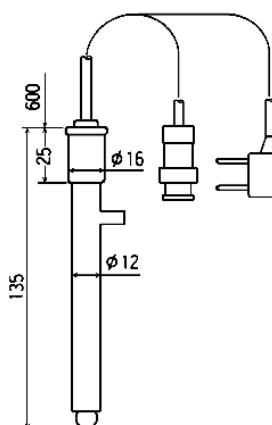
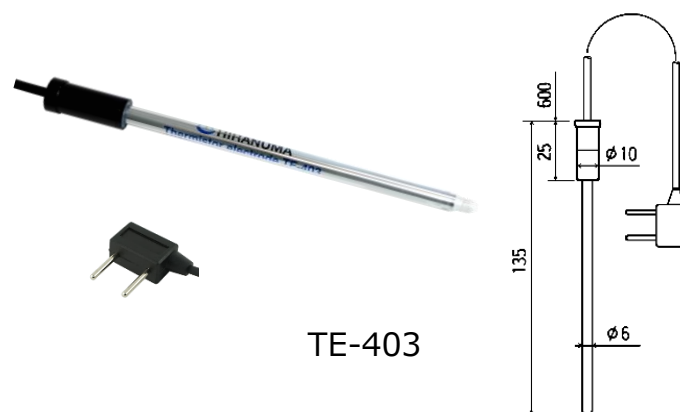
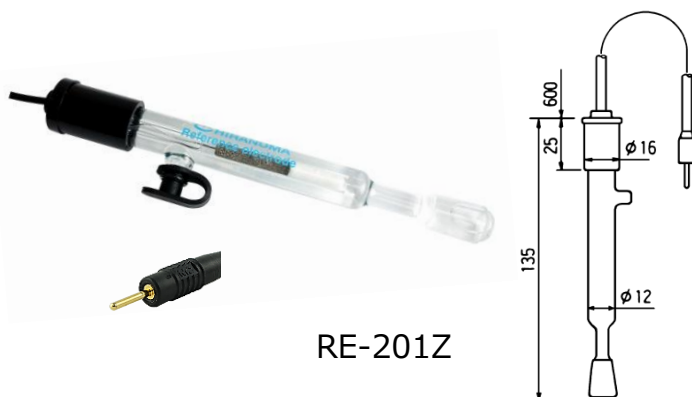
•Combination electrode

Reference and indicator electrodes are combined into a single cylinder. The combination electrode is used for cases where the diameter of the vessel is small like a test tube or Erlenmeyer flask, or when the electrodes don't fit within the electrode holder at the measurement of different titrations.

Usage and Combination of Electrodes

Titration	Analytes	Usage	Indicator electrode	Reference electrode
Neutralization	Acids•Bases (HCl, H ₂ SO ₄ , HNO ₃ , NaOH etc.)	General use	Glass electrode GE-101B	Reference electrode RE-201Z
		General use	Glass-Reference combination electrode GR-501BZ	
		Movable sleeve type	Glass-Reference combination electrode GR-511BZ	
		For test tube (≥φ18, ≤180mm in height) Cable length 1.0 m	Glass-Reference combination electrode GR-521BZ	
		For test tube or closed cell (≥φ18, ≤105 mm in height)	Glass-Reference combination electrode GR-522BZ	
		For Erlenmeyer flask	Glass-Reference combination electrode GR-525BZ	
		w/ Temperature compensation electrode	Glass-Reference Thermistor electrode GRT-603BZ	
Redox	Metal ions (Cu ²⁺ , Fe ³⁺ etc.), I ₂ , H ₂ O ₂	General use	Platinum electrode PT-301	Reference electrode RE-201Z
		General use	Platinum-Reference combination electrode PR-701BZ	
		For test tube or closed cell (≥φ18, ≤105 mm in height)	Platinum-Reference combination electrode PR-731BZ	
		For Erlenmeyer flask	Platinum-Reference combination electrode PR-733BZ	
Precipitation	Halogen ions (Cl ⁻ , I ⁻ , Br ⁻), SH ⁻ , S ²⁻	General use	Silver electrode AG-311	Silver reference electrode MS-231Z
		General use	Silver electrode AG-311	Silver reference electrode RE-241Z
		For non-aqueous solvent	Silver electrode AG-312	Silver reference electrode MS-231Z
		General use	Silver-Reference combination electrode AGR-801Z	
		Double junction type Combination with glass electrode enables neutralization titration.	Silver-Reference combination electrode AGR-811Z	
—	Lead ion	For lead-ion measurement	Lead ion-selective electrode PBi-081	Reference electrode RE-201Z
—	Copper ion	For copper-ion measurement	Copper ion-selective electrode CUI-081	Reference electrode RE-201Z
—	Chloride ion	For chloride-ion measurement	Chloride ion-selective electrode CLi-081	Silver reference electrode MS-231Z
—	Surfactant	For surfactant measurement	Surfactant electrode SU-091	Reference electrode RE-201Z

Electrodes for Neutralization Titration

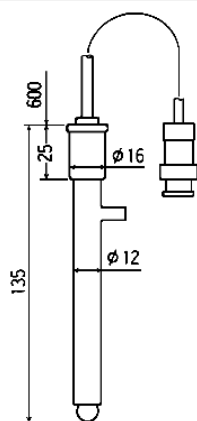


Glass electrode		Reference electrode	Thermistor electrode	Glass-Reference Thermistor electrode
Model	GE-101B	RE-201Z	TE-403	GRT-603BZ
Part No.	D252350-1	D230732-A	D252415-A	D254708-A
Temp. range	-5~80°C	-5~100°C	-5~80°C	-5~100°C
Inner solution	-	4M KCl	-	4M KCl
Note	General use	General use	Temperature compensation for pH	w/ Temperature compensation electrode

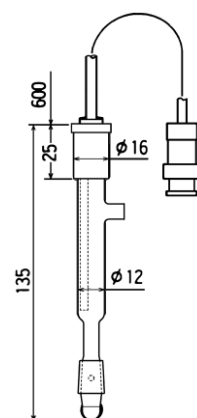
Electrodes for Neutralization Titration



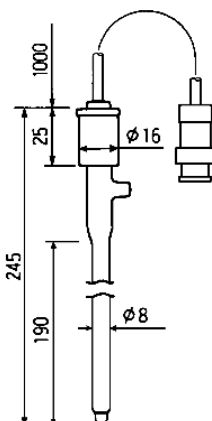
GR-501BZ



GR-511BZ



GR-521BZ



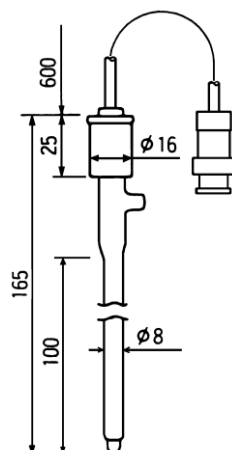
Glass-Reference combination electrode

Model	GR-501BZ	GR-511BZ	GR-521BZ
Part No.	D254700-A	D254704-A	D254701-B
Temp. range	-5~80°C	-5~80°C	-5~80°C
Inner solution	4M KCl	4M KCl	4M KCl
Note	General use	Movable sleeve type	For test tube ($\geq \phi 18$, ≤ 180 mm in height) Cable length:1.0m

Electrodes for Neutralization Titration



GR-522BZ

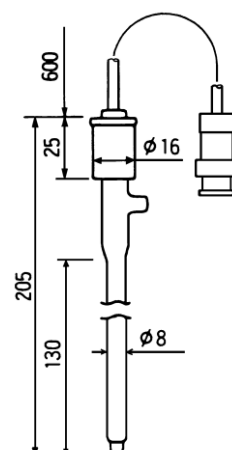


Glass-Reference combination electrode

Model	GR-522BZ
Part No.	D254702-A
Temp. range	-5~80°C
Inner solution	4M KCl
Note	For test tube or closed cell ($\geq \phi 18$, ≤ 105 mm in height)



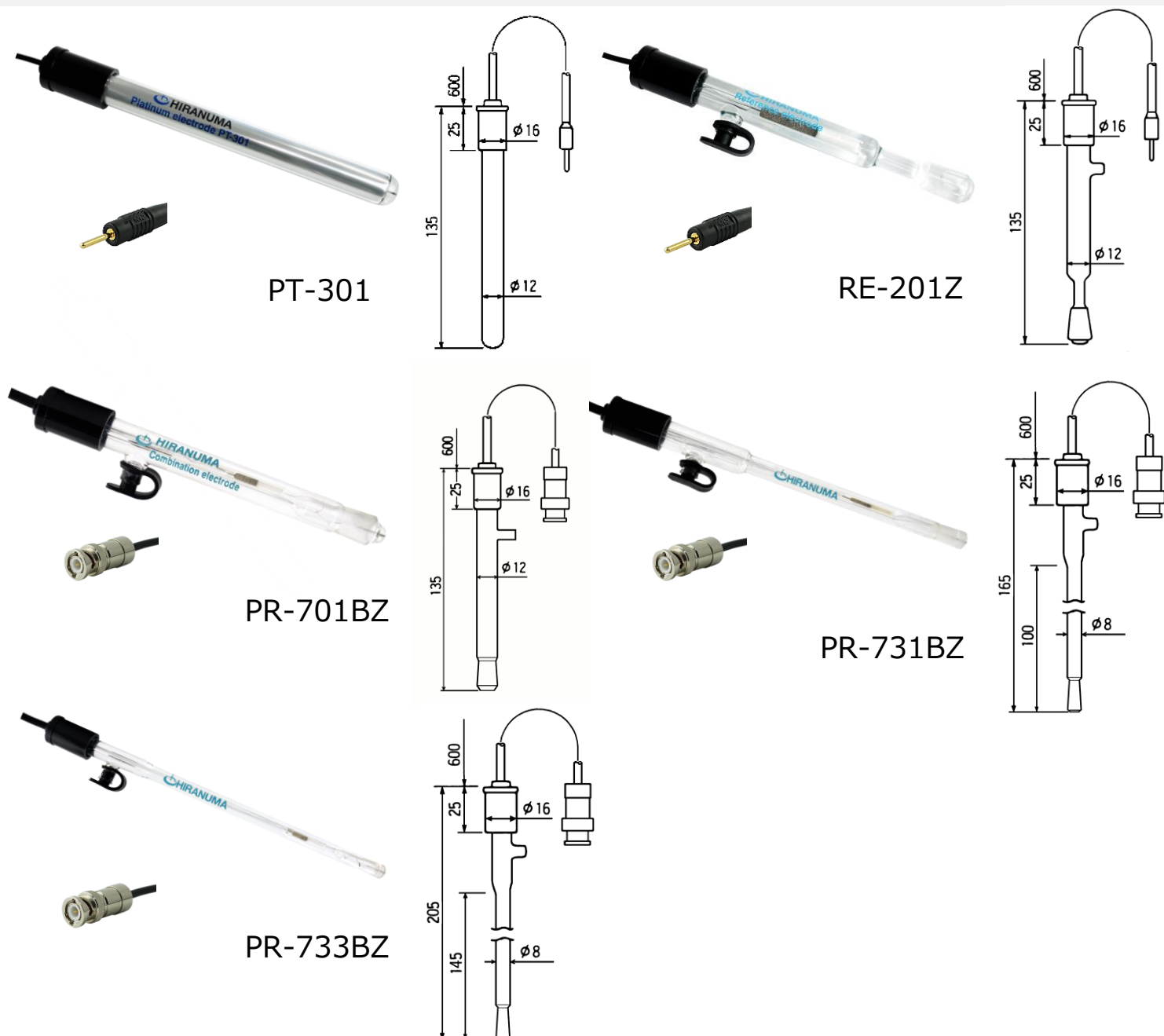
GR-525BZ



Glass-Reference combination electrode

Model	GR-525BZ
Part No.	D254703-A
Temp. range	-5~100°C
Inner solution	4M KCl
Note	For Erlenmeyer flask

Electrodes for Redox Titration

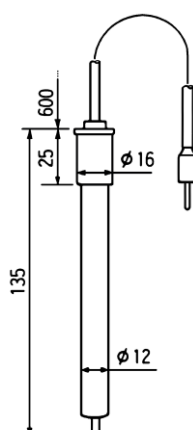


Platinum electrode		Reference electrode	Platinum-Reference combination electrode		
Model	PT-301	RE-201Z	PR-701BZ	PR-731BZ	PR-733BZ
Part No.	D231244-A	D230732-A	D254705-A	D254706-A	D254707-C
Temp. range	-5~100°C	-5~100°C	-5~100°C	-5~100°C	-5~100°C
Inner solution	-	4M KCl	4M KCl	4M KCl	4M KCl
Note	General use	General use	General use	For test tube or closed cell ($\geq \phi 18$, ≤ 105 mm in height)	For Erlenmeyer flask

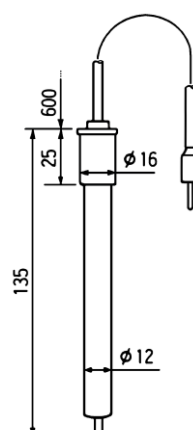
Electrodes for Precipitation Titration



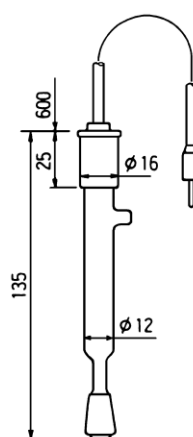
AG-311/AG-311A



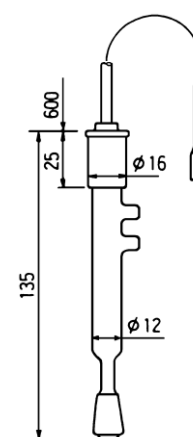
AG-312



MS-231Z



RE-241Z



Silver indicator electrode

Model	AG-311	AG-311A	AG-312
Part No.	E231245-A	D251215-A	D231259-A
Temp. range	-5~100°C	-5~100°C	-5~80°C
Inner solution	-	-	-
Note	General use	Silver chloride-coated AG-311	For non-aqueous solvent

Silver reference electrode

Model	MS-231Z*	RE-241Z
Part No.	D230733-A	D230129-A
Temp. range	-5~60°C	-5~60°C
Inner solution	0.35 mol/L K ₂ SO ₄	Outer cylinder: Saturated KNO ₃ Inner cylinder: 4M KCl containing AgCl
Note	General use	Double junction type

* "Mercurous sulfate" is used as the inner electrode.

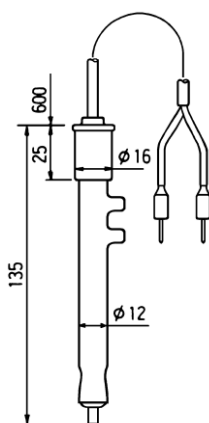
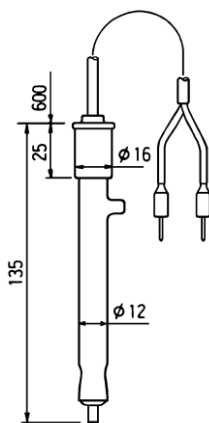
Electrodes for Precipitation Titration



AGR-801Z



AGR-811Z/AGR-811AZ



Silver-Reference combination electrode

Model	AGR-801Z*	AGR-811Z /AGR-811AZ
Part No.	D230736-A	D230090-A /D230139-A
Temp. range	-5~60°C	-5~60°C
Inner solution	0.35 mol/L K ₂ SO ₄	Outer cylinder: Saturated KNO ₃ Inner cylinder: 4M KCl containing AgCl
Note	General use	Double junction type /Silver chloride-coated AGR-811

* "Mercurous sulfate" is used as the inner electrode.

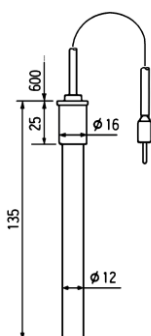
* Remark for electrode using mercury

- When disposing, please properly dispose complying with the law and regulations.
- Please inform industrial waste disposal contractors that mercury is contained in the electrode.

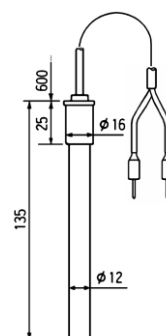
Other Electrodes



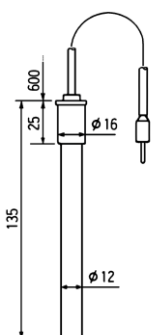
PBi-081



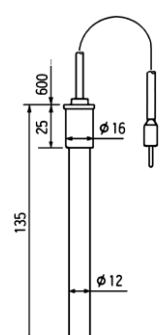
CUi-081



CLi-081



SU-091



	Lead ion-selective electrode	Copper ion-selective electrode	Chloride ion-selective electrode	Surfactant electrode
Model	PBi-081	CUi-081	CLi-081	SU-091
Part No.	D236000-1	D236005-1	D236010-1	D236100-1
Temp. range	0~50°C	0~50°C	0~50°C	5~40°C
Inner solution	-	-	-	-
Note	Use with reference electrode RE-201Z.	Use with reference electrode RE-201Z.	Use with Silver reference electrode MS-231Z	Use with reference electrode RE-201Z.

Inner solution for electrodes

Please refer to the recipe attached to each electrode for the preparation of inner solution.

*Inner solution for perchloric acid titration

In the case of perchloric acid titration, when 4 M potassium chloride inner solution is used, the potential change (differential value) at the end point shows a tendency to get small because water is mixed in the acetic acid solution.

The exchange of the inner solution to the saturated perchloric acid- acetic acid solution which contains no water is recommended.

※The listed items are dedicated products for HIRANUMA Titrators.

※Appearance and specifications are subject to change for the improvement of products without notice.

CAUTION: For correct operation, follow the instruction manual when using the items.

Sales

 **Hitachi High-Tech Science Corporation**

www.hitachi-hightech.com/global/hhs/

Head Office

Toranomon Hills Business Tower,
1-17-1 Toranomom, Minato-ku, Tokyo 105-6409, Japan

Manufacturer

HIRANUMA Co., Ltd.

www.hiranuma.com/english/index.html

Head Office

1739 Motoyoshida, Mito, Ibaraki, 310-0836, Japan