

OSAN

INDUSTRIAL ELEMENTS

GRAIN-ORIENTED ELECTRICAL STEEL

TECHNICAL CATALOG

Grain-Oriented Electrical Steel
for Transformer Core Systems.



GRAIN-ORIENTED ELECTRICAL STEEL

Grain-oriented electrical steel is engineered for transformer core systems requiring controlled core loss and defined magnetic performance.

The material structure is aligned in the rolling direction, enabling high magnetic permeability and efficient energy transfer under operating conditions.

It is applied in power and distribution transformer systems where performance stability and efficiency are critical.

MANUFACTURING PROCESS

- 01 — Hot Rolling
- 02 — Pickling & Preliminary Annealing
- 03 — Cold Rolling
- 04 — Decarburization Annealing
- 05 — High Temperature Annealing
- 06 — Heat Flattening & Insulation Coating
- 07 — Inspection & Laser Scribing



CORE LOSS (W/kg – 50Hz) – W17/50

Grade	Thickness (mm)	Core Loss W17/50
23PHD080	0.23	0.80
23PH085	0.23	0.85
27PH095	0.27	0.95
30PH105	0.30	1.05
35PG120	0.35	1.20
35PG135	0.35	1.35
35PG155	0.35	1.55

MAGNETIC FLUX DENSITY (B8 – Tesla)

Grade Series	B8 (T) @ 800 A/m
PHD Series	~ 1.91
PH Series	1.88 – 1.91
PG Series	~ 1.80

THICKNESS RANGE

Product Type	Thickness (mm)
PHD	0.23 – 0.30
PH	0.23 – 0.30
PG	0.27 – 0.35

LAMINATION FACTOR

Parameter	Value
Lamination Factor	94.5 – 98.0 %

COATING TYPE

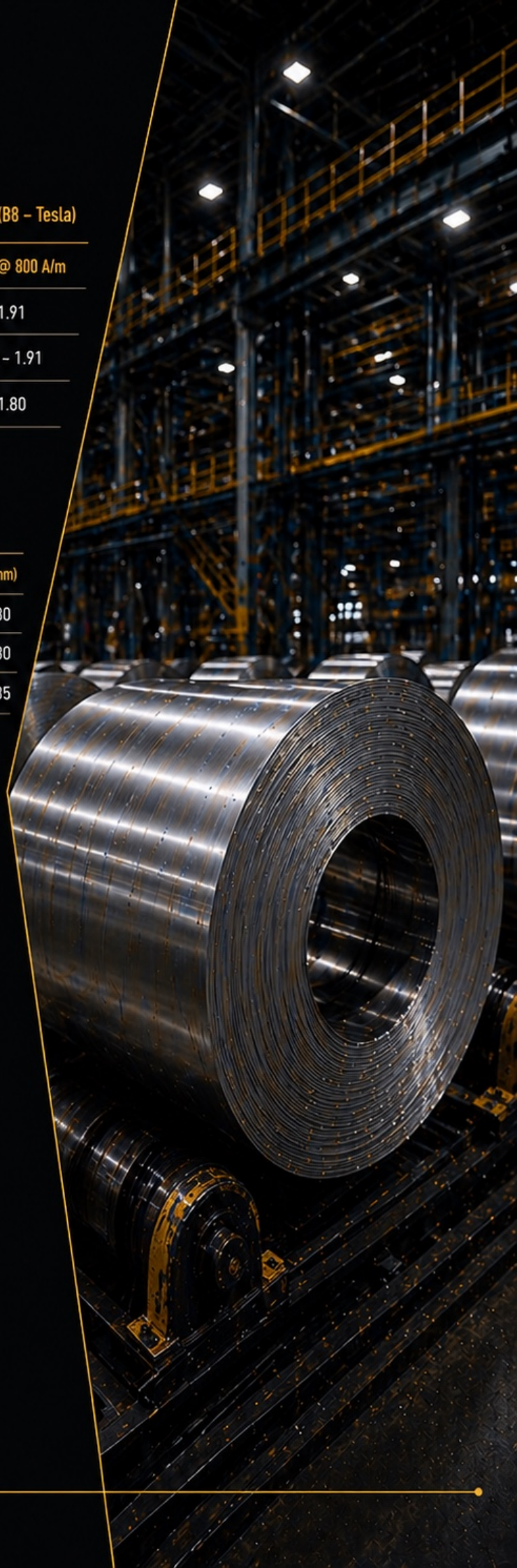
Parameter	Value
Coating	Inorganic insulation coating
Base Layer	Forsterite (Mg ₂ SiO ₄)

TEST CONDITIONS

Parameter	Condition
Frequency	50 Hz
Core Loss Measurement	W17/50
Flux Density Measurement	B8 @ 800 A/m

STANDARDS

Standard	Description
IEC 60404-2	Magnetic testing
JIS C2550	Electrical steel
JIS Z2241	Tensile test
JIS Z2244	Hardness test



PG-CORE

GRAIN-ORIENTED ELECTRICAL STEEL
FOR TRANSFORMER CORE APPLICATIONS

PG-CORE GRADE LIST AND TYPICAL PROPERTIES

Grade	Nominal Thickness (mm)	Core Loss $W_{17/50}$ (W/kg)	B_8 (T) @ 800 A/m (Min.)
23PGH080	0.23	0.80	1.91
23PGH085	0.23	0.85	1.91
27PGH095	0.27	0.95	1.88
30PGH105	0.30	1.05	1.88
35PGH120	0.35	1.20	1.80
35PGH135	0.35	1.35	1.80
35PGH155	0.35	1.55	1.80

STANDARD SIZE

Thickness (mm)	0.23 / 0.27 / 0.30 / 0.35
Width (mm)	900 – 1250
Length (mm)	Coil (C)

SPECIFICATION

Standard	IEC 60404-2
Material	Grain-oriented silicon steel
Coating	Inorganic insulation coating

DIMENSION AND SHAPE TOLERANCES

Item	Unit	Tolerance
Thickness	mm	± 0.02
Width	mm	+5 / -0
Length (Coil)	mm	—
Flatness	mm/m	≤ 2.0
Edge	mm	≤ 0.05
Camber	mm	≤ 2.0

TYPICAL MECHANICAL PROPERTY AND LAMINATION FACTOR

Property	Unit	Value (Typical)	Condition / Note
Tensile Strength (R_m)	MPa	—	—
Elongation (A_{50})	%	—	—
Lamination Factor	%	94.5 – 98.0	According to thickness



PH-CORE

GRAIN-ORIENTED ELECTRICAL STEEL
FOR TRANSFORMER CORE APPLICATIONS

PH-CORE GRADE LIST AND TYPICAL PROPERTIES

Grade	Nominal Thickness (mm)	Core Loss $W_{17/50}$ (W/kg)	B_8 (T) @ 800 A/m (Min.)
23PH080	0.23	0.80	1.91
27PH095	0.27	0.95	1.88
30PH105	0.30	1.05	1.88

STANDARD SIZE

Thickness (mm)	0.23 / 0.27 / 0.30
Width (mm)	900 – 1250
Length (mm)	Coil (C)

SPECIFICATION

Standard	IEC 60404-2
Material	Grain-oriented silicon steel
Coating	Inorganic insulation coating

DIMENSION AND SHAPE TOLERANCES

Item	Unit	Tolerance
Thickness	mm	± 0.02
Width	mm	+5 / -0
Length (Coil)	mm	—
Flatness	mm/m	≤ 2.0
Edge	mm	≤ 0.05
Camber	mm	≤ 2.0

COATING AND LAMINATION

Coating Type	Inorganic insulation coating
Lamination Factor	94.5 – 98.0 %



PHD-CORE

GRAIN-ORIENTED ELECTRICAL STEEL
FOR TRANSFORMER CORE APPLICATIONS

PHD-CORE GRADE LIST AND PROPERTIES

Grade	Nominal Thickness (mm)	Core Loss $W_{17/50}$ (W/kg)	B_8 (T) @ 800 A/m (Min.)
23PHD085	0.23	0.60	1.92
27PHD090	0.27	0.70	1.90
30PHD105	0.30	0.80	1.90
23PHD115	0.23	0.65	1.93
27PHD120	0.27	0.75	1.91

STANDARD SIZE

Thickness (mm)	0.23 / 0.27 / 0.30
Width (mm)	900 - 1250
Length (mm)	Coil (C)

SPECIFICATION

Standard	IEC 60404-2
Material	Grain-oriented silicon steel
Coating	Inorganic insulation coating

DIMENSION AND SHAPE TOLERANCES

Item	Unit	Tolerance
Thickness	mm	± 0.02
Width	mm	+5 / -0
Length (Coil)	mm	—
Flatness	mm/m	≤ 2.0
Edge	mm	≤ 0.05
Camber	mm	≤ 2.0

COATING AND LAMINATION

Coating Type	Inorganic insulation coating
Lamination Factor	94.5 - 98.0 %



INSULATION & SURFACE TECHNOLOGY

ELECTRICAL INSULATION SYSTEMS FOR GO ELECTRICAL STEEL

INSULATION COATING SYSTEMS

Parameter	Value
Coating Type	Inorganic insulation coating
Base Layer	Forsterite (Mg_2SiO_4)
Coating Application	Both surfaces
Lamination Factor	94.5 – 98.0 %
Standard	IEC 60404-2

COATING PROPERTIES

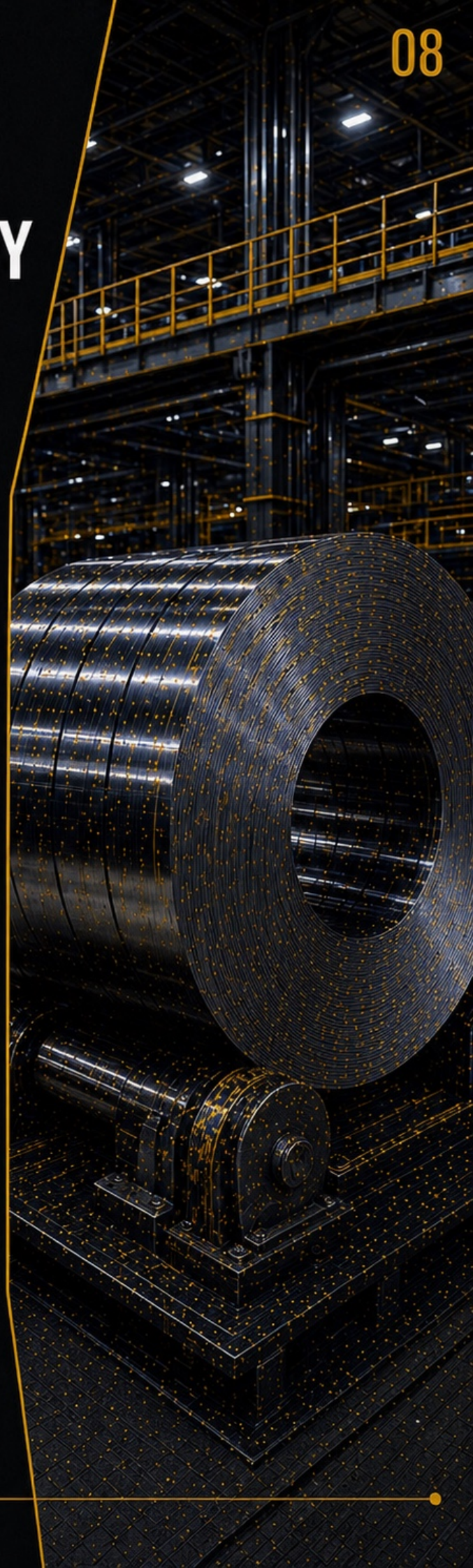
Property	Unit	Specification
Coating Mass (both sides)	g/m^2	0.50 – 1.50
Resistivity	$\Omega \cdot cm$	10^8 (Min.)
Breakdown Voltage	V/50 μm	≥ 500
Adhesion	Grade	1

ELECTRICAL INSULATION

Property	Unit	Specification
Insulation Resistance (R_{400})	$\Omega \cdot m^2/kg$	≥ 100
Breakdown Voltage	V/50 μm	≥ 500

SURFACE QUALITY

Item	Specification
Surface Condition	Smooth, clean and free from defects
Coating Uniformity	Uniform on both surfaces
Pinholes	Not visible at 20 \times magnification
Scratch Resistance	No peeling at specified test



GRAIN-ORIENTED ELECTRICAL STEEL PERFORMANCE MATRIX

MASTER TECHNICAL COMPARISON



MAGNETIC PROPERTIES (TYPICAL)

Property	Unit	23PHD085	27PHD090	30PHD105	23PH080	27PH095	35PG120	35PG135	35PG155	Test Standard
Core Loss (W17/50)	W/kg	0.60	0.70	0.80	0.80	0.95	1.20	1.35	1.55	IEC 60404-2
B ₈ @ 800 A/m	T	1.92	1.90	1.90	1.91	1.88	1.80	1.80	1.80	IEC 60404-2

PHYSICAL PROPERTIES

Property	Unit	23PHD085	27PHD090	30PHD105	23PH080	27PH095	35PG120	35PG135	35PG155	Test Standard
Thickness	mm	0.23	0.27	0.30	0.23	0.27	0.35	0.35	0.35	IEC 60404-2
Thickness Tolerance	%	± 2.5	± 2.5	± 2.5	± 2.5	± 2.5	± 2.5	± 2.5	± 2.5	IEC 60404-2
Surface Insulation Coating	—	Inorganic	Inorganic	Inorganic	Inorganic	Inorganic	Inorganic	Inorganic	Inorganic	IEC 60404-2
Coating Mass (both sides)	g/m ²	0.50–1.50	0.50–1.50	0.50–1.50	0.50–1.50	0.50–1.50	0.50–1.50	0.50–1.50	0.50–1.50	IEC 60404-2
Resistivity	Ω·cm	≥ 10 ⁸	≥ 10 ⁸	≥ 10 ⁸	≥ 10 ⁸	≥ 10 ⁸	≥ 10 ⁸	≥ 10 ⁸	≥ 10 ⁸	IEC 60404-2
Lamination Factor	%	94.5–98.0	94.5–98.0	94.5–98.0	94.5–98.0	94.5–98.0	94.5–98.0	94.5–98.0	94.5–98.0	IEC 60404-2

MECHANICAL PROPERTIES

Property	Unit	23PHD085	27PHD090	30PHD105	23PH080	27PH095	35PG120	35PG135	35PG155	Test Standard
Tensile Strength	MPa	≥ 350	≥ 350	≥ 350	≥ 350	≥ 350	≥ 350	≥ 350	≥ 350	IEC 60404-2
Elongation	%	≥ 20	≥ 20	≥ 20	≥ 20	≥ 20	≥ 20	≥ 20	≥ 20	IEC 60404-2

STANDARD

Item	Value
Applicable Standard	IEC 60404-2

DELIVERY CONDITION

Item	Value
Delivery State	Fully Annealed

NOTE

Typical values are based on standard test conditions and may vary depending on production parameters and final processing conditions.

APPLICATION MATRIX

Item	Unit	PG Series	PH Series	PHD Series
Transformer Type	—	Distribution	Distribution / Power	Power
Application Level	—	Standard	High Efficiency	Ultra High Efficiency
Core Design	—	Conventional	Step-lap	Step-lap
Flux Density Usage	T	≤ 1.80	1.88 – 1.91	1.90 – 1.93
Core Loss Level	W/kg	Standard	Low	Ultra Low



TRANSFORMER SYSTEM COMPATIBILITY

System Type	Applicable Series	Description
Distribution Transformer	PG / PH	Distribution transformer applications
Power Transformer	PH / PHD	Power transformer applications
High Voltage Transformer	PHD	High voltage transformer applications
Renewable Energy Transformer	PH / PHD	Renewable energy systems
Reactor Systems	PG / PH	Reactor and magnetic applications

CORE DESIGN RELATION

Parameter	Specification
Core Construction	Laminated core
Stacking Method	Step-lap
Joint Type	Step-lap
Lamination Direction	Rolling direction
Assembly	Standard stacking

OPERATING CONDITIONS (REFERENCE)

Parameter	Unit	Value
Frequency	Hz	50
Core Loss Measurement	—	W17/50
Magnetic Flux Condition	—	B ₈ @ 800 A/m

APPLICATION CHARACTERISTICS

Parameter	Description
Lamination Use	Transformer core
Operating Environment	Indoor
Compatibility	Standard assembly

STANDARD

Applicable Standard | IEC 60404-2

DELIVERY CONDITION

Delivery State | Fully Annealed

NOTE

Typical values are based on standard test conditions and may vary depending on final processing conditions.

MEASUREMENT SYSTEMS

Parameter	Symbol	Unit	Measurement Condition	Standard
Specific Core Loss	W	W/kg	W17/50	IEC 60404-2
Magnetic Flux Density	B	T	B _s @ 800 A/m	IEC 60404-2
Magnetic Field Strength	H	A/m	—	IEC 60404-2

STANDARD REFERENCES

Standard	Title	Description
IEC 60404-2	Magnetic materials – Part 2: Methods of measurement of the magnetic properties	Methods of measurement of electrical steel sheet and strip

MAGNETIC PROPERTY DEFINITIONS

Parameter	Definition
Specific Core Loss (W)	Total core loss per unit mass under specified frequency and flux density conditions.
Magnetic Flux Density (B)	Magnetic flux per unit area under specified magnetic field strength.
Magnetic Field Strength (H)	Magnetic field strength applied to the magnetic material.
Permeability (μ)	The ability of a material to support the formation of a magnetic field.

TEST CONDITIONS

Parameter	Unit	Condition
Frequency	Hz	50
Core Loss Measurement	—	W17/50
Magnetic Flux Density	T	B _s @ 800 A/m
Magnetic Field Strength	A/m	800
Sheet Thickness	mm	0.23
		0.27
		0.30
		0.35

ENGINEERING DEFINITIONS

Term	Definition
Grain-Oriented Electrical Steel	Electrical steel with oriented grains for low core loss and high magnetic performance.
Step-Lap Core	Core construction method using step-lap joints to reduce no-load losses.
Annealed Condition	Heat-treated condition to relieve stresses and optimize magnetic properties.
Lamination Factor	Percentage of lamination area effectively used in the magnetic circuit.



APPLICABLE STANDARD	DELIVERY CONDITION	NOTE
IEC 60404-2	Fully Annealed	Values and definitions are based on IEC 60404-2 and standard measurement practices.

OSAN INDUSTRIAL ELEMENTS

CONTACT & GLOBAL PRESENCE

12

HEAD OFFICE – OSAN HOLDING (DUBAI HQ)

1 Sheikh Mohammad Bin Rashid Blvd.
Burj Khalifa No:287, Downtown Dubai, UAE
executive.office@osanholding.com

TURKEY OFFICE

Maslak Mah. Meydan Sok. No:1
Beybi Giz Plaza No:55
Sarıyer, İstanbul, Türkiye
info@osanholding.com

GEORGIA OFFICE

Khelvachauri District
Village of Feria, 9th VI Lane No. 4
Georgia
georgia@osanholding.com

KOREA FACILITY

6262, Donghaean-ro, Nam-gu, Pohang-si
Gyeongsangbuk-do, 37877
Republic of Korea
korea@osanholding.com

RUSSIA FACILITY

pl. Metallurgov, 2
Lipetsk, 398040
Russia
russia@osanholding.com



STRUCTURED SUPPLY. CONTROLLED EXECUTION. INDUSTRIAL RELIABILITY.

WWW.OSANHOLDING.COM