

材料专家

创新典范

产业先锋

科技精英



**安泰非晶科技有限责任公司**  
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# 安泰事业 大家成就

创新推进科技进步  
材料改善人类生活

Innovation for Technical Progress

Materials for Better Life

## 公司简介

### Company Profile

安泰非晶科技有限责任公司是安泰科技股份有限公司（中国钢研科技集团有限公司控股）的全资子公司，从事非晶材料研发和生产的高科技企业。公司成立于2012年，注册资本5.1亿元。

安泰非晶科技是中国非晶材料产业的领导者，拥有完全自主知识产权的非晶合金宽带产业技术。主导产品为铁基非晶合金宽带，主要应用于输配电、电力电子、新能源、交通、航空航天、医疗、消费电子和工业电源等领域。我们专注节能环保领域，为节能环保提供关键高新技术材料。作为非晶材料产业化的典范，多年来我们致力于为全球高端客户提供优质非晶合金带材及应用解决方案。

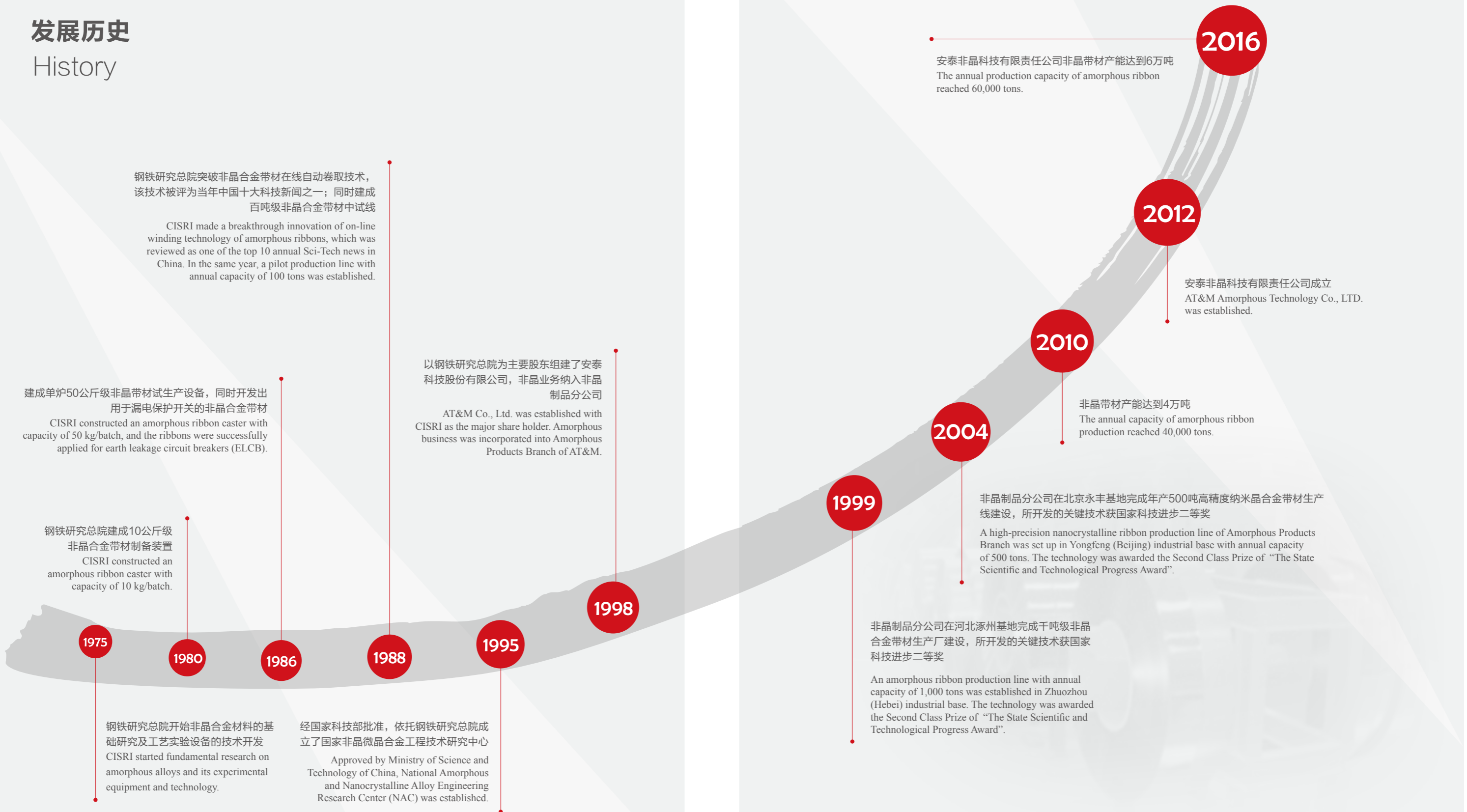
AT&M Amorphous Technology Co., Ltd., a wholly owned subsidiary of AT&M Technology Co., Ltd. (controlled by China Iron & Steel Research Institute Group, CISRI), is a high-tech enterprise engaged in the R&D and production of amorphous Materials. The company was founded in 2012 with a registered capital of 510 million yuan.

As the leader of amorphous materials industry in China, AT&M Amorphous Technology Co., Ltd. has its own intellectual property in amorphous alloy and production technologies. The main products of Fe-based amorphous alloy ribbons are widely used in the fields of power transmission and distribution, power electronics, new energy, transportation, aerospace, medical equipments, consumer electronics and industrial power supply etc. We concentrate on energy saving, environment protection and key high-tech materials to make our world cleaner. As a paradigm of industrialization of amorphous materials, we commit to providing high quality products and solutions for customers.





# 发展历史 History



1975

钢铁研究总院开始非晶合金材料的基础研究及工艺实验设备的技术开发  
CISRI started fundamental research on amorphous alloys and its experimental equipment and technology.

1980

钢铁研究总院建成10公斤级非晶合金带材制备装置  
CISRI constructed an amorphous ribbon caster with capacity of 10 kg/batch.

1986

建成单炉50公斤级非晶带材试生产设备，同时开发出用于漏电保护开关的非晶合金带材  
CISRI constructed an amorphous ribbon caster with capacity of 50 kg/batch, and the ribbons were successfully applied for earth leakage circuit breakers (ELCB).

1988

经国家科技部批准，依托钢铁研究总院成立了国家非晶微晶合金工程技术研究中心  
Approved by Ministry of Science and Technology of China, National Amorphous and Nanocrystalline Alloy Engineering Research Center (NAC) was established.

1995

以钢铁研究总院为主要股东组建了安泰科技股份有限公司，非晶业务纳入非晶制品分公司  
AT&M Co., Ltd. was established with CISRI as the major share holder. Amorphous business was incorporated into Amorphous Products Branch of AT&M.

1998

1999

非晶制品分公司在河北涿州基地完成千吨级非晶合金带材生产厂建设，所开发的关键技术获国家科技进步二等奖  
An amorphous ribbon production line with annual capacity of 1,000 tons was established in Zhuozhou (Hebei) industrial base. The technology was awarded the Second Class Prize of "The State Scientific and Technological Progress Award".

2004

非晶制品分公司在北京永丰基地完成年产500吨高精度纳米晶合金带材生产线建设，所开发的关键技术获国家科技进步二等奖  
A high-precision nanocrystalline ribbon production line of Amorphous Products Branch was set up in Yongfeng (Beijing) industrial base with annual capacity of 500 tons. The technology was awarded the Second Class Prize of "The State Scientific and Technological Progress Award".

2010

非晶带材产能达到4万吨  
The annual capacity of amorphous ribbon production reached 40,000 tons.

2012

安泰非晶科技有限责任公司成立  
AT&M Amorphous Technology Co., LTD. was established.

2016

安泰非晶科技有限责任公司非晶带材产能达到6万吨  
The annual production capacity of amorphous ribbon reached 60,000 tons.



# 非晶合金简介

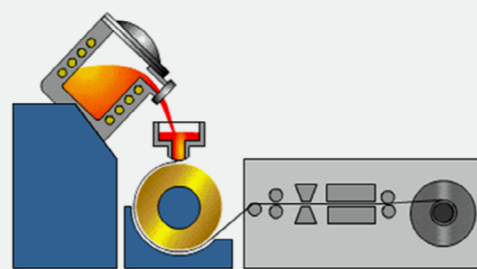
## Introduction to Amorphous Alloys

非晶软磁合金是一种新型的节能材料，由熔融金属以每秒约百万度的速率快速冷却制成。非晶软磁合金具有与晶体完全不同的长程无序结构，具有高磁导率、低损耗的特点，广泛应用于配电变压器、电感元件、电机定子和传感器等领域，可以显著提高器件效率、降低能耗。特别是应用于配电变压器时，非晶合金铁心变压器相比传统硅钢变压器的空载损耗降低60%-80%。

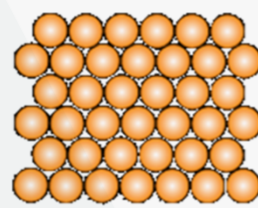
与传统带材生产工艺相比，非晶合金带材生产流程短，生产过程中无污染排放。由于非晶合金具有制造过程节能和使用过程节能的双重节能效果，被誉为冶金领域的革命性进展。

Amorphous soft magnetic alloy is a new type of energy saving materials, which is produced by rapid solidification technology. The cooling rate of molten alloy is about one million degrees. The microstructure of amorphous alloys is different from that of crystals. Regarding to the microstructure of amorphous alloys, the atoms are in non-periodic structures. Amorphous soft magnetic alloys exhibit combined high permeability and low core loss, and widely used in a variety of applications such as distribution transformers, inductive devices, motor stators, and sensors etc. Especially in the field of distribution transformers, amorphous core transformers save 60% - 80% no-load losses compared to traditional silicon steel core ones.

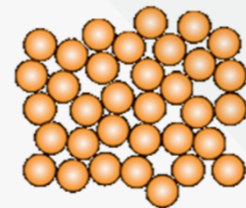
Compared to conventional rolled ribbons, the amorphous ribbon production process is very compact, and there is no pollution emission. Due to their energy saving effect in production and applications, the amorphous ribbons are known as a revolutionary progress in metallurgy.



非晶合金带材生产工艺示意图  
Schematic of amorphous alloy ribbon casting



金属的原子排列  
Atomic structure of metal



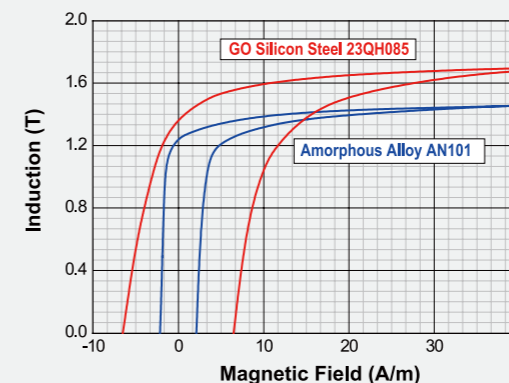
非晶合金的原子排列  
Atomic structure of amorphous alloy

# 铁基非晶合金带材与取向硅钢特性对比

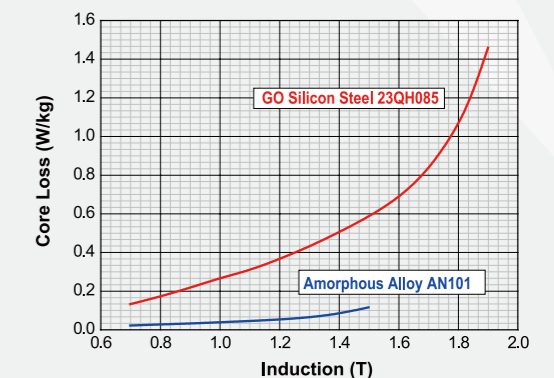
## Characteristics Comparison Between Fe-based Amorphous Alloy Ribbon and Grain-Oriented (GO) Silicon Steel

性能参数 Parameters	取向硅钢 GO Silicon Steel	铁基非晶合金 Fe-based Amorphous Alloy
密度 Density (g/cm <sup>3</sup> )	7.65	7.20
居里温度 Curie Temperature (°C)	746	428
晶化温度 Crystallization Temperature (°C)	-	500-520
抗拉强度 Tensile Strength (GPa)	> 0.3	2.1
弹性模量 Young's Modulus (GPa)	-	130
维氏硬度 Victor's Hardness (Hv)	> 180	940
热膨胀系数 Thermal Expansion Coefficient (× 10 <sup>-6</sup> /°C)	-	7.6
饱和磁感应强度 Saturation Induction (T)	1.8-2.0	≥ 1.56
电阻率 Electrical Resistivity (μΩ·m)	~0.50	1.35
饱和磁致伸缩系数 Saturation Magnetostriction (× 10 <sup>-6</sup> )	~2 (取向后, Oriented)	25 (制备态, As-cast)
矫顽力 Coercivity (A/m)	< 30	< 2.5
比总损耗 Core Loss (W/kg)	< 0.85 @ 50 Hz, 1.7 T (23QH085) *	< 0.14 @ 50 Hz, 1.35 T
比视在功率 Apparent Power (VA/kg)	< 2.20 @ 50 Hz, 1.7 T (23QH085) *	< 0.20 @ 50 Hz, 1.35 T

\* 数据取自GB/T 2521.2-2016中的取向硅钢牌号23QH085。  
\* Data from GB/T 2521.2-2016 GO silicon steel grade 23QH085.



铁基非晶合金与取向硅钢的磁滞回线对比  
Hysteresis loops comparison between Fe-based amorphous alloy and GO silicon steel



铁基非晶合金与取向硅钢的比总损耗对比  
Core loss comparison between Fe-based amorphous alloy and GO silicon steel



## 产品规格与性能

### Specifications and Properties

#### 产品规格 Specifications

商标 * Trade Mark	宽度及允许偏差 Width (mm)	平均厚度及允许偏差 Average Thickness ( $\mu\text{m}$ )	叠片系数 Lamination Factor (%)
AN101	120 $\pm$ 0.5	24 $\pm$ 2	90 88 86
AN101S	142 $\pm$ 0.5	25 $\pm$ 2	
	170 $\pm$ 0.5		
AN101A	213 $\pm$ 0.5	25 $\pm$ 2	
	100~300mm定制宽度 Customized Width		

#### 通用物理性能 General Physical Properties

铁基非晶合金带材 Fe-based Amorphous Alloy Ribbons	AN101	AN101S	AN101A
密度 Density (g/cm <sup>3</sup> )	7.18	7.20	7.23
晶化温度 Crystallization Temperature (°C)	525	515	500
抗拉强度 Tensile Strength (GPa)	2.1	2.1	2.1
杨氏模量 Young's Modulus (GPa)	130	130	130
维氏硬度 Vicker's Hardness Hv-50 g Load	940	940	940
热膨胀系数 Thermal Expansion Coefficient ( $\times 10^{-6}/^{\circ}\text{C}$ , @ 30~300°C)	6.8	6.7	5.9

## 产品规格与性能

### Specifications and Properties

#### 通用电磁特性 General Electromagnetic Characteristics

铁基非晶合金带材 Fe-based Amorphous Alloy Ribbons	AN101	AN101S	AN101A	
磁感应强度 Induction $B_{800}$ (T)	$\geq 1.56$	$\geq 1.57$	$\geq 1.59$	
电阻率 Electrical Resistivity ( $\mu\Omega\cdot\text{m}$ )	1.40	1.35	1.23	
饱和磁致伸缩系数 Saturation Magnetostriction ( $\times 10^{-6}$ )	退火态 Annealed	2.6	2.2	1.7
	制备态 As-cast	25	25	25
居里温度 Curie Temperature (°C)	428	417	405	

#### 典型磁性能 Typical Magnetic Properties

铁基非晶合金带材 Fe-based Amorphous Alloy Ribbons	AN101	AN101S	AN101A	
频率50 Hz, 磁场强度80A/m下的磁感应强度 Induction at 50 Hz and 80 A/m* (T)	$\geq 1.40$	$\geq 1.40$	$\geq 1.40$	
矫顽力 Coercivity (A/m)	$\leq 2.0$			
比总损耗 Core Loss (W/kg)	50 Hz, 1.30T	$\leq 0.10$	$\leq 0.10$	$\leq 0.10$
	50 Hz, 1.35 T	$\leq 0.11$	$\leq 0.11$	$\leq 0.11$
	50 Hz, 1.40T	$\leq 0.12$	$\leq 0.12$	$\leq 0.12$
比视在功率 Apparent Power (VA/kg)	50 Hz, 1.30T	$\leq 0.13$	$\leq 0.13$	$\leq 0.13$
	50 Hz, 1.35 T	$\leq 0.15$	$\leq 0.15$	$\leq 0.15$
	50 Hz, 1.40T	$\leq 0.20$	$\leq 0.18$	$\leq 0.17$

注: 比总损耗及比视在功率采用单片测试仪测量

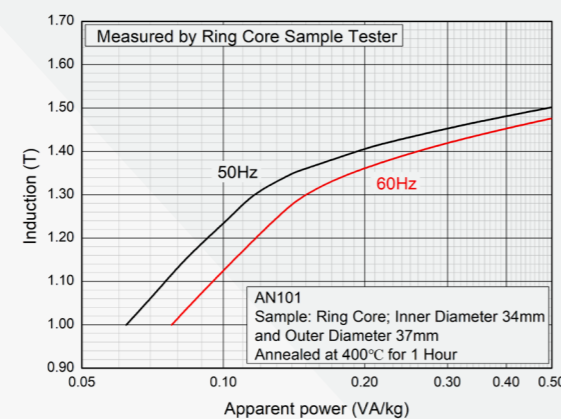
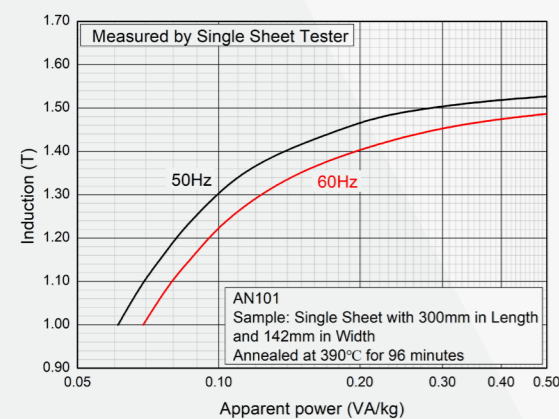
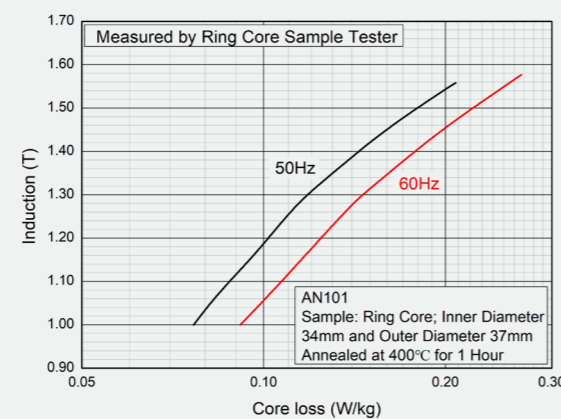
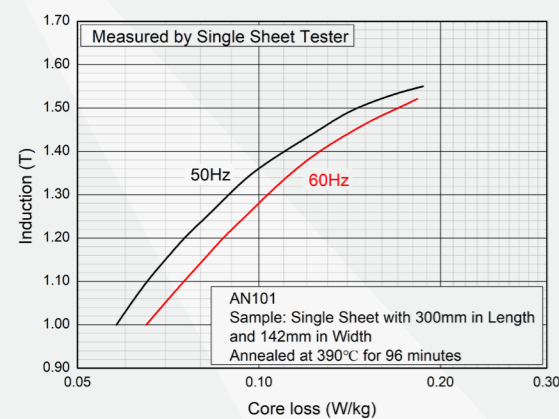
Note: Core loss and apparent power are measured by single sheet tester.



### 典型磁性能曲线AN101

### Typical Magnetic Properties of AN101

比总损耗曲线和比视在功率曲线  
Core Loss Curves and Apparent Power Curves



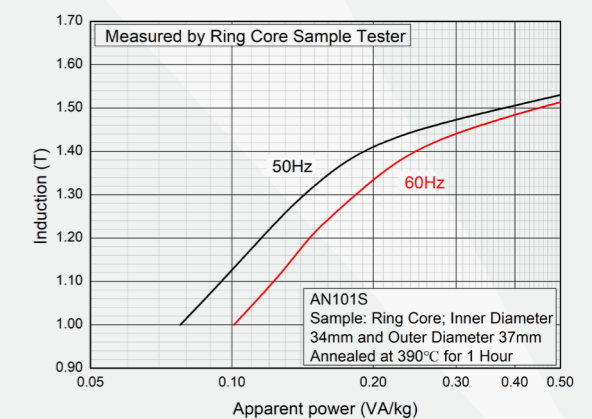
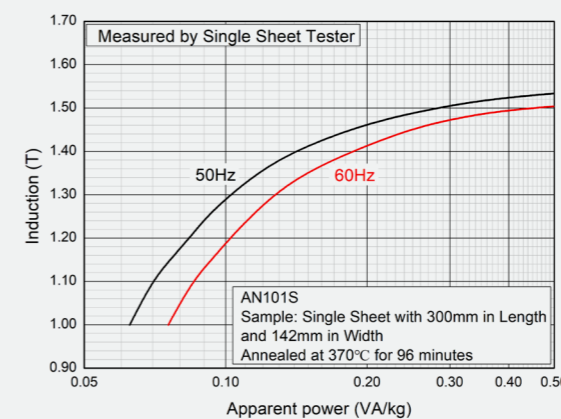
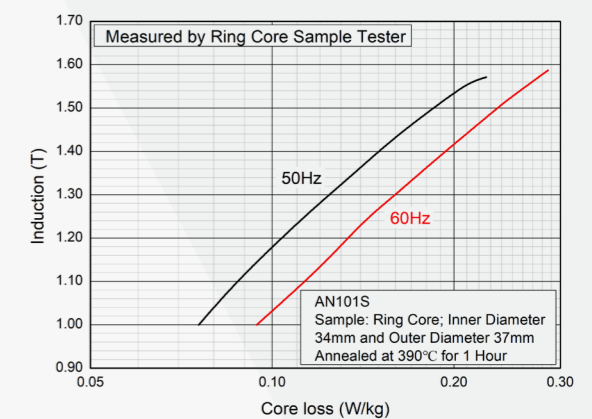
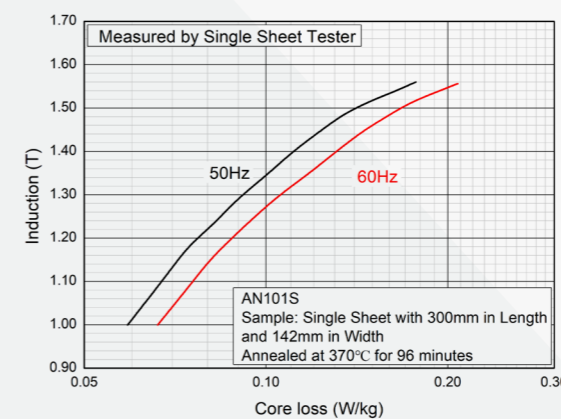
注：以上的典型磁性能曲线为我公司铁基非晶带材产品的磁性能典型值，仅供设计人员在变压器设计时参考；这些曲线不是产品性能指标的保证值或供货标准，不作为产品验收依据。

Note: The above curves are typical properties and are only used for reference in designing transformers. They are not the guaranteed values and are not the standard for acceptance of any product.

### 典型磁性能曲线AN101S

### Typical Magnetic Properties of AN101S

比总损耗曲线和比视在功率曲线  
Core Loss Curves and Apparent Power Curves



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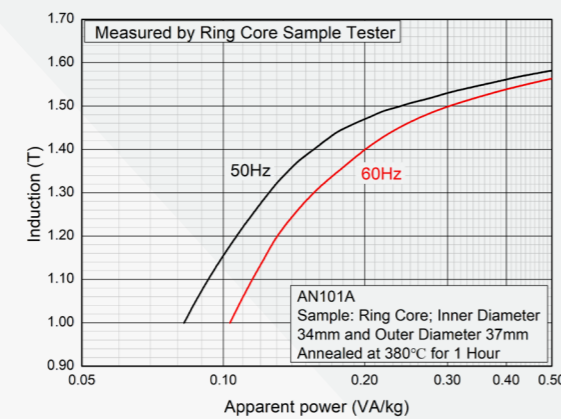
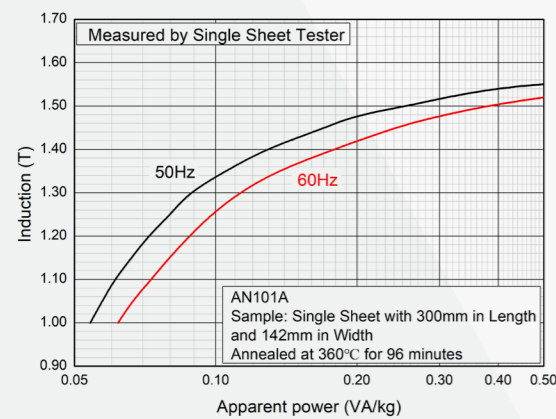
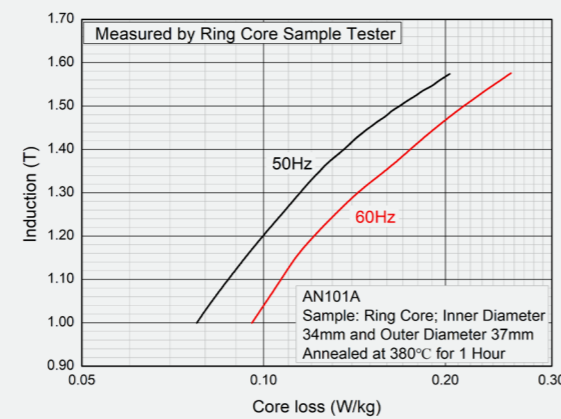
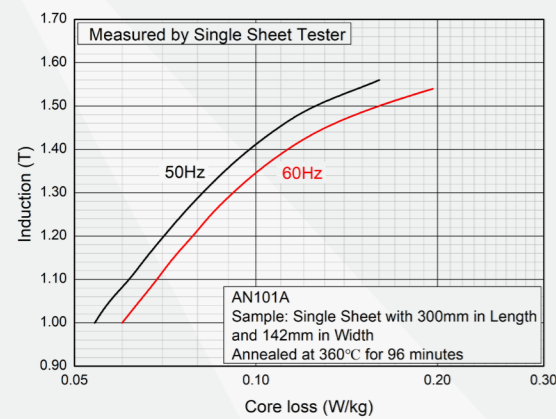
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### 典型磁性能曲线AN101A

### Typical Magnetic Properties of AN101A

比总损耗曲线和比视在功率曲线  
Core Loss Curves and Apparent Power Curves



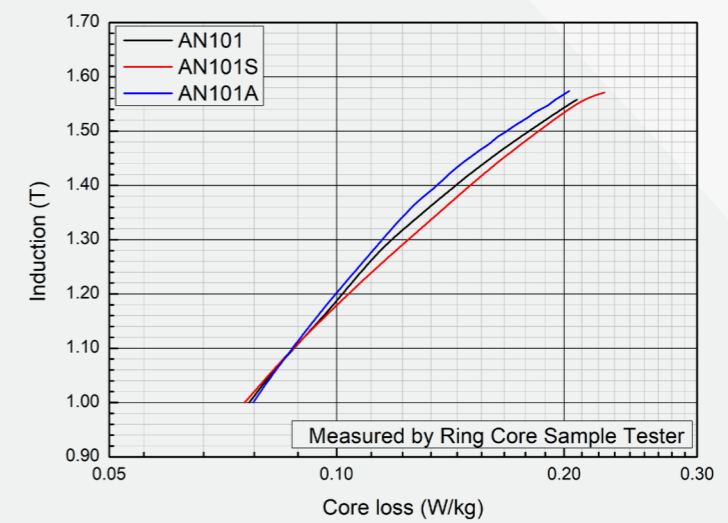
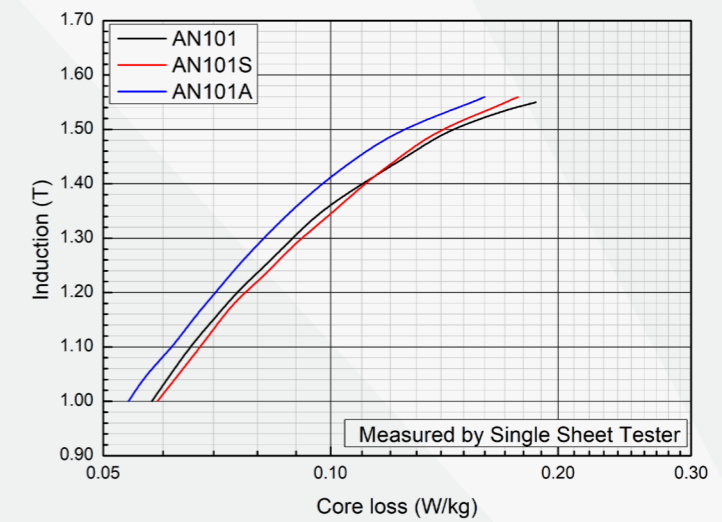
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### 典型磁性能曲线

### Typical Magnetic Properties

AN101, AN101S和AN101A带材的比总损耗曲线  
Core Loss Curves of AN101, AN101S and AN101A



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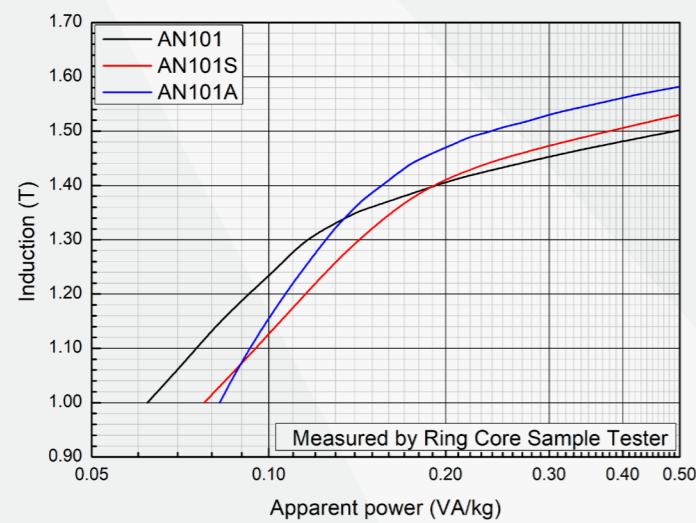
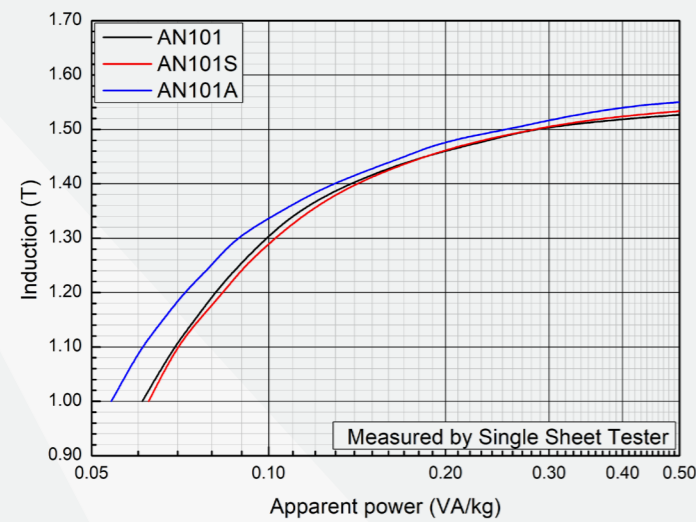
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### 典型磁性能曲线

### Typical Magnetic Properties

AN101, AN101S和AN101A带材的比视在功率曲线  
Apparent Power Curves of AN101, AN101S and AN101A



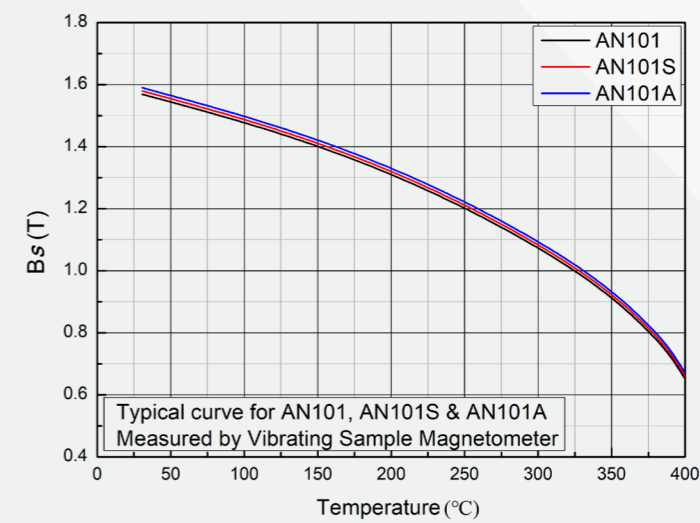
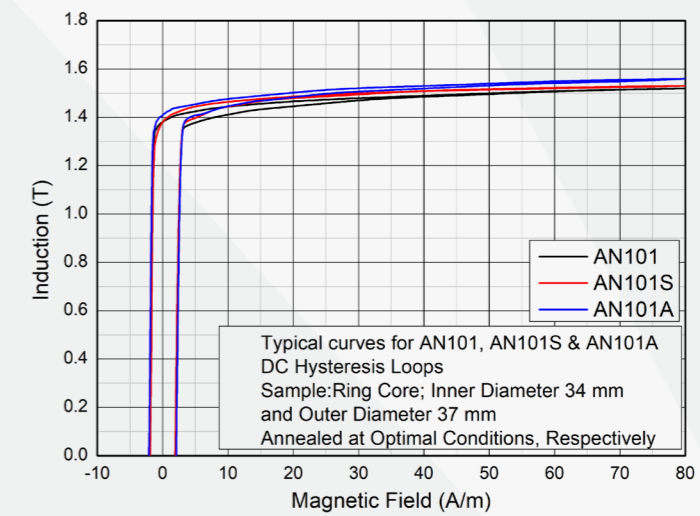
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### 典型磁性能曲线

### Typical Magnetic Properties

AN101, AN101S和AN101A带材的静态磁滞回线和热磁曲线  
Static Hysteresis Loops and Thermomagnetic Curves of AN101, AN101S and AN101A



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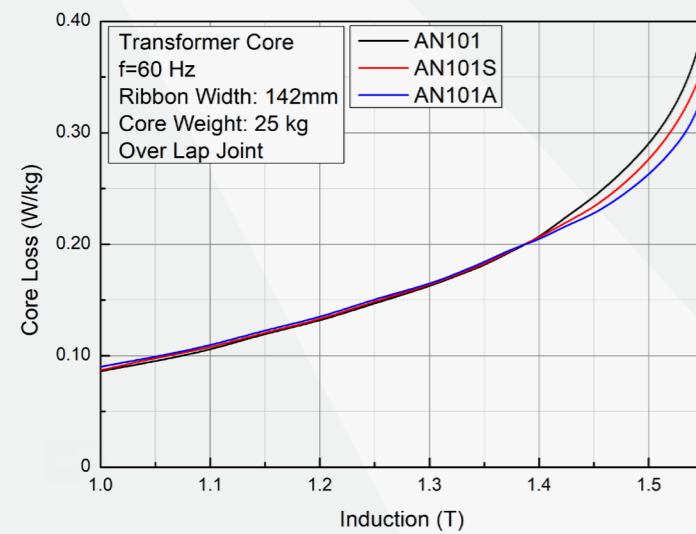
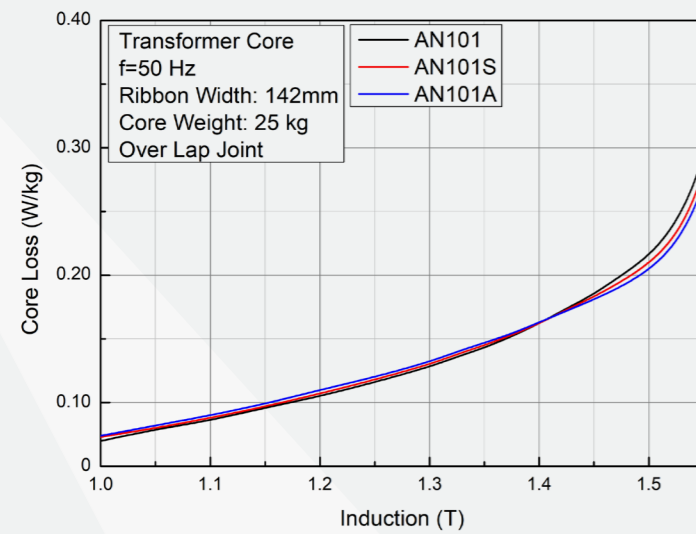




### 典型变压器铁心性能曲线

### Typical Properties of Transformer Cores

AN101, AN101S 和AN101A铁心的典型比总损耗曲线  
Typical Core Loss Curves of Transformer Cores of AN101, AN101S and AN101A



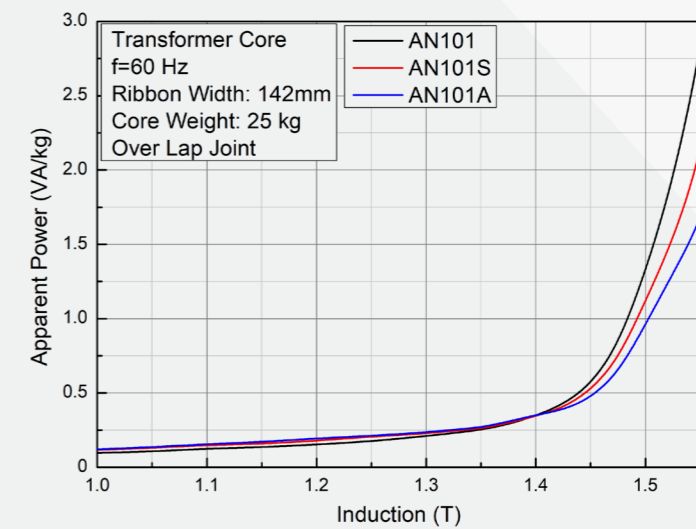
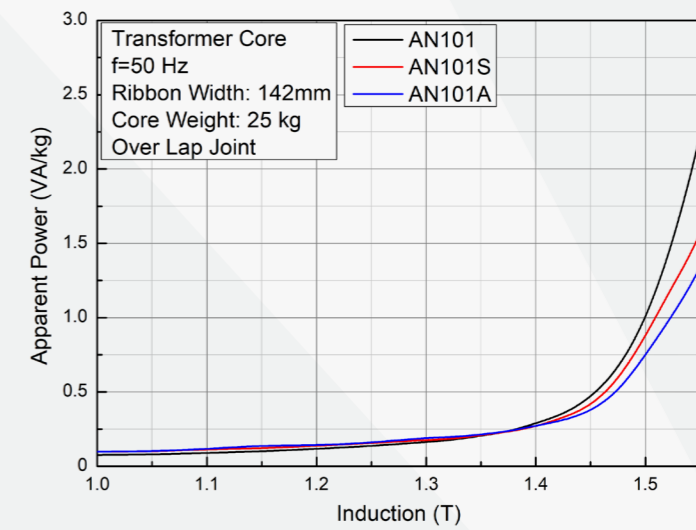
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### 典型变压器铁心性能曲线

### Typical Properties of Transformer Cores

AN101, AN101S 和AN101A铁心的典型比视在功率曲线  
Typical Apparent Power Curves of Transformer Cores of AN101, AN101S and AN101A



注：以上的典型磁性能曲线为我公司铁心的磁性能典型值，仅供设计人员在变压器设计时参考；这些曲线不是产品性能指标的保证值或供货标准，不作为产品验收依据。

Note: The above curves are typical properties and are only used for reference in designing transformers. They are not the guaranteed values and are not the standard for acceptance of any product.

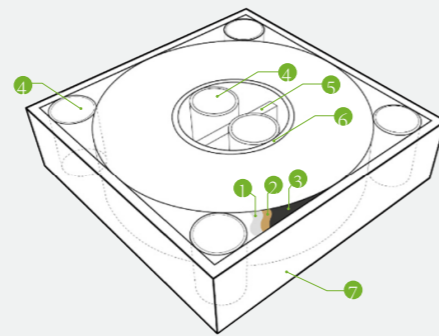


## 关于产品包装储存的说明

### Package and Storage

#### 关于产品包装 Packaging

- 1、非晶带材 Amorphous ribbon  
内径Inner Diameter: 400mm  
外径Outer Diameter:  $\leq 1080$ mm  
重量Weight: 550~850kg
- 2、气相防锈纸Volatile preventive paper
- 3、聚乙烯袋 Polythene bag
- 4、支撑纸筒 Support cylinder
- 5、固定木块 Fixed block
- 6、内衬纸管芯 Paper lining
- 7、瓦楞纸箱 Corrugated case



#### 注意事项 Notes

- 本产品具有非常锋利的边缘，在运输和作业中应穿戴工作服、防割手套、防护鞋等劳动防护用品。本产品可能会产生少量碎片，在运输和作业中应佩戴护目镜。
- 本产品在开放的空气环境中长期存放可能锈蚀，在打开包装箱后应尽快使用。如需长时间存放，应采取防潮措施。本产品的堆垛层数不能超过规定的限度，运输时不能碰撞、翻滚。
- 本产品应用于腐蚀性气氛、辐射、高温高湿、粉尘、水下等特殊环境时，应采取适当的防护措施。
- 本产品如需丢弃时，应视为工业垃圾进行适当处置。
- **特别提示：**当产品刚运抵客户现场时，若现场环境湿度较大，产品表面温度可能会低于环境露点温度，若此时拆开包装，可能会出现水蒸气在产品表面凝结的现象，从而导致产品生锈。如遇这种特殊情况，请将产品放置24小时后再打开包装，即可避免产品生锈。
- This product has sharp edges. Protective clothing, gloves and shoes should be worn during transportation and operation. Goggles are also needed for protection as a small amount of debris may be produced by this product.
- This product may get rusted if exposed to the air for long time. Use this product as soon as possible after opening the package or take moisture-proof measures for long term storage. Do not exceed the maximum stacking layer. Do not collide and roll in transportation.
- Take appropriate protective measures when this product exposes to atmosphere of erosive, radiation, high temperature and humidity, dust, water and other special environment.
- Treat this product as industrial waste for disposal.
- **SPECIAL TIPS:** If the surface temperature of the product is lower than the dew point when the product arrives at the workplace, unpack the product 24 hours later to avoid vapour condensation on the product surface which may cause rust.

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