

Ferrite Cores

Electrodes for Electrolysis Ferrite Electrodes

These ferrite electrodes are constructed from a special ceramic with low specific resistivity. These are excellent electrodes for electrolysis applications. Over an operating range that is broader than prior art electrodes (Pb, Pt-coated Ti), these electrodes display considerable power, even in electrolytic solutions including cyanide or containing organic material beyond the operational range.

Only TDK's ferrite electrodes avoid secondary pollution from anode sludge since such sludge attaches to the magnet and is readily treated.

TDK ferrite electrodes have found applications in a wide range of fields including various types of surface treatment, precious metal recovery, alkaline electrolytic cleaning, waste water treatment, electrodeposition coating, plating, construction, and pollution treatment.

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.

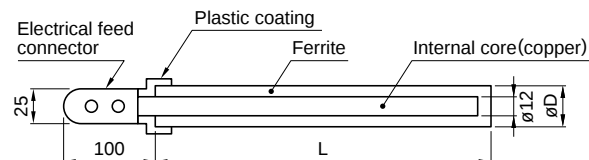
STANDARD MATERIAL CHARACTERISTICS

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]

N102 Series

RH SHAPE

SHAPES AND DIMENSIONS



Dimensions in mm

Part No.	øD	L
N102RH20X200	20	200
N102RH20X300	20	300
N102RH20X400	20	400
N102RH20X500	20	500
N102RH20X600	20	600
N102RH20X700	20	700
N102RH20X800	20	800
N102RH20X900	20	900
N102RH28X200	28	200
N102RH28X300	28	300
N102RH28X400	28	400
N102RH28X500	28	500
N102RH28X600	28	600
N102RH28X700	28	700
N102RH28X800	28	800
N102RH28X900	28	900

- Other feeders except those described above can be manufactured.
- The connection method can be adopted and the shape with L over 900mm can also be manufactured.
- 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)



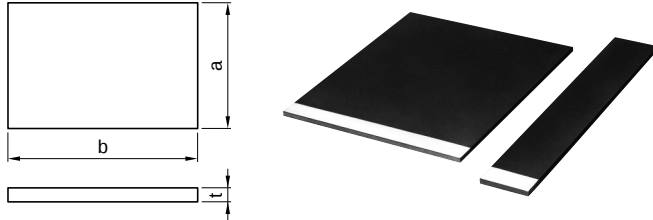
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N102 Series

SP SHAPE

SHAPES AND DIMENSIONS



Dimensions in mm			
Part No.	a	b	t
N102SP60X120X6	60	120	6
N102SP100X100X6	100	100	6
N102SP100X200X10	100	200	10
N102SP200X250X10	200	250	10

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

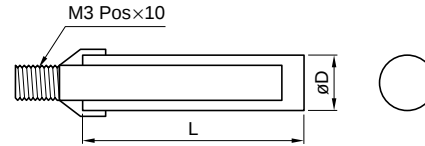
PRODUCT IDENTIFICATION

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

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

RH SHAPE

SHAPES AND DIMENSIONS



Dimensions in mm		
Part No.	øD	L
N102RH8X35	8	35
N102RH12X25	12	25
N102RH12X35	12	35
N102RH15X27	15	27
N102RH15X50	15	50
N102RH15X65	15	60

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

PRODUCT IDENTIFICATION

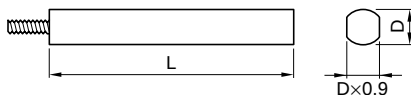
N102 RH 8 X 35
(1) (2) (3)



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

IR SHAPE

SHAPES AND DIMENSIONS



Dimensions in mm		
Part No.	D	L
N102IR15X110	15	110
N102IR15X150	15	150
N102IR18X110	18	110

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

PRODUCT IDENTIFICATION

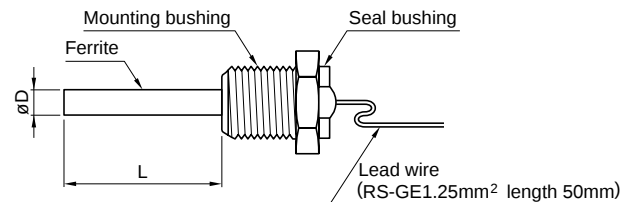
N102 IR 15 X 110
(1) (2) (3)

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



R SHAPE

SHAPES AND DIMENSIONS



Dimensions in mm			
Part No.	øD	L	Bushing shape
N102R6X20	6	20	JIS-PT1/2 inches
N102R6X30	6	30	JIS-PT1/2 inches
N102R6X40	6	40	JIS-PT1/2 inches
N102R7X50	7	50	JIS-PT3/4 inches

- Please contact us for other dimensional products described above.

PRODUCT IDENTIFICATION

N102 R 6 X 20
(1) (2) (3)

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



Ferrite Cores

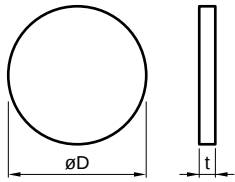
Electrodes for Electrolysis

Ferrite Electrodes

N102 Series

D SHAPE

SHAPES AND DIMENSIONS



Dimensions in mm

Part No.	øD	t
N102D12X1	12	1
N102D12X1.6	12	1.6

• Please contact us for other dimensional products described above.

PRODUCT IDENTIFICATION

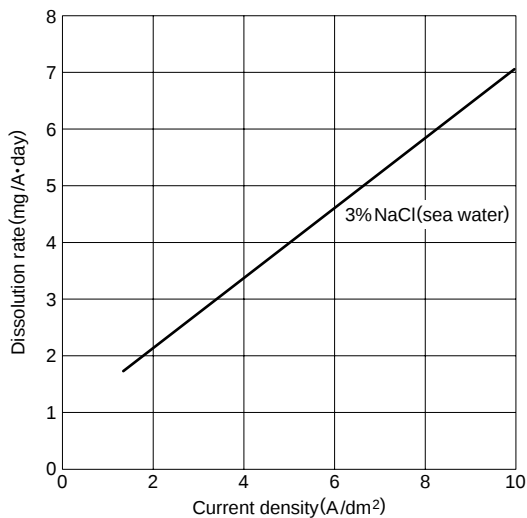
N102 D 12 X 1
(1) (2) (3)

(1)Material

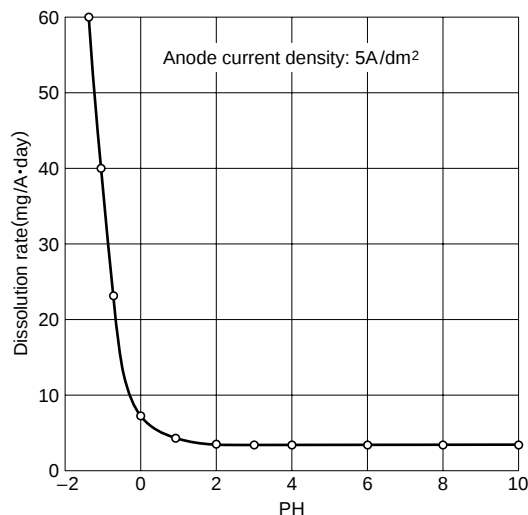
(2)Shape

(3)Dimensions(øD×t)

CURRENT DENSITY vs. DISSOLUTION RATE



PH vs. DISSOLUTION RATE



FERRITE ELECTRODE CONSUMPTION

Solution	Concentration (%)	Current Density (A/dm²)	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)

Unit:g/A • year

Electrode material	Current density	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	—	—

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Ferrite Electrodes

EXAMPLE FERRITE ELECTRODE APPLICATIONS

Field of application	Example application	Electrode Shape	Result	Remarks
Surface treatment	Chrome plating (Including supplementary electrode)	RH shape ⊕ RS shape ⊕	Long operational life non-polluting ease of use	• Permeability requirements as anode • Harsh conditions for controlling Cr^{3+} • 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	Hot water vessel corrosion prevention	R shape ⊕	Long operational life	Prevention of water contamination (contamination can occur when used as sacrificial electrode.)
	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 material can suddenly weaken when bent despite a relatively large bending resistance. Therefore sufficient care should be taken to prevent collision with hard objects, dropping during handling, dropping during operation, etc.
- 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.
- When ferrite electrodes are used for chrome plating, sufficient testing of plating conditions should be carried out to avoid anode oxidation of Cr^{3+} to Cr^{6+} (due to weak oxidation potential of ferrite material).
- Ferrite electrodes can not be used for soda electrolysis to generate 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 for such applications since the TDK is developing a SPLODE® metal electrode series that has a special highly active catalyst.
- 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.

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