



- *Oriented Silicon Steel*
- *Grain-oriented Electrical Steel*
- *Non-oriented Silicon Steel*
- *Transformer*

Oriented Silicon Steel

The oriented silicon steel is mainly used for the manufacturing of all kinds of transformers. regenerator iron core. According to the different magnet property, the oriented silicon steel is divided into HiB steel and regular oriented silicon steel. Compared to the regular oriented silicon steel, Hi steel has higher magnetic strength, lower iron loss and lower magnetostrictive. The oriented silicon steel of WISCO has excellent electromagnetic property, excellent processing property, high thickness precision, smooth plate shape and good surface quality.

Standard value of selectable grade, density, iron loss, magnetic strength and stacking coefficient (1)

| Type | Grade | Thickness mm | Density Kg/dm ³ | Iron loss P _{1.7/50} W/kg | Magnetic strength B ₈₀₀ T | Stacking coefficient % |
|--|---------|--------------|----------------------------|------------------------------------|--------------------------------------|------------------------|
| Regular oriented silicon steel Q series | 23Q110 | 0.23 | 7.65 | 1.10 | 1.81 | 94.5 |
| | 27Q120 | 0.27 | 7.65 | 1.20 | 1.82 | 95.0 |
| | 27Q130 | | | 1.30 | 1.81 | |
| | 30Q120 | 0.30 | 7.65 | 1.20 | 1.82 | 95.5 |
| | 30Q130 | | | 1.30 | 1.81 | |
| | 35Q135 | 0.35 | 7.65 | 1.35 | 1.82 | 96.0 |
| | 35Q145 | | | 1.45 | 1.81 | |
| | 35Q155 | | | 1.55 | 1.80 | |
| HiB steel G series (High magnetic strength oriented silicon steel) | 23QG090 | 0.23 | 7.65 | 0.90 | 1.88 | 94.5 |
| | 23QG095 | | | 0.95 | 1.88 | |
| | 23QG100 | | | 1.00 | 1.88 | |
| | 27QG095 | 0.27 | 7.65 | 0.95 | 1.89 | 95.0 |
| | 27QG100 | | | 1.00 | 1.89 | |
| | 27QG120 | | | 1.20 | 1.89 | |
| | 30QG105 | 0.30 | 7.65 | 1.05 | 1.89 | 95.5 |
| | 30QG120 | | | 1.20 | 1.89 | |
| Magnetic domain refinement HiB steel K series (Magnetic domain refinement high magnetic strength oriented silicon steel) | 23RK080 | 0.23 | 7.65 | 0.80 | 1.88 | 94.5 |
| | 23RK085 | | | 0.85 | 1.88 | |
| | 23RK090 | | | 0.90 | 1.88 | |
| | 23RK095 | | | 0.95 | 1.88 | |
| | 27RK085 | 0.27 | 7.65 | 0.85 | 1.88 | 95.0 |
| | 27RK090 | | | 0.90 | 1.89 | |
| | 27RK095 | | | 0.95 | 1.89 | |
| | 27RK100 | | | 1.00 | 1.89 | |
| | 27RK120 | 0.30 | 7.65 | 1.20 | 1.89 | 95.5 |
| | 30RK100 | | | 1.00 | 1.89 | |
| | 30RK105 | | | 1.05 | 1.89 | |
| | 30RK120 | | | 1.20 | 1.89 | |

Note: (1) For the oriented silicon steel not processed by magnetic domain refinement, the magnetic parameters will be tested according to GB/T 3655

(2) For the oriented steel processed after magnetic domain refinement, the magnetic parameters will be tested according to GB/T 13789 in unit sheet method, and should not be used for annealing. (3) The stacking coefficient test will adopt the sample with T: coating.

Typical value of the iron loss and magnetic strength (1)

| Type | Grade | Thickness mm | Density Kg/dm ³ | Iron loss (W/kg) | | | | Magnetic strength T | | |
|--|--|--------------|----------------------------|---------------------|---------------------|---------------------|---------------------|---------------------|-------------------|------|
| | | | | P _{1.7/50} | P _{1.7/60} | P _{1.5/50} | P _{1.5/60} | B ₈₀₀ | B ₂₅₀₀ | |
| Regular oriented silicon steel Q series | 23Q110 | 0.23 | 7.65 | 1.05 | 1.39 | 0.71 | 0.94 | 1.87 | 1.93 | |
| | 27Q120 | 0.27 | 7.65 | 1.11 | 1.45 | 0.80 | 1.05 | 1.87 | 1.93 | |
| | 27Q130 | | | 1.15 | 1.52 | 0.83 | 1.11 | 1.86 | 1.93 | |
| | 30Q120 | 0.30 | 7.65 | 1.12 | 1.49 | 0.82 | 1.09 | 1.87 | 1.94 | |
| | 30Q130 | | | 1.16 | 1.52 | 0.83 | 1.10 | 1.86 | 1.93 | |
| | 35Q145 | 0.35 | 7.65 | 1.26 | 1.68 | 0.92 | 1.23 | 1.85 | 1.93 | |
| | 35Q155 | | | 1.30 | 1.72 | 0.97 | 1.28 | 1.85 | 1.93 | |
| HiB steel G series (High magnetic strength oriented silicon steel) | 23QG090 | 0.23 | 7.65 | 0.88 | 1.17 | 0.65 | 0.85 | 1.90 | 1.96 | |
| | 23QG095 | | | 0.92 | 1.19 | 0.66 | 0.88 | 1.89 | 1.96 | |
| | 23QG100 | | | 0.96 | 1.26 | 0.68 | 0.89 | 1.89 | 1.96 | |
| | 27QG095 | 0.27 | 7.65 | 0.92 | 1.23 | 0.70 | 0.93 | 1.91 | 1.97 | |
| | 27QG100 | | | 0.96 | 1.27 | 0.71 | 0.94 | 1.90 | 1.96 | |
| | 27QG120 | | | 1.04 | 1.36 | 0.75 | 0.99 | 1.89 | 1.94 | |
| | 30QG105 | 0.30 | 7.65 | 1.01 | 1.35 | 0.76 | 1.02 | 1.92 | 1.97 | |
| | 30QG120 | | | 1.05 | 1.40 | 0.78 | 1.04 | 1.91 | 1.97 | |
| | Magnetic domain refinement HiB steel K series (Magnetic domain refinement high magnetic strength oriented silicon steel) | 23RK080 | 0.23 | 7.65 | 0.78 | 1.05 | 0.57 | 0.75 | 1.91 | 1.97 |
| | | 23RK085 | | | 0.82 | 1.09 | 0.59 | 0.78 | 1.90 | 1.96 |
| 23RK090 | | 0.86 | | | 1.14 | 0.62 | 0.82 | 1.90 | 1.96 | |
| 23RK095 | | 0.91 | | | 1.21 | 0.64 | 0.85 | 1.89 | 1.95 | |
| 27RK085 | | 0.27 | 7.65 | 0.82 | 1.10 | 0.61 | 0.81 | 1.91 | 1.97 | |
| 27RK090 | | | | 0.86 | 1.13 | 0.64 | 0.85 | 1.91 | 1.97 | |
| 27RK095 | | | | 0.90 | 1.20 | 0.66 | 0.87 | 1.90 | 1.96 | |
| 27RK100 | | | | 0.95 | 1.26 | 0.68 | 0.90 | 1.90 | 1.96 | |
| 27RK120 | | 0.30 | 7.65 | 1.02 | 1.35 | 0.73 | 0.97 | 1.89 | 1.95 | |
| 30RK100 | | | | 0.92 | 1.21 | 0.69 | 0.91 | 1.92 | 1.97 | |
| 30RK105 | 0.96 | | | 1.27 | 0.71 | 0.94 | 1.91 | 1.97 | | |
| 30RK120 | 1.02 | | | 1.35 | 0.74 | 0.98 | 1.90 | 1.96 | | |

Note: (1) For the oriented silicon steel not processed by magnetic domain refinement, the magnetic parameters will be tested according to GB/T 3655 (2) For the oriented steel processed after magnetic domain refinement, the magnetic parameters will be tested according to GB/T 13789 in unit sheet method, and should not be used for annealing. (3) The stacking coefficient test will adopt the sample with T: coating.

Non-oriented Silicon Steel

The non-oriented silicon steel is mainly used for the manufacturing of all kinds of rotation motor and electronic transformer core. According to the different production and process conditions, it can be divided into complete process type non-oriented silicon steel and semi-process type non-oriented silicon steel; in addition, according to the professional application area, the dedicated non-oriented silicon steel is also developed.

Standard value of selectable grade, density, iron loss, magnetic strength and stacking coefficient

| Type | Grade | Thickness mm | Density Kg/dm ³ | Iron loss P _{1.5/50} W/kg | Magnetic strength B ₅₀₀₀ T | Stacking coefficient % | |
|--|---------------------------------------|--------------|----------------------------|------------------------------------|---------------------------------------|------------------------|------|
| Complete process type non-oriented silicon steel | 35WW230 | 0.35 | 7.60 | 2.10 | 1.62 | 96.0 | |
| | 35WW250 | | | 2.30 | 1.62 | | |
| | 35WW270 | | | 2.50 | 1.62 | | |
| | 35WW300 | | 7.65 | 2.70 | 1.62 | | |
| | 35WW360 | | | 3.30 | 1.63 | | |
| | 35WW400 | | | 3.60 | 1.64 | | |
| | 35WW440 | 7.70 | 4.00 | 1.65 | | | |
| | 50WW270 | | 7.60 | 2.50 | 1.62 | 97.0 | |
| | 50WW290 | 2.70 | | 1.62 | | | |
| | 50WW310 | 2.90 | | 1.62 | | | |
| | 50WW350 | 7.65 | 3.10 | 1.62 | | | |
| | 50WW400 | | 3.50 | 1.63 | | | |
| | 50WW470 | | 4.00 | 1.64 | | | |
| | 50WW600 | 7.75 | 7.80 | 4.30 | 1.66 | 98.0 | |
| | 50WW700 | | | 5.00 | 1.67 | | |
| | 50WW800 | | | 6.00 | 1.68 | | |
| 50WW1000 | 7.00 | | | 1.70 | | | |
| 50WW1300 | 8.00 | | | 1.73 | | | |
| Semi-process type non-oriented silicon steel | BDG | 0.50 | 7.80 | 6.00 | 1.68 | 97.0 | |
| | 50WGB350 | | | 3.50 | 1.71 | | |
| | 50WGB400 | | | 4.00 | 1.71 | | |
| | 50WGB430 | | | 4.30 | 1.68 | | |
| | 50WGB500 | | | 5.00 | 1.68 | | |
| Dedicated non-oriented silicon steel | 0.65mm non-oriented | 0.65 | 7.70 | 5.30 | 1.64 | 97.0 | |
| | | | | 65W800 | 6.50 | | 1.70 |
| Dedicated non-oriented silicon steel | For relay and electro-magnetic switch | 0.70 | 7.65 | 3.40 | 1.48 | 97.0 | |
| | | | | 70WK380 | 3.80 | | 1.48 |
| | | | | 75WK400 | 4.00 | | 1.48 |
| | | | | 80WK420 | 4.20 | | 1.48 |
| | | | | 85WK450 | 4.50 | | 1.48 |

Note: (1) The iron loss of the steel for relay and electromagnetic switch is P_{us}, and the magnetic strength is B_{sw}; the iron loss of other grade is P_{so}, and magnetic strength is B_{so}. (2) The magnetic property of the semi-process non-oriented silicon steel is the measuring value after annealing and eliminating the strength. (3) The magnetic parameters are from the sample that half parallel to the rolling direction and half vertical to the rolling direction, the measurement base standard: GB/T 3655.

Typical value of non-oriented silicon steel iron loss and magnetic strength

| Grade | Thickness mm | Density Kg/dm ³ | Iron loss (W/Kg) | | | | Magnetic strength T | |
|----------|--------------|----------------------------|------------------|------|------|------|---------------------|---------|
| | | | 50Hz | | 60Hz | | 2500A/m | 5000A/m |
| | | | 1.0T | 1.5T | 1.0T | 1.5T | | |
| 35WW230 | 0.35 | 7.60 | 0.78 | 2.05 | 1.05 | 2.65 | 1.56 | 1.65 |
| 35WW250 | | | 0.89 | 2.22 | 1.13 | 2.80 | 1.57 | 1.66 |
| 35WW270 | | | 0.95 | 2.40 | 1.20 | 2.90 | 1.57 | 1.66 |
| 35WW300 | | 7.65 | 1.07 | 2.60 | 1.34 | 3.16 | 1.59 | 1.67 |
| 35WW360 | | | 1.21 | 2.75 | 1.50 | 3.31 | 1.59 | 1.67 |
| 35WW400 | | | 1.21 | 3.18 | 1.51 | 3.40 | 1.59 | 1.68 |
| 35WW440 | 7.70 | 1.30 | 3.75 | 1.61 | 3.60 | 1.63 | 1.71 | |
| 50WW270 | 0.50 | 7.60 | 0.98 | 2.40 | 1.27 | 3.05 | 1.58 | 1.67 |
| 50WW290 | | | 1.06 | 2.60 | 1.38 | 3.22 | 1.58 | 1.67 |
| 50WW310 | | | 1.18 | 2.75 | 1.52 | 3.49 | 1.58 | 1.67 |
| 50WW350 | | 7.65 | 1.20 | 2.95 | 1.53 | 3.53 | 1.60 | 1.68 |
| 50WW400 | | | 1.28 | 3.15 | 1.61 | 3.66 | 1.60 | 1.68 |
| 50WW470 | | | 7.70 | 1.41 | 3.25 | 2.05 | 4.50 | 1.64 |
| 50WW600 | 7.75 | 1.76 | 3.95 | 2.42 | 5.30 | 1.61 | 1.69 | |
| 50WW700 | | 1.87 | 4.30 | 2.95 | 6.40 | 1.61 | 1.69 | |
| 50WW800 | | 7.80 | 2.18 | 4.85 | 3.64 | 7.68 | 1.63 | 1.71 |
| 50WW1000 | 7.85 | 2.49 | 5.60 | 3.92 | 8.22 | 1.66 | 1.74 | |
| 50WW1300 | | 2.52 | 5.90 | 4.27 | 8.92 | 1.67 | 1.75 | |

Execution standard and grade description

Execution standard: The non-oriented silicon steel of WISCO respectively executes the state standard GB/T 2521-2008 and WISCO enterprise standard Q/WG(GG)05-2012, If the customer has special requirement.

dedicated technical agreement can be signed.

Grade description: The non-oriented silicon steel grade No. composed of the thickness, enterprise name and non-oriented code and iron loss.

For example: 50WW470

50——100 times of the thickness value,

WW——Non-oriented silicon steel of WISCO,

470——100 times of iron loss.

Typical value of the non-oriented silicon steel mechanical property

| Type | Grade | Thickness mm | Tensile strength R _m MPa | Extension rate A % | Hardness Hv5 | | |
|--|--|---------------------|-------------------------------------|--------------------|--------------|-----|-----|
| Complete process type non-oriented silicon steel | 35WW250 | 0.35 | 520 | 17 | 195 | | |
| | 35WW270 | | 520 | 17 | 195 | | |
| | 35WW300 | | 520 | 27 | 180 | | |
| | 35WW360 | | 520 | 29 | 175 | | |
| | 35WW400 | | 500 | 31 | 170 | | |
| | 35WW440 | | 440 | 31 | 140 | | |
| | 50WW270 | 0.50 | 530 | 25 | 200 | | |
| | 50WW290 | | 520 | 27 | 195 | | |
| | 50WW310 | | 525 | 30 | 190 | | |
| | 50WW350 | | 530 | 30 | 185 | | |
| | 50WW400 | | 520 | 33 | 170 | | |
| | 50WW470 | | 450 | 37 | 155 | | |
| | 50WW600 | | 425 | 42 | 130 | | |
| | 50WW700 | | 430 | 43 | 130 | | |
| | 50WW800 | | 385 | 48 | 107 | | |
| | 50WW1000 | | 360 | 50 | 100 | | |
| | 50WW1300 | | 360 | 52 | 100 | | |
| | Semi-process type non-oriented silicon steel | | BDG | 0.50 | 385 | 46 | 155 |
| | | | 50WGB350 | | 350 | 40 | 130 |
| | | | 50WGB400 | | 360 | 40 | 120 |
| 50WGB430 | | 420 | 40 | | 160 | | |
| 50WGB500 | | 400 | 40 | | 150 | | |
| MW101 | | 385 | 40 | | 125 | | |
| Dedicated non-oriented silicon steel | | 0.65mm non-oriented | 0.65 | | 65W530 | 425 | 43 |
| | 65W800 | | | 380 | 50 | 110 | |
| | For relay and electromagnetic switch | 0.70 | 70WK340 | 545 | 36 | 190 | |
| | | | 70WK380 | | | | |
| | | 0.75 | DWK2-75 | 530 | 37 | 190 | |
| | | 0.80 | DWK2-80 | 530 | 37 | 190 | |
| | | 0.85 | DWK2-85 | 530 | 37 | 190 | |

Note: (1) The mechanical property adopts the horizontal sample measurement value (2) Measurement basis standard: GB/T 2522, GB/T 228.

Dimension scope (Supplied according to steel coil)

| Grade | Thickness mm | Width (mm) | | Single coil weight t |
|----------|--------------|--------------|-------------|----------------------|
| | | Edge cutting | Burring | |
| 35WW250 | 0.35 | 950 ~ 1100 | — | 2 ~ 7 |
| 35WW270 | | | | |
| 35WW300 | | 950 ~ 1200 | | 2 ~ 8 |
| 35WW360 | | | | |
| 35WW400 | | 950 ~ 1200 | | |
| 35WW440 | | 950 ~ 1200 | | |
| 50WW270 | 0.50 | 950 ~ 1100 | — | 2 ~ 8 |
| 50WW290 | | 950 ~ 1200 | | |
| 50WW310 | | 950 ~ 1200 | | |
| 50WW350 | | | | |
| 50WW400 | | 1000 ~ 1200 | 1000 ~ 1240 | 3 ~ 9 |
| 50WW470 | | | | |
| 50WW600 | | 1000 ~ 1200 | 1000 ~ 1250 | |
| 50WW700 | | | | |
| 50WW800 | | | | |
| 50WW1000 | | | | |
| 50WW1300 | | | | |

Allowable dimension difference

| Nominated thickness mm | Allowable thickness difference mm | | Horizontal thickness difference mm | | Allowable width difference mm |
|------------------------|-----------------------------------|---------------|------------------------------------|---------------|-------------------------------|
| | High grade | Regular grade | High grade | Regular grade | |
| 0.35 | ± 0.015 | ± 0.015 | ≤ 0.020 | ≤ 0.012 | + 1.5 0 |
| 0.50 | ± 0.015 | ± 0.020 | ≤ 0.015 | ≤ 0.015 | |
| 0.65 | ± 0.030 | ± 0.030 | ≤ 0.020 | ≤ 0.020 | |
| 0.70 | ± 0.030 | | ≤ 0.020 | | |
| 0.75 | ± 0.030 | | ≤ 0.025 | | |
| 0.80 | | | | | |
| 0.85 | | | | | |

Selection of the surface insulation coating

The non-oriented silicon steel normally adopts the semi-organic insulation coating, and coating of other types can also be adopted according to the customer's requirements. The semi-process product has no insulation coating on the surface, so the customer should have annealing conditions.

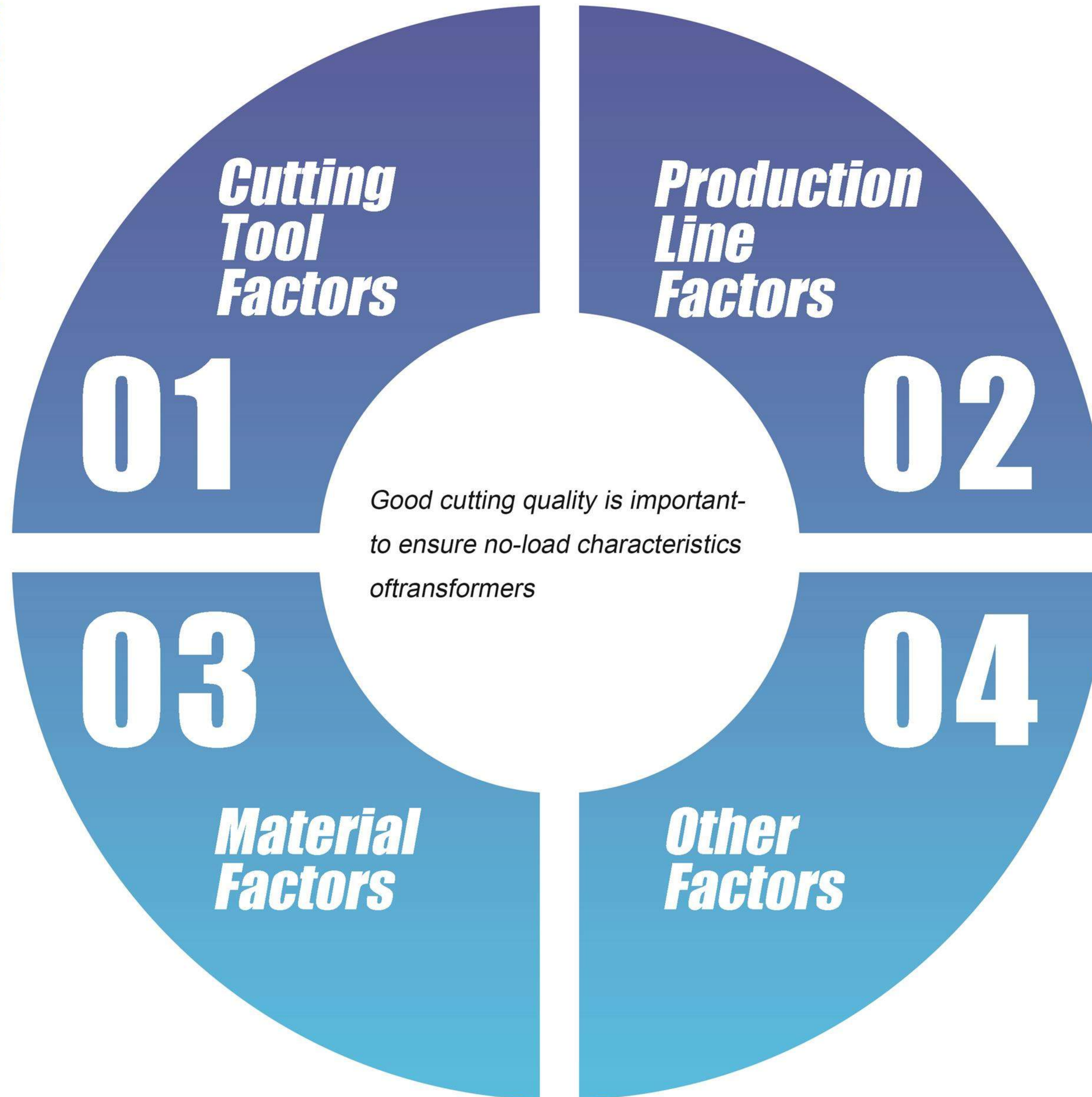
Lab conditions of iron loss and magnetic property parameter

All the grades can ensure that the supplied property is lower than the maximum iron loss, and higher than the minimum magnetic strength and minimum stacking coefficient. Unless otherwise specified, the iron loss is the value at 1.5T and 50Hz, and the specified magnetic strength is the value at 5000A/m.



- ▶ Blade condition
- ▶ Gap between blades
- ▶ Overlap
- ▶ Grinding precision
- ▶ Grinding cycle

- ▶ Material thickness
- ▶ Mechanical properties
- ▶ Coil state
- ▶ Defects
- ▶ Coating



- ▶ Production line
- ▶ Production speed
- ▶ Feed centering
- ▶ Stability

- ▶ Gap between platens
- ▶ Tension pressure
- ▶ Position of guides
- ▶ Separation

