

Ferrite for Electrolysis

Ferrite electrodes

N102 series

Issue date: December 2007

- All specifications are subject to change without notice.
 - Conformity to RoHS Directive: This means that, in conformity with EU Directive 2002/95/EC, lead, cadmium, mercury, hexavalent chromium, and specific bromine-based flame retardants, PBB and PBDE, have not been used, except for exempted applications.
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Electrodes for Electrolysis Ferrite Electrodes

N102 Series

Conformity to RoHS Directive

The ferrite material used for these TDK's Ferrite Electrodes is kind of special ceramic materials that have very low electrical resistance. TDK's Ferrite Electrodes have superior performance in applications not just for conventional lead and titanium electrodes, but for various kinds of application such as electrolyte which include organic materials and cyan.

TDK's Ferrite Electrodes also have unique features that minimize secondary pollution and anode sludge will be stuck to magnets. These types of ferrite electrodes are available only from TDK. Again, TDK's Ferrite Electrodes can be used in various kinds of application such as various types of surface treatment, precious metal recovery, alkaline ionized water, waste water treatment, electrodeposition coating, and soon.

FEATURES

• Corrosion resistance

The outstanding resistance to corrosion of the ferrite electrodes is due to superior physical characteristics such as low porosity and small, uniform crystals.

• Non-pollution

Secondary pollution is of no concern since the major component of these ferrite electrodes is iron oxide.

• Light weight

Ferrite electrodes are relatively light weight. For example, Pb electrode material has a specific gravity of 11, in contrast to ferrite's specific gravity of 5. Ferrite electrodes are much more easily handled.

• Free of deformation

Since ferrite electrode material is a type of ceramic, in contrast to metallic electrodes, bending and deformation does not occur during use.

• Operating voltage

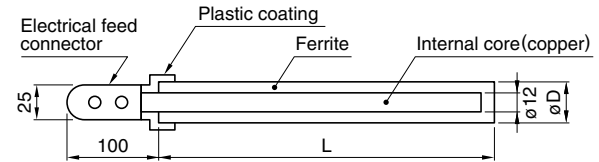
Ferrite electrodes can even be used at high voltages.

STANDARD MATERIAL CHARACTERISTICS

Material	N102
Specific resistivity	0.5Ω·cm
Specific gravity	4.9g/cm ³
Porosity	0.5%
Gas permeability	None (1 atm. pressure)
Bending strength	600kg/cm ²
Vickers hardness	700kg/mm ²
Thermal expansion coefficient	90×10 ⁻⁷ /°C[+20 to +400°C]
Oxygen overvoltage	0.66V[at 10A/dm ²]
Chlorine overvoltage	0.3V[at 10A/dm ²]

RH SHAPE

SHAPES AND DIMENSIONS



STANDARD SHAPE OF FEEDER



Other shaped feeders are also available. Please contact us.
(Example)



Dimensions in mm

Part No.	øD	L
N102 RH20X200	20	200
N102 RH20X300	20	300
N102 RH20X400	20	400
N102 RH20X500	20	500
N102 RH20X600	20	600
N102 RH20X700	20	700
N102 RH20X800	20	800
N102 RH20X900	20	900
N102 RH28X200	28	200
N102 RH28X300	28	300
N102 RH28X400	28	400
N102 RH28X500	28	500
N102 RH28X600	28	600
N102 RH28X700	28	700
N102 RH28X800	28	800
N102 RH28X900	28	900

• The products of which length is longer than 900mm are also available by connecting two or more electrodes.

• Please contact us for other dimensional products described above.

PRODUCT IDENTIFICATION

N102 RH 20 X 200
(1) (2) (3)

(1)Material

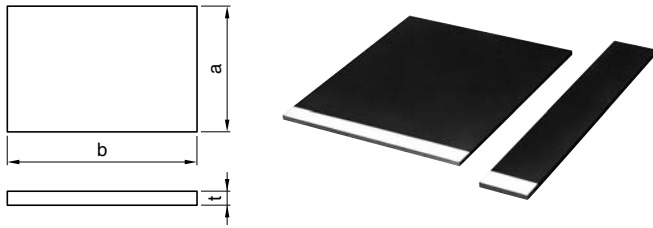
(2)Shape

(3)Dimensions(øD×L)

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SP SHAPE SHAPES AND DIMENSIONS



Dimensions in mm

Part No.	a	b	t
N102 SP60X120X6*	60	120	6
N102 SP99X99X6	99	99	6
N102 SP100X100X6*	100	100	6
N102 SP100X200X10*	100	200	10
N102 SP135X65X6	135	65	6
N102 SP205X103X10	205	103	10
N102 SP259X155X10	259	155	10

* Be grinding machined products.

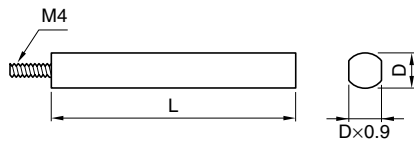
- Other electrical feed connector shapes and hole arrangements are available at extra cost.
- Please contact us for other dimensional products described above.

PRODUCT IDENTIFICATION

N102 SP 60 X 120 X 6
(1) (2) (3)

- (1)Material
(2)Shape
(3)Dimensions(Height×Length×Thickness)

IR SHAPE SHAPES AND DIMENSIONS

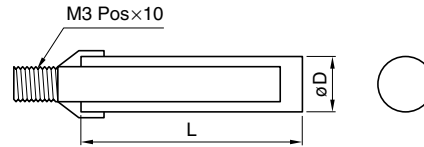


Dimensions in mm

Part No.	D	L
N102 IR10x200	10	200
N102 IR11x200	11	200
N102 IR12x200	12	200
N102 IR13x200	13	200
N102 IR14x200	14	200
N102 IR15x110	15	110
N102 IR15x150	15	150
N102 IR15x200	15	200
N102 IR16x200	16	200
N102 IR17x200	17	200
N102 IR18x110	18	110
N102 IR18x200	18	200
N102 IR19x200	19	200
N102 IR20x200	20	200
N102 IR21x200	21	200
N102 IR22x200	22	200

- Other electrical feed connector shapes are available at extra cost.
- Please contact us for other dimensional products described above.
- A dimension of product length processes cut in correspondence with a request.

RH SHAPE SHAPES AND DIMENSIONS



Dimensions in mm

Part No.	øD	L
N102 RH8X35	8	35
N102 RH12X25	12	25
N102 RH12X35	12	35
N102 RH15X27	15	27
N102 RH15X50	15	50
N102 RH15X65	15	60

- Other electrical feed connector shapes are available at extra cost.
- Please contact us for other dimensional products described above.

PRODUCT IDENTIFICATION

N102 RH 8 X 35
(1) (2) (3)



- (1)Material
(2)Shape
(3)Dimensions(øD×L)

PRODUCT IDENTIFICATION

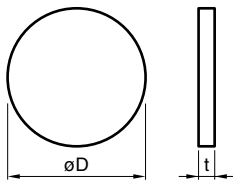
N102 IR 15 X 110
(1) (2) (3)



- (1)Material
(2)Shape
(3)Dimensions(D×L)

D SHAPE

SHAPES AND DIMENSIONS

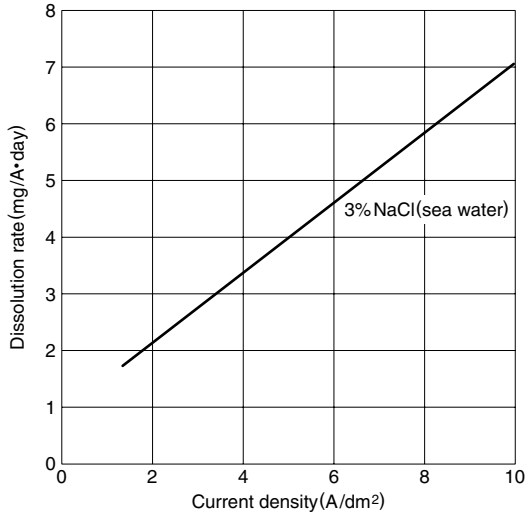


Dimensions in mm

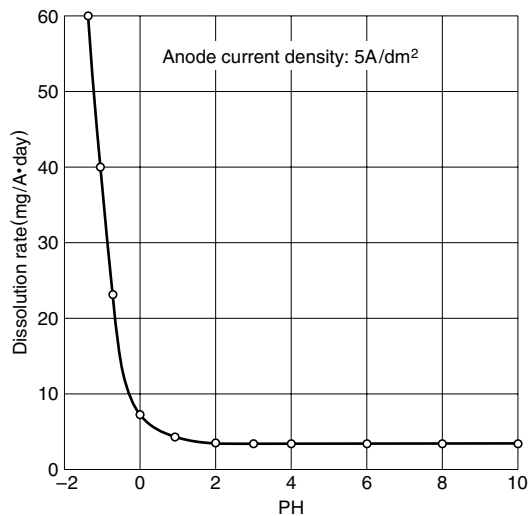
Part No.	øD	t
N102 D12X1	12	1
N102 D12X1.6	12	1.6

- Please contact us for other dimensional products described above.

CURRENT DENSITY vs. DISSOLUTION RATE



PH vs. DISSOLUTION RATE



PRODUCT IDENTIFICATION

N102 D 12 X 1
 (1) (2) (3)

- (1)Material
- (2)Shape
- (3)Dimensions(øD×t)

FERRITE ELECTRODE CONSUMPTION

Solution	Concentration (%)	Current Density (A/dm ²)	Electrode consumption (g/A • year)
NaCl	3(sea water)	5	0.4
	0.5	5	0.5
	0.05	5	0.5
HCl	0.1	5	0.9
	1	5	1.2
	10	5	5.7
HNO ₃	0.1	5	0.4
	1	5	0.8
	10	5	6.4
H ₂ SO ₄	0.1	5	1.3
	1	5	1.8
	10	5	8.1
HF	0.002	2	2.4
	0.005	2	2.9

- Anode : Ferrite electrode (25cm² surface area)
- Cathode : Platinum electrode
- Current density : 0.5 to 5 A/dm²
- Time period with current ON : 8h
- Temperature : 30°C
- Measurement of dissolution : Atomic absorption analysis
- Electrode consumption : Calculated on a g/A • year basis

ELECTROLYTIC CONSUMPTION OF VARIOUS ELECTRODES(NaCl solution)

Electrode material	Current density	Unit:g/A • year		
		5A/dm ²	5A/dm ²	5A/dm ²
	Solution concentration	Salt water containing 3% NaCl	Water containing 0.5% NaCl	Water containing 0.05% NaCl
Ferrite electrode		0.4	0.5	0.5
Lead and silver alloy		30	—	—
Ni plate		—	25000 abbreviation	—
Stainless steel plate(SUS27)		—	25000 abbreviation	—
Ferro silicon		400	—	—
Graphite		290	700	5000
Magnetic iron oxide (fused body)		100	125	250
Magnetic iron oxide (sintered body)		0.006	50	—
Platinum plated titanium plate		0.006	—	—

- Anode : Ferrite electrode (25cm² surface area)
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EXAMPLE FERRITE ELECTRODE APPLICATIONS

Field of application	Example application	Electrode Shape	Result	Remarks
Surface treatment	Chrome plating (Including supplementary electrode)	RH shape ⊕	Long operational life non-polluting ease of use	<ul style="list-style-type: none"> • Harsh conditions for controlling Cr³⁺ • Conditions for use with Pb-Sn alloy anode
	Electrolytic recovery of various types of metals	RH shape ⊕	Long operational life	Recovery of high purity precious metals, nickel, etc.
	Alkaline electrolytic cleaning	RH shape ⊕	Long operational life	
Water treatment	Electrolytic floatation	RH shape ⊕	Long operational life	Eliminates sludge
Electrodeposition coating	Cationic method	RH shape ⊕	Long operational life	Lowers maintenance costs
Electrolytic corrosion prevention	Marine equipment corrosion prevention	RH shape ⊕	long operational life	Reduction of initial construction costs
Medical application	Water purification	RH, SP, IR	Long operational life	Improves water quality
	Humidification	RH, SP, IR	Long operational life	Steam from electrolytic heating
	Electrocardiograph	D shape	Easily operated	Used for conversion to magnetism

GENERAL PRECAUTIONS FOR FERRITE ELECTRODE APPLICATIONS

- Like other ceramics, ferrite electrode materials are fragile despite a relatively large bending resistance. The extra caution should be taken in handling.
- Spallation due to the thermal shock (resulting from rapid heating or cooling) should be avoided. Ferrite electrodes can be weakened by repeated exposure to thermal differentials greater than 30° C.
- For chrome plating process, condition from Cr³⁺ to Cr⁶⁺ should be considered deeply, since the ferrite electrodes have relatively weak performance in oxidation.
- Ferrite electrodes can not be used for soda electrolysis either generating chlorine since a ferrite electrode has a high chlorine overvoltage in comparison to a DSE electrode consisting of a titanium material coated with a platinum-group metal.
- Please contact TDK when investigating the use of ferrite electrodes for special applications.
- Please contact TDK if there are any issues that are unclear during design.