

## ELECTRICAL STEEL FOIL GT-SERIES / ST-SERIES

Nippon Kinzoku group Electrical steel foil products



## Contents

---

|                                                                    |     |
|--------------------------------------------------------------------|-----|
| ■ Company history of Nippon Kinzoku Group                          | 4~5 |
| ■ Characteristics of Electrical Steel Foil                         | 6~7 |
| Products                                                           |     |
| ■ Grain Oriented Electrical Steel Foil GT-series                   | 8   |
| ■ Non Grain Oriented Electrical Steel Foil ST-series               | 9   |
| ■ Manufacturing process                                            | 10  |
| ■ Product range and Tolerances                                     | 11  |
| ■ Application consideration                                        | 12  |
| ■ Design and Experimental Support of Reactors                      | 13  |
| ■ Manufacturing items of three business sections of Nippon Kinzoku | 14  |
| ■ Plant Locations of Electrical Steel Foil                         | 15  |

**We will offer environment-friendly and low core loss Electrical Steel Foils by superior rolling techniques.**

In accordance with the principle of “We do not enter the roads where elephants walk.”, we accommodate the various requests from customers based on the individual responses. We do not pursue quantities, and offer our products by 100% make-to-order manufacturing mainly in cold rolling business and processed products business.

In Nippon Kinzoku, the spirits of “Ever onward challenge to technologies” have been passed down to the next generations since the establishment, and our products play active roles in the state-of-the-art products such as automobile parts, electronic equipment, IT devices and medical equipment.

The Nippon Kinzoku group possesses 50 years’ experience in manufacturing and sales of the Electrical Steel products, and earn the domestic and the foreign customer's trust particularly with the less than 0.1mm thick Electrical Steel Foils manufactured by our excellent rolling techniques. We will offer various cores, reactors, transformers and current transformers, etc. designed by cultivated technology for many years.

**We will meet the needs of customers by active development of new materials and new products.**

## HISTORY

The Nippon Kinzoku group has over 50 years experience in production and sales of Electrical Steel Products.

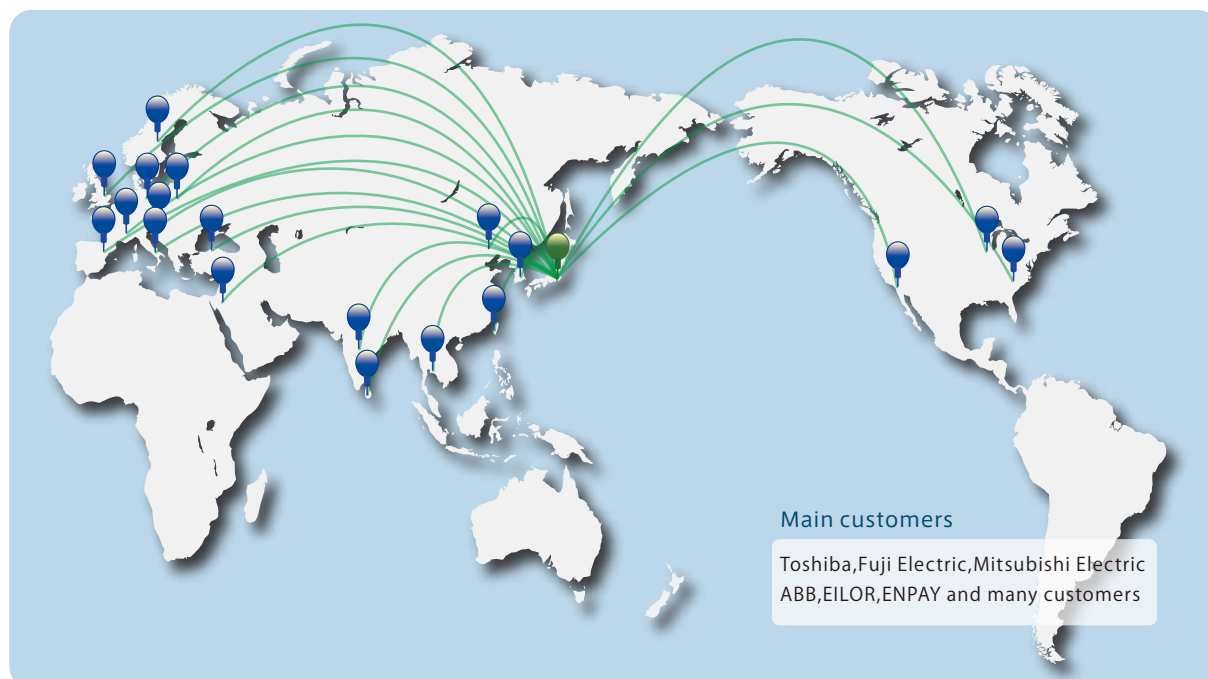
We are the only one manufacturer of the Electrical Steel Foils with the thickness less than 0.10mm in Japan. We design cores and various reactors by many years of cultivated design technology, and offer those products including prototypes. We have earned trusts from domestic and foreign customers in the sales of Electrical Steel Foils.

### Corporate history

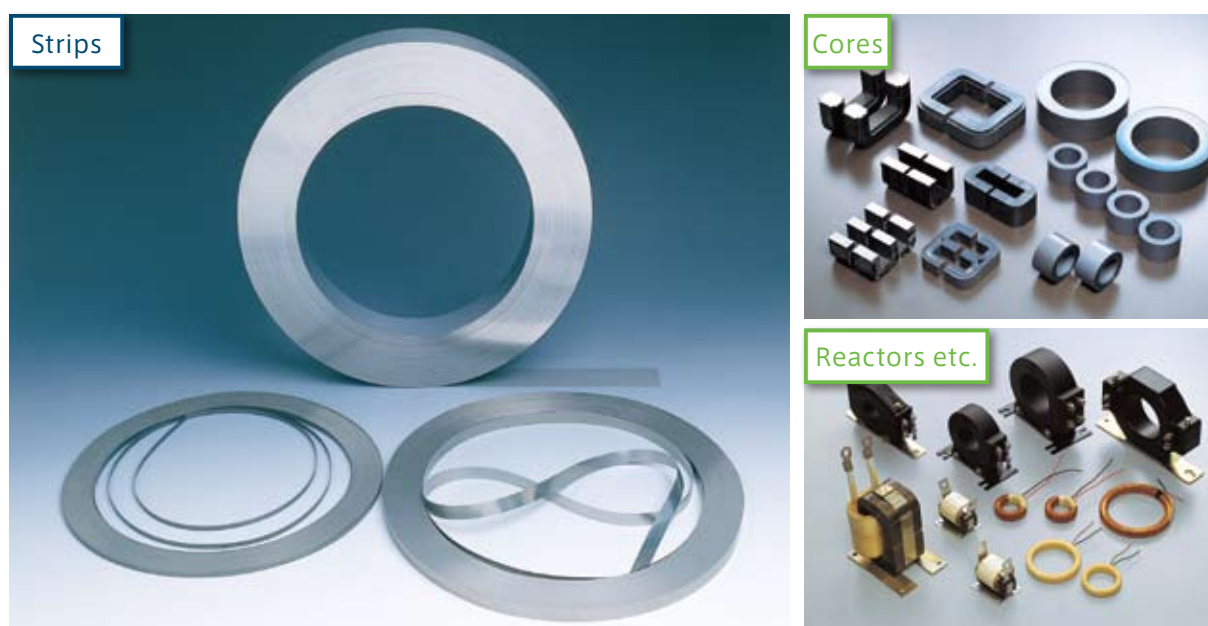
| Nippon Kinzoku Co., Ltd. |                                                      | Nikkin Denji Kogyo Co.,Ltd.<br>(100% subsidiary company of Nippon Kinzoku) |                                                                                                              |
|--------------------------|------------------------------------------------------|----------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------|
| 1930                     | Establishment                                        |                                                                            |                                                                                                              |
| 1940                     | Completion of Itabashi Plant                         |                                                                            |                                                                                                              |
| 1954                     | Start of production of Stainless steel products      |                                                                            |                                                                                                              |
|                          |                                                      | 1958                                                                       | Establishment of HATTORI KOGYO Co.,Ltd.                                                                      |
| 1960                     | Establishment of Electrical Steel Production section |                                                                            |                                                                                                              |
|                          |                                                      | 1962                                                                       | Completion of Kawaguchi Plant                                                                                |
| 1963                     | Start of production of Electrical Steel Products     |                                                                            |                                                                                                              |
|                          |                                                      | 1977                                                                       | Start of production of Electrical Steel Foils<br>The company name was changed to NIKKIN DENJI KOGYO Co.,Ltd. |
|                          |                                                      | 1984                                                                       | Installation of Slitter Line for Electrical Steel Foils                                                      |
|                          |                                                      | 1985                                                                       | Start of production of various reactors                                                                      |
|                          |                                                      | 1994                                                                       | The capital was increased to 30 million yen.                                                                 |
|                          |                                                      | 1997                                                                       | The capital was increased to 60 million yen.                                                                 |
|                          |                                                      | 2003                                                                       | Acquired ISO9001 certification                                                                               |
| 2012                     | Facility expansion and reinforcement                 |                                                                            |                                                                                                              |

## Main customers

Main customers are more than 100 companies in 15 countries.



## Classification and weight ratio of products



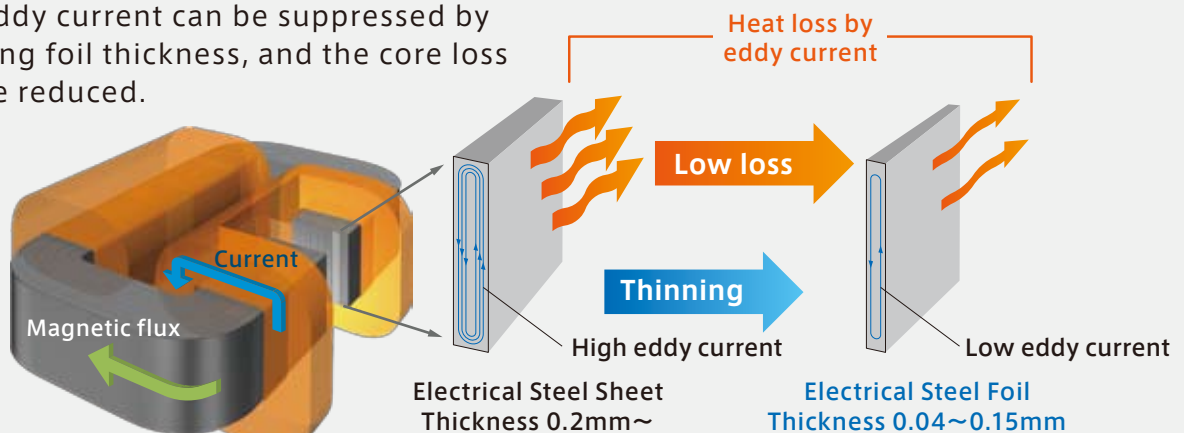
|                                 |                 |               |                                |                                      |
|---------------------------------|-----------------|---------------|--------------------------------|--------------------------------------|
| Weight ratio<br>of sales<br>(%) | Domestic<br>35% | Strips<br>15% | Cores and reactors etc.<br>20% |                                      |
|                                 | Overseas<br>65% | Strips<br>55% |                                | Cores and<br>reactors<br>etc.<br>10% |

## Advantages of Electrical Steel Foils

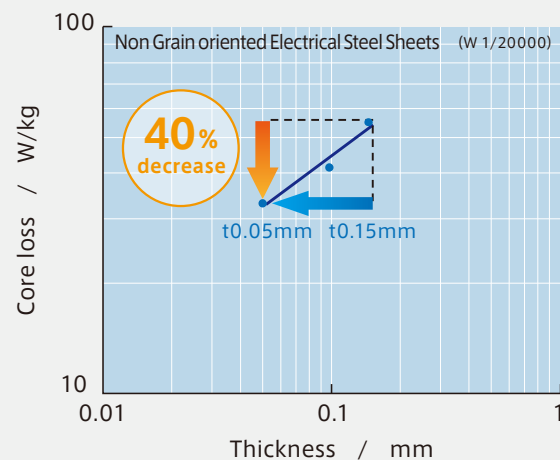
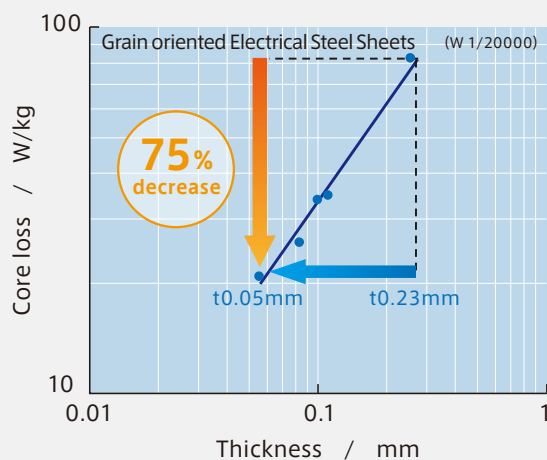
Recently, the needs for low loss and downsizing rise in the renewable energy electric power market and the high frequency inverter market. Nippon Kinzoku group offers the Electrical Steel Foils to meet these needs.

### Low core loss

The eddy current can be suppressed by thinning foil thickness, and the core loss can be reduced.



< Example of reducing the loss by using thinner sheets >

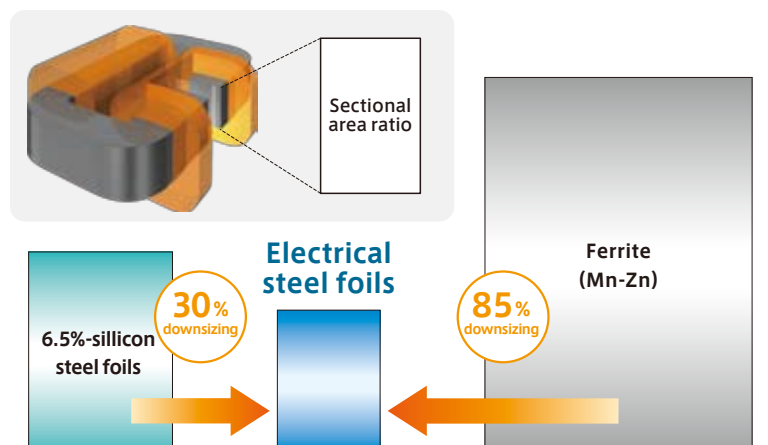


### Downsizing

Thin Electrical Steel foils have high flux density and contribute to downsizing of reactors.

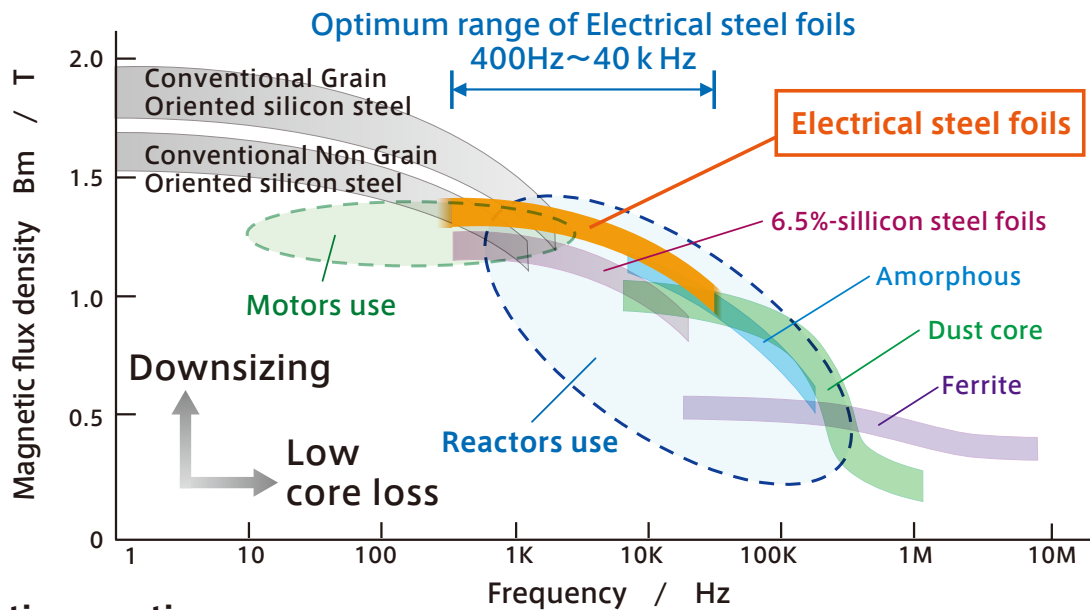
| Core material                                  | Magnetic flux density B8(T) | Density (g/cm <sup>3</sup> ) | Ratio of cross sectional area of core |
|------------------------------------------------|-----------------------------|------------------------------|---------------------------------------|
| Grain Oriented Electrical Steel foils (GT-100) | 1.8                         | 7.7                          | 1 (Base)                              |
| 6.5%-silicon steel foils                       | 1.3                         | 7.5                          | 1.4 times                             |
| Ferrite                                        | 0.4                         | 4.8                          | 6.4 times                             |

Comparison of Sectional area in constant Magnetic flux



## Optimum range of use

GT-series, which has higher Magnetic flux density in frequency 400Hz~40kHz compared with other materials, can realize to downsize the reactors.



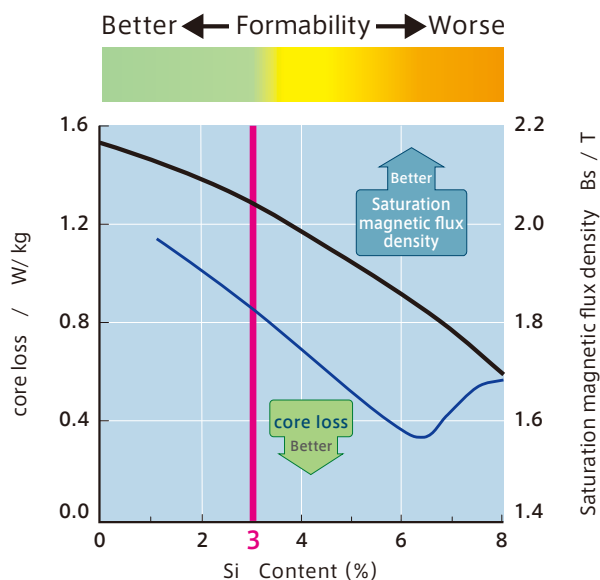
## Insulation coating

Excellent insulation coating makes the best use of the material characterization. The insulation coating keeps resistance up to 850°C.

| Item                          | Characteristics                         | Standard                           |
|-------------------------------|-----------------------------------------|------------------------------------|
| Type of coating               | Inorganic                               | IEC60404-1-1 (corresponds to EC-5) |
| Heatproof temperature         | Max 850°C                               | IEC60404-12                        |
| Coating thickness             | $\leq 1 \mu\text{m}$                    | —                                  |
| Surface insulation resistance | $\geq 10 \Omega \cdot \text{cm}^2$      | IEC60404-11(Measuring method)      |
| Lamination factor             | $\geq 90\%$ Thickness 0.05mm (0.0020in) | IEC60404-8-8                       |
| Blanking Quality              | Good                                    | —                                  |

## Raw material

Electrical steel foils are made of 3% Silicon steel (Raw material by NSSMC).



The formability declined by over 3% Si content.



The 3% Silicon steel has high reliability based on 50 years experience.

## Grain Oriented Electrical Steel Foil

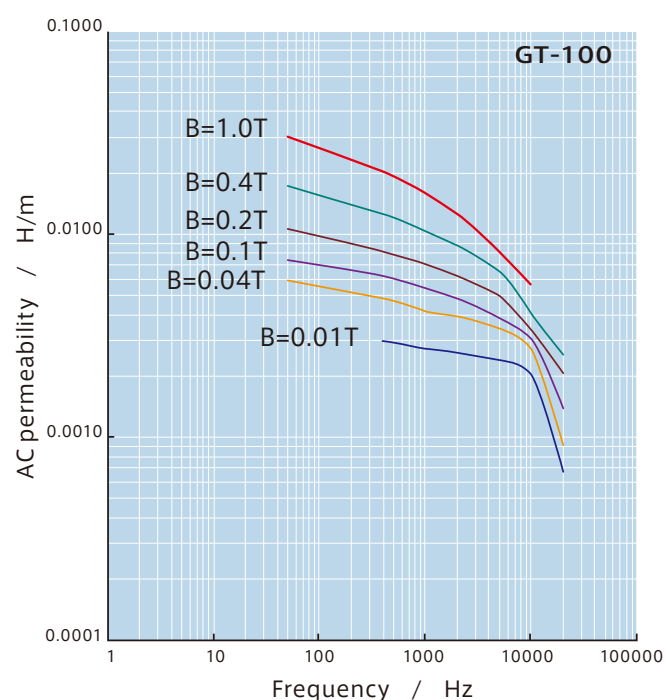
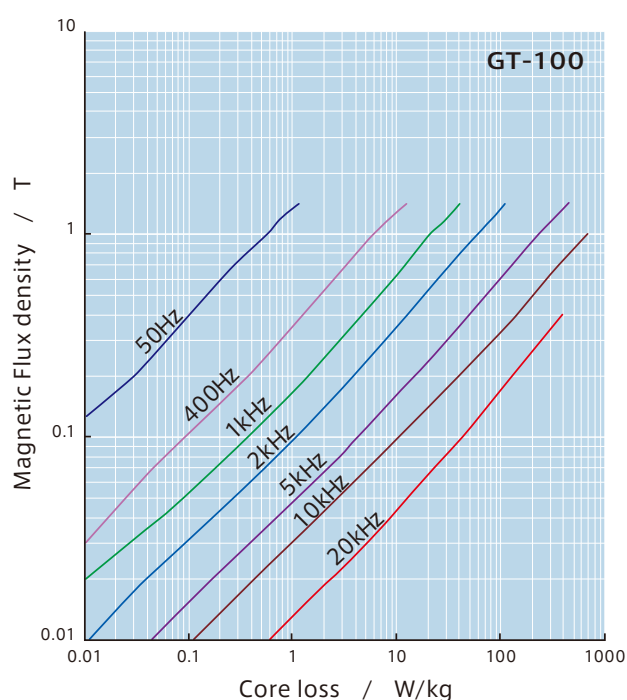
### GT-Series

#### Typical magnetic properties and specification(IEC404-8-8)

| Grade<br>GT-series | Thickness |        | Density<br>g/cm <sup>3</sup> | Core loss(W/kg) ※1 |                     |                      |                     |                     |                      |                        | Magnetic flux<br>density※2 B <sub>8</sub><br>T | Lamination<br>factor<br>% |
|--------------------|-----------|--------|------------------------------|--------------------|---------------------|----------------------|---------------------|---------------------|----------------------|------------------------|------------------------------------------------|---------------------------|
|                    | mm        | in     |                              | W <sub>15/50</sub> | W <sub>15/400</sub> | W <sub>10/1000</sub> | W <sub>5/2000</sub> | W <sub>2/5000</sub> | W <sub>1/10000</sub> | W <sub>0.5/20000</sub> |                                                |                           |
| GT-100             | 0.10      | 0.0039 | 7.65                         | 1.2                | 12.5                | 21.3                 | 18.0                | 15.2                | 10.4                 | 13.0                   | 1.82                                           | 93                        |
| Specification      | —         | —      | —                            | —                  | ≤15                 | —                    | —                   | —                   | —                    | —                      | ≥1.7                                           | ≥91                       |
| GT-080             | 0.08      | 0.0031 | 7.65                         | 0.9                | 13.2                | 17.5                 | 13.9                | 11.1                | 9.6                  | 8.2                    | 1.80                                           | 92                        |
| GT-050             | 0.05      | 0.0020 | 7.65                         | 1.7                | 13.0                | 17.0                 | 13.0                | 10.2                | 7.1                  | 5.3                    | 1.75                                           | 90                        |
| Specification      | —         | —      | —                            | —                  | —                   | ≤24                  | —                   | —                   | —                    | —                      | ≥1.6                                           | ≥88                       |
| GT-040             | 0.04      | 0.0016 | 7.65                         | 2.0                | 17.9                | 20.3                 | 15.6                | 10.3                | 8.3                  | 4.0                    | 1.61                                           | 90                        |

※1 W<sub>10/1000</sub> Core loss in1.0(T)/1000(Hz)

※2 B<sub>8</sub> Magnetic flux density at magnetizing force 800(A/m)



#### Example of usage



#### Reactors

High frequency inverter(ex.UPS)  
Renewable energy power system  
(ex. Power conditioners)  
Direct current power transformer system

#### Advantage

Low loss  
Downsizing

#### High frequency transformer

Welding machine, medical equipment,  
and lighting

#### Advantage

Low loss  
Downsizing

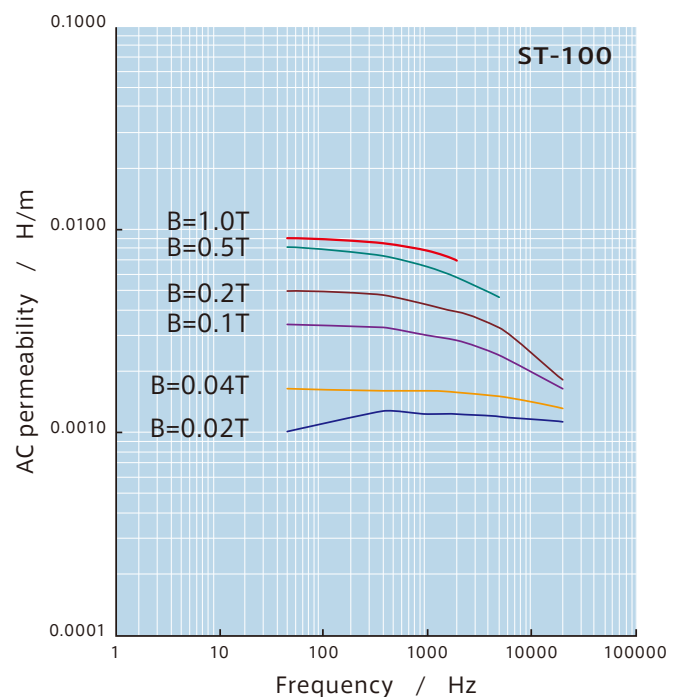
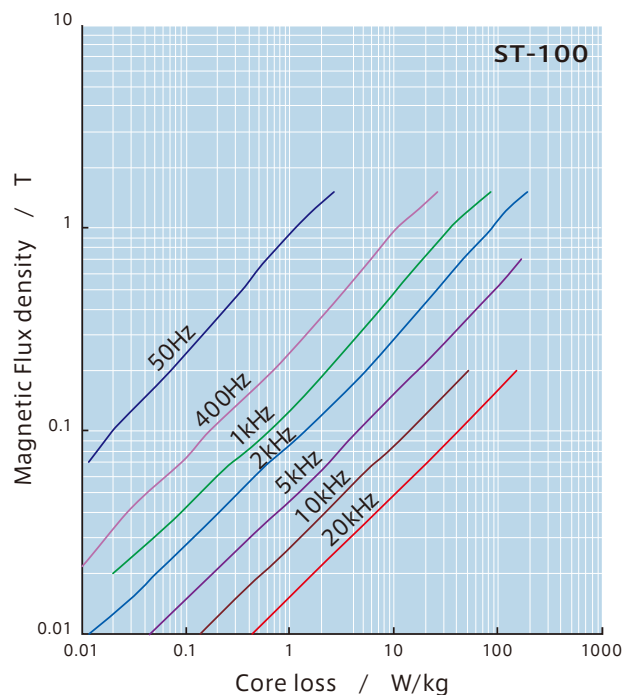


# Non Grain Oriented Electrical Steel Foil

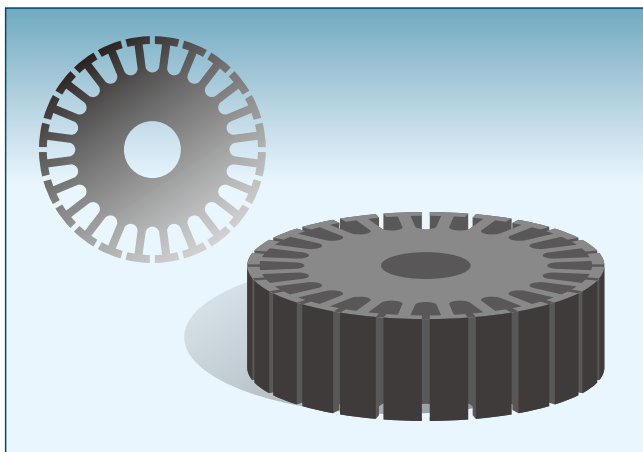
## ST-Series

### Typical magnetic properties and specification (IEC404-8-8)

| Grade<br>STseries | Thickness |        | Density<br>g/cm <sup>3</sup> | Core loss (W/kg) ※1 |                     |                      |                     |                     |                      |                        | Magnetic flux<br>density※2 B <sub>50</sub><br>T | Lamination<br>factor<br>% |
|-------------------|-----------|--------|------------------------------|---------------------|---------------------|----------------------|---------------------|---------------------|----------------------|------------------------|-------------------------------------------------|---------------------------|
|                   | mm        | in     |                              | W <sub>15/50</sub>  | W <sub>10/400</sub> | W <sub>10/1000</sub> | W <sub>5/2000</sub> | W <sub>2/5000</sub> | W <sub>1/10000</sub> | W <sub>0.5/20000</sub> |                                                 |                           |
| ST-150            | 0.15      | 0.0059 | 7.65                         | 2.3                 | 11.6                | 39.4                 | 30.0                | 21.5                | 17.2                 | 14.2                   | 1.66                                            | 94                        |
| Specification     | —         | —      | —                            | —                   | ≤14                 | —                    | —                   | —                   | —                    | —                      | ≥1.6                                            | ≥92                       |
| ST-100            | 0.10      | 0.0039 | 7.65                         | 2.7                 | 11.0                | 34.1                 | 25.3                | 17.0                | 12.9                 | 10.2                   | 1.65                                            | 93                        |
| Specification     | —         | —      | —                            | —                   | ≤13                 | —                    | —                   | —                   | —                    | —                      | ≥1.6                                            | ≥91                       |
| ST-050            | 0.05      | 0.0020 | 7.65                         | 3.0                 | 12.3                | 34.4                 | 23.7                | 13.0                | 7.5                  | 6.0                    | 1.63                                            | 90                        |
| Specification     | —         | —      | —                            | —                   | —                   | ≤45                  | —                   | —                   | —                    | —                      | ≥1.6                                            | ≥88                       |

※1 W<sub>10/1000</sub> Core loss in 1.0(T)/1000(Hz)※2 B<sub>50</sub> Magnetic flux density at magnetizing force 5000(A/m)

### Example of product and usage



#### Mortor core

Automotives(EV/HEV)  
HDD  
Medical equipment

#### Advantage

High rotation  
(Reduction of heat generation)  
Downsizing

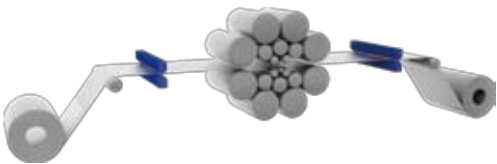
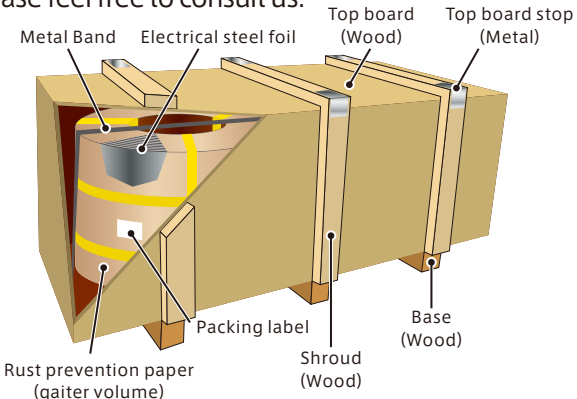
#### Magnetic bearing

Turbo-molecular pump

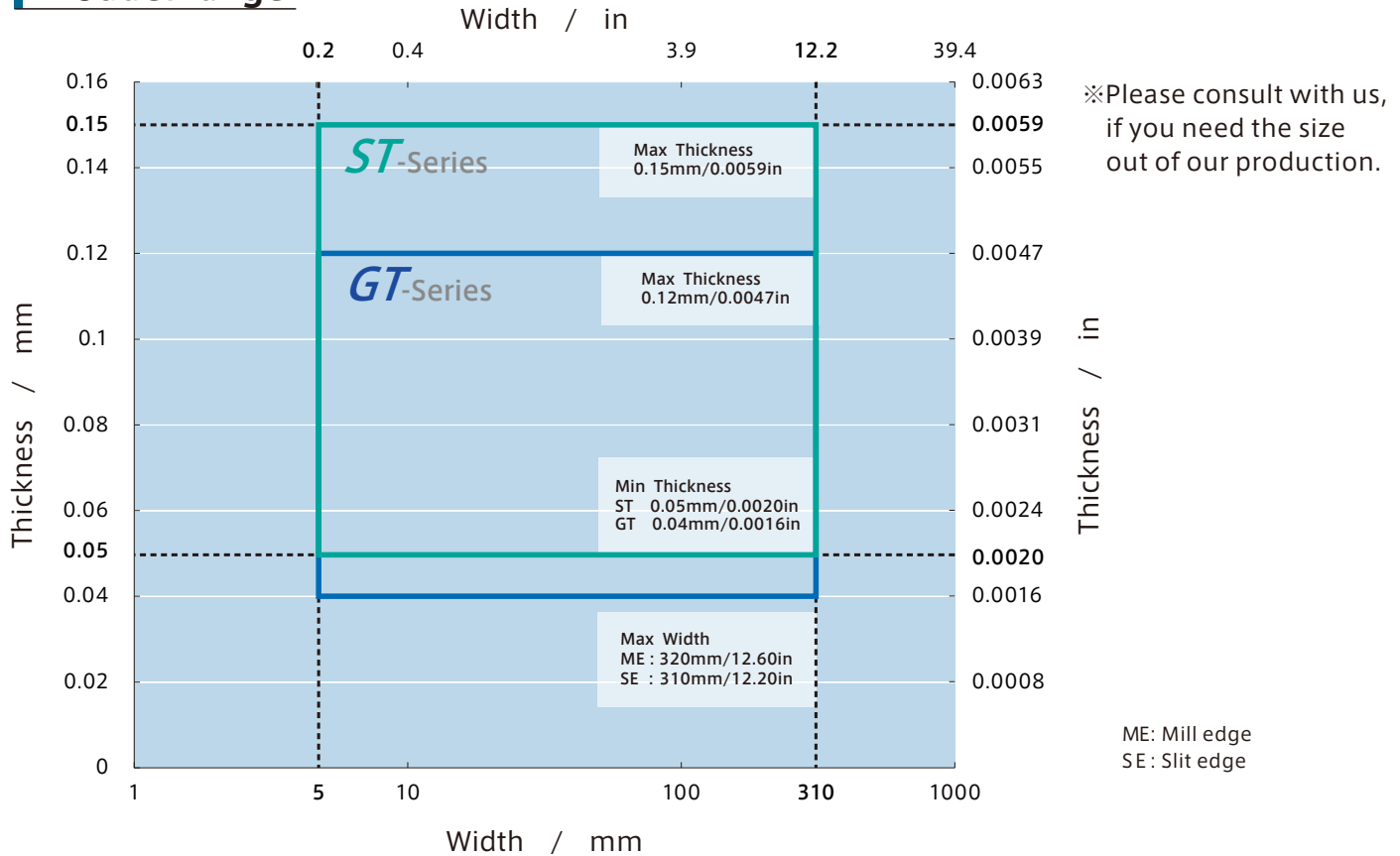
#### Advantage

Reduction of heat generation

## Manufacturing process

| Process                                                                                                                                                                                                                                                                                 | Plant of Electrical Steel Foil |                         |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------|-------------------------|
|                                                                                                                                                                                                                                                                                         | Nippon Kinzoku                 | Nikken Denji Kogyo      |
| <b>Raw materials</b><br>Fe-3%Si steel (From NSSMC).                                                                                                                                                                                                                                     | GT-Series<br>ST-Series         |                         |
| <b>Cold rolling</b><br>Cold-rolling to 0.04- t0.15mm by Sendzimir mill.                                                                                                                                |                                |                         |
| <b>Annealing and insulation coating</b><br>Annealing and insulation coating for optimize the magnetic properties.                                                                                     |                                |                         |
| <b>Inspection</b><br>The magnetic properties are inspected by various inspection equipments.<br>Inspection of Magnetic characteristics IEC60404-2 (core loss,Magnetic flux density) IEC60404-10<br>Inspection of Surface insulation resistance IEC60404-11                              |                                |                         |
| <b>Slitting</b><br>Slitting into 5 to 310mm in width according to customer's request.                                                                                                                |                                |                         |
| <b>Packing and shipment</b><br>We have many variation of packings,please feel free to consult us. <div>   </div> |                                | Core-Reactor production |

### Product range



### Product tolerances

| Grade  | Thickness |        | Board thickness allowance |          | Width allowance                |              |                                   |              | Inside diameter of coil  |                             |
|--------|-----------|--------|---------------------------|----------|--------------------------------|--------------|-----------------------------------|--------------|--------------------------|-----------------------------|
|        |           |        |                           |          | 5mm≤w≤150mm<br>(0.2in) (5.9in) |              | 150mm≤w≤310mm<br>(5.9in) (12.2in) |              |                          |                             |
|        | mm        | in     | mm                        | in       | mm                             | in           | mm                                | in           | mm                       | in                          |
| GT-100 | 0.10      | 0.0039 | ±0.010                    | ±0.00039 | +0.4<br>-0                     | +0.016<br>-0 | +0.5<br>-0                        | +0.020<br>-0 | 250<br>300<br>400<br>500 | 9.8<br>11.8<br>15.7<br>19.7 |
| GT-080 | 0.08      | 0.0031 | ±0.010                    | ±0.00039 |                                |              |                                   |              |                          |                             |
| GT-050 | 0.05      | 0.0020 | ±0.008                    | ±0.00031 |                                |              |                                   |              |                          |                             |
| GT-040 | 0.04      | 0.0016 | ±0.008                    | ±0.00031 |                                |              |                                   |              |                          |                             |
| ST-150 | 0.15      | 0.0059 | ±0.015                    | ±0.00059 |                                |              |                                   |              |                          |                             |
| ST-100 | 0.10      | 0.0039 | ±0.010                    | ±0.00039 |                                |              |                                   |              |                          |                             |
| ST-050 | 0.05      | 0.0020 | ±0.008                    | ±0.00031 |                                |              |                                   |              |                          |                             |

### Typical Mechanical properties

| Grade  | Density<br>g/cm <sup>3</sup> | Lamination factor<br>% | Tensile strength<br>MPa | Elongation<br>% | Vickers Hardness<br>Hv | Resistivity value<br>μΩcm |
|--------|------------------------------|------------------------|-------------------------|-----------------|------------------------|---------------------------|
| GT-100 | 7.65                         | 93                     | 420                     | 9               | 202                    | 48                        |
| GT-050 | 7.65                         | 90                     | 387                     | 11              | 179                    | 48                        |
| ST-150 | 7.65                         | 94                     | 496                     | 15              | 205                    | 52                        |
| ST-100 | 7.65                         | 93                     | 476                     | 13              | 198                    | 52                        |
| ST-050 | 7.65                         | 90                     | 487                     | 12              | 182                    | 52                        |

## **Insulation coating**

The Insulation coating of Electrical steel foils have Characteristics as follows.

### **1. Coating type**

The inorganic insulation coating corresponds to IEC60404-1-1 EC-5.

The coating keeps the resistance up to 850°C

The same insulation coatings (both side) are applied to GT-series and ST-series.

### **2. Characteristics**

High lamination factor is obtained, because the coating thickness is less than 1 μm,

The coating has high surface insulation resistance more than 10Ω·cm<sup>2</sup>.

The coating is thermally and chemically stable .

## **Heat treatment at customer**

Stresses by cutting, punching and bending have adverse effects on magnetic properties.

To relieve these stresses, stress relief annealing should be performed if necessary.

The cautionary statements about stress relief annealing are as follows.

### **The following points call for attention**

#### **〈Heat treatment condition〉**

##### **1. Annealing temperature and times**

The annealing temperature of 730-770°C, for 2-3 hours is recommended.

##### **2. Cooling rate**

Cooling rate of 50-100°C/hr, and removing temperature of cores from the furnace 350°C below will have the best results.

##### **3. Annealing atmosphere**

Compositions of atmosphere gas are needed to be highly pure Nitrogen or mixed gas of 5-10% Hydrogen and 90-95% Nitrogen with the dew point less than 0°C.

#### **〈Notes〉**

##### **1. Carburizing**

The electrical steel foils can be easily carburized by annealing, because they are low carbon steel. The spacers and the inner cover of batch-type furnace should be made of low carbon steels. Oil, paper and cloth must be removed completely.

##### **2. Piling**

If the annealing base is not level, the electrical properties are deteriorated when they are stacked. The heat radiation and the heat transfer by convection of atmosphere should be considered. Unlevel surfaces of the bases reduce the performance of the cores because of the induced strains.

## **Substances of environmental concern**

The Electrical Steel Foils have no intentional addition of hazardous components nor use in manufacturing process according to RoHS directive and the REACH restriction, all components are below the restricted threshold value.

## Design and Experimental Support

We can quickly offer the simulation data of reactors used our materials based on our many years' experiment when you show your specification.

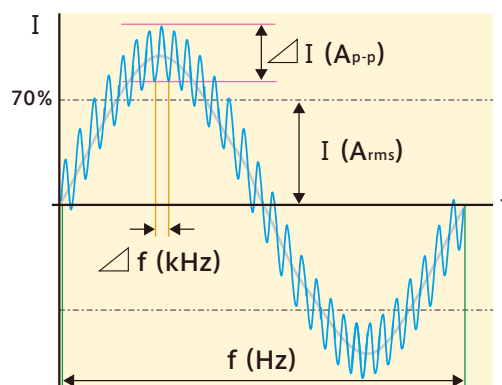
We can make a small amount of prototypes up to 30kg.

Procedure from spec decision to trial production.

### Spec decision

Reactor specification item

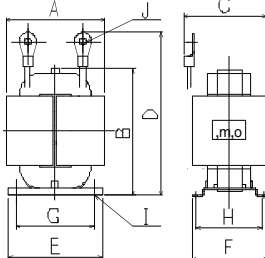
| Essential item | Item                      | Sign       | Unit                  |
|----------------|---------------------------|------------|-----------------------|
| ●              | Rated Inductance          | L          | $\mu\text{H}$         |
| ●              | Rated Current             | I          | $A_{dc}$ or $A_{rms}$ |
| ●              | Base Frequency            | f          | Hz                    |
| ●              | Carrier Frequency         | $\Delta f$ | kHz                   |
| ●              | Carrier Current           | $\Delta I$ | $A_{p-p}$             |
|                | Minimum inductance        | $L_{min}$  | $\mu\text{H}$         |
|                | Maximum current           | $I_{max}$  | $A_p$                 |
| ●              | Temperature rise          | —          | K                     |
| ●              | Velocity of cooling air   | —          | m/s                   |
|                | Insulation class          | B·F·H      | —                     |
|                | Direct current resistance | $R_{dc}$   | m $\Omega$            |



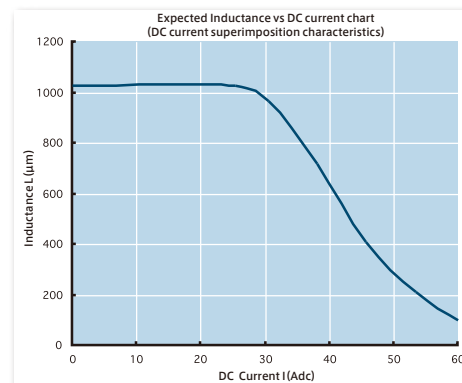
### Design

The best core size is designed, and the core loss and the DC current superimposition characteristics could be calculated.

| Design specification        |                    | Externals size       |     |
|-----------------------------|--------------------|----------------------|-----|
| Item                        | Specifications No. | ***-***              |     |
| Inductance( $\mu\text{m}$ ) |                    | 1000                 |     |
| Base current(Arms)          |                    | 25                   |     |
| Base frequency(Hz)          |                    | 50                   |     |
| Carrier frequency(kHz)      |                    | 20                   |     |
| Carrier current(Ap-p)       |                    | 5                    |     |
| Insulation class            |                    | F                    |     |
| Cooling methods             |                    | Dry type air cooling |     |
| Dielectric strength         |                    | AC50Hz 2kVx1min      |     |
| Size (mm)                   | A                  | MAX                  | 90  |
|                             | B                  | MAX                  | 130 |
|                             | C                  | MAX                  | 80  |
|                             | D                  | MAX                  | 180 |
|                             | E                  |                      | 74  |
|                             | F                  |                      | 66  |
|                             | G                  |                      | 50  |
|                             | H                  |                      | 53  |
|                             | I                  |                      | 5   |
|                             | J                  |                      | 5.3 |
| Estimating weight(kg)       |                    | 1.7                  |     |



Expectation value of core loss(W) 19  
Expectation value of Coil loss(W) 13



### Making for trial production

There are many experimental results for various types, and please feel free to inquire.

| TN shape | SC shape | EC shape | ECP shape | SCP shape |
|----------|----------|----------|-----------|-----------|
|          |          |          |           |           |



## Manufacturing items and manufacturing factory of three business section of Nippon Kinzoku

| [Business section]                                       | [Manufacturing item]                                          |                                                                   | [Factory]                            |
|----------------------------------------------------------|---------------------------------------------------------------|-------------------------------------------------------------------|--------------------------------------|
| New Business Development division                        | ■ Electrical steel foil                                       | Grain Oriented Electrical Steel Foil GT-series                    | Itabashi plant<br>Nikken Denji kogyo |
|                                                          |                                                               | Non Grain Oriented Electrical Steel Foil St-series                |                                      |
|                                                          |                                                               | Cores,reactors and etc                                            |                                      |
|                                                          | ■ Magnesium alloy                                             | Magnesium alloy strip                                             | Itabashi plant                       |
| Steel strip division                                     |                                                               |                                                                   |                                      |
| Cold-rolled stainless steel strip (Fine stainless steel) |                                                               |                                                                   |                                      |
| Cold-rolled special steel strip                          | ■ Products of high precision stainless steel strip for spring | Stainless steel foil                                              | Itabashi plant                       |
|                                                          |                                                               | Products of automatic gage control stainless steel                |                                      |
|                                                          |                                                               | Special spring                                                    |                                      |
|                                                          |                                                               | High tensile strength advance                                     |                                      |
|                                                          |                                                               | Tension annealing                                                 |                                      |
|                                                          |                                                               | Special tension annealing                                         |                                      |
|                                                          | ■ Products of design properties                               | Products of our own stainless steel strip for automobile moulding |                                      |
|                                                          |                                                               | Pearly Finish                                                     |                                      |
|                                                          |                                                               | Pearly White                                                      |                                      |
|                                                          |                                                               | BA5                                                               |                                      |
|                                                          |                                                               | nanoBA                                                            |                                      |
|                                                          | ■ Products of Functionality                                   | Surface reforming                                                 |                                      |
|                                                          |                                                               | Mending endoplasm                                                 |                                      |
|                                                          |                                                               | Lubricating coated stainless steel                                |                                      |
|                                                          |                                                               | Products of our own stainless steel strip for welding             |                                      |
| ■ Products of Nickelless stainless steel strip           |                                                               |                                                                   |                                      |
|                                                          |                                                               |                                                                   |                                      |
|                                                          |                                                               |                                                                   |                                      |
|                                                          |                                                               |                                                                   |                                      |
| ■ Heat-traeded steel strip                               | Bainite steel strip                                           |                                                                   |                                      |
|                                                          | TF steel strip                                                |                                                                   |                                      |
|                                                          | Precision quenched steel                                      |                                                                   |                                      |
| Processed products division                              |                                                               |                                                                   |                                      |
| Processed products                                       | ■ Precision profile rolled steel                              |                                                                   | Fukushima plant                      |
|                                                          | ■ Fine pipe (Precision pipe)                                  |                                                                   | Gifu plant                           |
|                                                          | ■ Die steel                                                   |                                                                   | Fukushima plant<br>Thailand plant    |
|                                                          | ■ Roll forming                                                |                                                                   |                                      |



## Plant Locations of Electrical Steel Foil and Stainless Steel Itabashi plant

We introduced latest production and testing.  
We will meet the customer's demands with our concept that are "more thinnig", "high precision", "more functional" and "more beautiful".  
Nippon Kinzoku group will advance new technology with the technical research center in Itabashi plant.

### Itabashi plant

4-10-1, Funato Itabashi-ku, Tokyo 174-8560, Japan  
TEL 03-3968-6300

### Product item

- Cold-rolled stainless steel strip (JIS-G4305)
- Cold-rolled special steel strip (JIS-G3311)
- Electrical steel foil
- Magnesium alloy



Nippon Kinzoku (Itabashi plant)

ISO 9001:2000/JIS Q 9001:2000 ISO 14001:2004/JIS Q 14001:2004  
Registration number: 1637 Registration number: E204  
Approvals obtained in 29.May 2003 Approvals obtained in 21.December 2000

## Plant Locations of Electrical steel foils, cores, reactors, etc. Nikkin Denji Kogyo

The Nikkin Denji Kogyo possesses 50 years' experience in manufacturing and sales of the Electrical Steel products, and earn the domestic and the foreign customer's trust, particularly with the less than 0.1mm thick Electrical Steel Foils manufactured by our excellent rolling techniques. We will offer various cores, reactors, transformers and current transformer, etc. designed by cultivated technologies for many years.

1308-1, Angoryonegishi Kawaguchi-shi, Saitama 333-0834, Japan  
TEL: 048(283)1001 FAX: 048(283)1004

### Product item

- Electrical steel foil
- Cores
- Reactor transformer and current transmissions, etc.



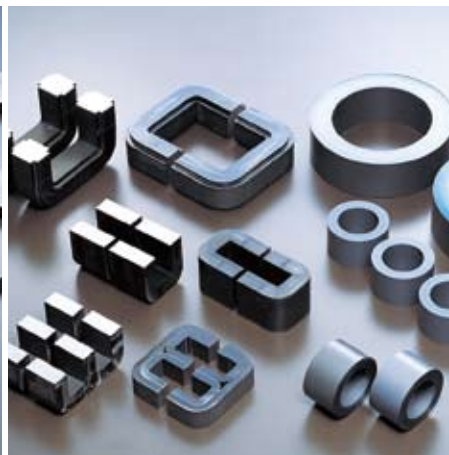
Nikkin Denji Kogyo

ISO9001 : 2008  
Registration number : 9769  
Approvals obtained in 28.March 2003

Foils



Cores



Reactor etc.



# **NIPPON KINZOKU CO.,LTD.**

[www.nipponkinzoku.co.jp/](http://www.nipponkinzoku.co.jp/)

**Reference [NEW BUSINESS DEVELOPMENT DEPT.] TEL03-5765-8122**

✉ [denji@nipponkinzoku.co.jp](mailto:denji@nipponkinzoku.co.jp)

---

## **Head office**

5-30-7,Shiba Minato-ku,Tokyo 108-0014,Japan  
TEL 03-5765-8111 (Main switchboard)

## **Tokyo branch**

5-30-7,Shiba Minato-ku,Tokyo 108-0014,Japan  
TEL 03-5765-8108 (Switchboard number)

## **Osaka branch**

Senba Central Bldg.6F,2-6-8,Honmachi chuo-ku,Osaka 541-0053,Japan  
TEL 06-6282-6188 (Switchboard number)

## **Nagoya branch**

Meiji Yasuda Life Insurance Bldg.6F,1-1,Shinsakae Nagoya Naka-ku,Aich 460-0004,Japan  
TEL 052-962-6671 (Switchboard number)

## **Itabashi plant**

4-10-1,Funato Itabashi-ku,Tokyo 174-8560,Japan  
TEL 03-3968-6300 (Switchboard number)

## **Gifu plant**

2-24,Himegaoka Kani-shi,Gifu 509-0249,Japan  
TEL 0574-63-1071 (Switchboard number)

## **Fukushima plant**

Higashi Kamako Aza Kashima1,Shirakawa-shi,Fukushima 961-0303,Japan  
TEL 0248-34-2961 (Switchboard number)

## **Technical research institute**

4-10-1,Funato Itabashi-ku,Tokyo 174-8560,Japan  
TEL 03-3968-6477

---

## **[Overseas Subsidiaries]**

### **SHANGHAI**

#### **NIPPON KINZOKU(SHANGHAI) CO.,LTD.**

TEL +86 21 3252 2328 (Switchboard number)  
上海市長寧區仙霞路333號東方維京大廈19階-B3室

### **SINGAPORE**

#### **NIPPON KINZOKU(SINGAPORE)PTE.LTD.**

TEL +65-6861-7003 (Switchboard number)  
11.WOODLANDS CLOSE, #04-08, WOODLANDS 11 SINGAPORE 787853

### **THAILAND**

#### **NIPPON KINZOKU(THAILAND) CO.,LTD.**

TEL +66-35-741621~741632 (Switchboard number)  
Rojana Industrial Park,59 Moo5,Tambon U-Thai,Amphur U-Thai,  
Phranakorn Sri Ayutthaya 13210,Thailand

### **MALAYSIA**

#### **NIPPON KINZOKU(MALAYSIA)SDN.BHD.**

TEL +60-7660-6229 (Switchboard number)  
No.18 Jalan i-Park 1/2,Kawasan Perindustrian i-Park,  
Bandar Indahpura,81000 Kulaijaya,Johor.Malaysia

---

## **NIKKIN DENJI KOGYO CO.,LTD**

<http://www.nikkindenjikogyo.co.jp/>

✉ E-mail : [info9@nikkindenjikogyo.co.jp](mailto:info9@nikkindenjikogyo.co.jp)

●The company names and product names shown in this catalogue are trademarks, or registered trademarks of their respective owners.  
●Rights regarding trademarks, logo's and trade names belong to this company or the respective owner of those rights. ●Copying or printing any content of this document is prohibited without our permission. ●The content of the catalogue may change without warning due to updates to the products. ●We cannot assume responsibility for the operation of the product through misuse or the like of any product in this catalogue. ●The technical information given in this catalogue is an explanation of the representative application of a product, and does not give permission or guarantee from our rights or those of a third party.