

Cast Resin Transformers



Global Top Energy, Machinery & Plant Solution Provider



About HYOSUNG



Hyosung Power & Industrial Systems PG is a division under Hyosung which consists of seven performance groups(PGs). In addition to establishing itself as a world-class manufacturer of electrical equipments, green technology and industrial machineries, Hyosung is also the largest producer of tire cords and spandex in the global market and the second largest supplier of ATMs in the USA.

01 Our Business

Brief introduction of Hyosung Power & Industrial Systems

Hyosung Power & Industrial Systems Performance Group

Hyosung Power & Industrial Systems Performance Group(PG), a comprehensive energy solution provider, boasts world-leading technology in the global power industry and has secured a competitive capability on par with that of top competitors in transformers, switchgears, motors, generators, gear units, industrial machineries, industrial pumps, and wind energy business.

With globalization as one of our top priorities, we have achieved outstanding increase in sales over the past few years thanks to the enhancement in Hyosung's quality, technology, and brand recognition among overseas clients, which include North America, Europe, the Middle East, and Asia. We expect such robust performance, marked by an increasing number of orders from the overseas market, to continue in the future.

At the heart of our capability to grow as a comprehensive energy solution provider is our global organization structure. Hyosung Power & Industrial Systems PG is divided into four business areas or performance units(PU), depending on the types of flagship products : Power Systems PU, Industrial Machinery PU, HYOSUNG GOODSPRINGS PU, and the Wind Energy Business Division.



Power Systems Performance Unit

Hyosung's Power Systems PU provides a full spectrum of power generation, transmission, and distribution services, from design and engineering to the maintenance of equipment. Power System PU has been building up on cutting-edge information technology resources and developing substation automation systems, such as power monitor and control systems, and early detection and prevention systems.

Such vast product assortment and technical know-how is based on our product development history. In 1992, Hyosung was the first in Korea, and the sixth in the world, to develop a 765kV ultra-high voltage (UHV) transformer, and, in 1999, was the first in the world to manufacture the 2-breaker 800kV gas insulated switchgear (GIS). Those technological achievements gave Hyosung world-wide recognition as one of the global major manufacturers.

The Power systems PU is continuously striving to secure competitiveness in every aspect of quality, technology, sales, services, and management, in order to satisfy customer needs globally and become a top-tier company in the world by providing customers with the best quality products and services in the power systems sector.



Cast Resin Transformers

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02 Sustainability

Our sustainability principles are the backbone of the way we design and manufacture products

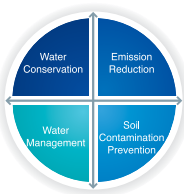
Quality Management System

Customer-focused Management System

Concentration on Core Competencies

Quality Assurance

Hyosung strives for excellence. We believe excellence can only be achieved through absolute quality and value for customers. In order to create quality products, we believe that all of the actions of every single employee must be focused in the highest level of quality. In order to achieve such levels, we have implemented a quality assurance policy and programs that make our philosophy into a reality. Our Quality Assurance Policy was founded based on the management policy of the president and meets the demands of ISO 9001. As a globally active company, we are committed to comprehensive and quality management through three quality strategies: quality management system, customer-focused management system, and concentration on core competencies. The comprehensive quality management system ensures that we completely comply with all compliances and applicable legislation, codes, and standards in addition to implementing efficient operation of our management resources to eliminate unnecessary waste. Our customer-focused management system clarifies and simplifies our first priority which is customer satisfaction. All of our work is aimed to exceed customer needs and provide exceptional value through quality standards, flexibility, and innovation. Finally, we concentrate on our core competencies for strict quality control and continual improvement which provides quality products and cost-saving to our clients via advancement in technical capacity and technological innovation. We implement our policy via a Quality Management Team manages research laboratories, including the Measurement Standard Laboratory, the Chemical Analysis Laboratory and the Material Analysis Laboratory to maintain a strict control over quality.



Environment Protection Policy

Hyosung understands the impact of Hyosung's activities in the environment and works to protect the environment from pollution, manages the environmental impacts of Hyosung's products and technologies, and prevents future pollution and harmful effects in the environment by investing in environmentally-friendly products and solutions. Based on this eco-philosophy of shared responsibility, Hyosung has implemented a comprehensive environmental protection program that aims to minimize our impact on the environment and conserve resources. Our environmental policy fulfils all requirements of the ISO 14001.

03 R&D

Inspiring innovation, creation and expertise

Hyosung R&D Center identifies innovation, creation, and expertise as core value, and concentrates on world class R&D activities in the 21st century with a philosophy aspiring after customer satisfaction, quality priority, and performance orientation. Hyosung pursues to be the world's best company in the field of heavy electrical machinery, industrial & electrical electronics engineering, and energy system. Ever since establishment in 1978, R&D Center had led the development of domestic technology. Along with the Anyang and Changwon labs, the group has endeavored to produce core technology and world-class products in the areas of heavy electrical machinery, energy system, electrical electronics engineering, and industrial automation system.

Research Areas

Hyosung R&D Center engages in the activities in the field of energy system, solution & service, applied electrical and electronic technology, basic core technology, technology of improved reliability, core components, and new materials.

Energy System

- Renewable energy (wind system, wind turbine, wind PCS, solar system, PV PCS, fuel cell, co-generation)
- Electric Vehicle (EV charger, EV motor)

Solution & Service

- Power facility diagnosis algorithm and system
- Power facility lifecycle evaluation system
- Service solution for remote diagnosis for prevention

Applied Electrical & Electronic Technology

- Power conversion system
- Flexible AC transmission system and high voltage direct current
- Power quality solution

Basic Core Technology

- Fortified technology in structural dynamics, electromagnetics, heat transfer analysis, etc.
- Skills for system simulation, analysis and evaluation
- Business support technology

Technology with Improved Reliability

- Test data analysis and testing facility
- Analysis of lifecycle and cause of error
- Reliability assessment (environment-friendliness, durability, long-term degradation, and more)

Core Components and New Materials

- Organic and inorganic insulation materials
- Silicon forming technology
- Intelligent sensor (facility diagnosis, CT, PT, VT, LA, and more)

Cast Resin Transformers



General

Hyosung has led the world cast coil industry for 25 years after developing Cast Resin Transformers in 1982. Hyosung has introduced a rectifier transformer, an amorphous transformer and a high-efficiency transformer with its own technology. Hyosung will continue to maintain the superior quality that can satisfy all of its customers around the world, and will endlessly continue its efforts to provide the value its customers truly desire.

Hyosung manufactures Cast Resin Transformers under IEC, JEC, ANSI, CESI, KEMA and every required national standard. Hyosung Cast Resin Transformers are designed to withstand all environmental hazards, high vibration, fire risk, heavy shocks, etc.

Technology

Features

Self-extinguishing characteristics of epoxy significantly reduces the spread and effect of a fire, and the possibility of explosion is nearly non-existent

Easy transportation and installation with simple structure

No toxic substance (oil or gas) discharged

Extended lifetime

- Adopts a higher class epoxy resin
- Epoxy Resin: uses H class epoxy resin, which is higher than the standard F class, as the main insulation material of the mold transformer to control thermal aging and extend the overall lifetime of the transformer by three-folds. Provides also higher overload capacity.

High stability and durability with strict quality management

- Adopts a higher class epoxy resin
- Vacuum Casting for HV & LV Coils : · High mechanical (No - Crack) and electrical strength · High Short-Circuit Strength · No air-bubble or void inside a coil · Free of partial discharge
- Insulation System : · Operates in humid places (environments with humidity higher than 95%) with varying temperature conditions · Resistance against the Extreme Temp. (-25°C ~ +50°C)
- High Short-time overload capacity safe under fluctuating loads
- Space Saving : Compact design based on our accumulated experience
- Winding structure : when the radial build (RB) of the Vacuum-Cast winding is large, the temperature gradient between the imbedded conductor and the outer surface of the winding gets higher, then cracks in the epoxy body may cause partial discharges. Therefore, when the RB is large, air ducts are inserted splitting the RB in thinner sections, then the temperature gradient between the imbedded conductor and the outer surface is reduced and cracking is prevented.
- When the air ducts are inserted, the electric field distribution of the Vacuum-Cast winding is improved and the withstanding voltage becomes more resilient against external surge.
- Vacuum-Casting process quality management : By strengthening quality management and a strict control of the Vacuum-casting process which determines the electrical and mechanical quality of the windings, the quality of the Vacuum-casting is performed (*The epoxy casting material is tested regularly and is required for checking the Tg (Glass transition temperature), the temperature at which the epoxy mix transits from the solid glass-like state of the solid polymer to the flexible rubber-like elasticity state as well to control the reactivity and the gel time of the epoxy casting system to maintain process stability.)
- By adopting the latest analysis technique, the transformer can be operated under severe conditions.

Installation Site

Scott connected transformer, Grounding transformer, Auto transformer

Where the installation condition is limited

Where fire prevention is required (Flame Retardancy)

Where customers request reliability

Transformer for special load : Inverter, converter, UPS system, electric arc furnace, variable transmission drive, electric welding device, industrial process control

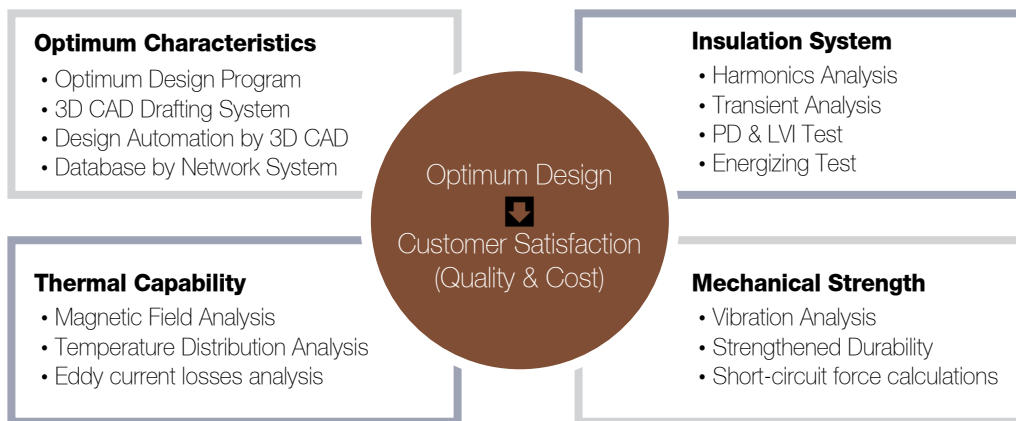
Where the eco-friendly and environment-resistance is necessary

- Common and public facilities : Condominiums, hotels, studio apartments, shopping malls, hospitals, and other public facilities
- Manufacturing factories : Automobile factories, semiconductor factories, and chemical factories
- Ships and renewable energy facilities : LNG ships, electric propulsion ships, and wind power generation systems
- Special areas : Power plants (nuclear, water, fire, wind, and tidal), airports, subways, container cranes, and tunnel excavation work

Design Concept

Design Concept

Basic Design Concepts



Transformer Tests

For the best quality, all tests are based on international standards, and our customers' requirements.

We guarantee the best quality of our products testing the following :

Routine Test

- Appearance Check
- Measurement of Insulation Resistances
- Measurement of Winding Resistances
- Measurement of Voltage Ratios
- Check of Voltage Vector Relationship
- Measurement of Impedance Voltage & Load Loss
- Measurement of No-Load Loss & Exciting Current
- Power Frequency Withstand Voltage Test
- Induced Over-Voltage Withstand Test
- Core to Frame Insulation Test
- Partial Discharge Test (below 10pico)

Line Test (for perfect quality management)

- Gel Time Test : Measures whether resin is adequately mixed at a right ratio
- Tg Test : Measurement of Tg. (Glass-Transition Temperature) for right mixing of resins
- ASH Content Test : Measures whether filler is evenly distributed

Type Test

- Impulse Test
- Temperature Rise Test
- Sound Level Test

Special Test

- Short Circuit Test
- Fire Behavior Class Test by FILK
- Seismic Test
- Thermographic Imagery Analysis
- Climatic Class Test
- Environmental Class Test

Accessories

Cooling Fan & Controller

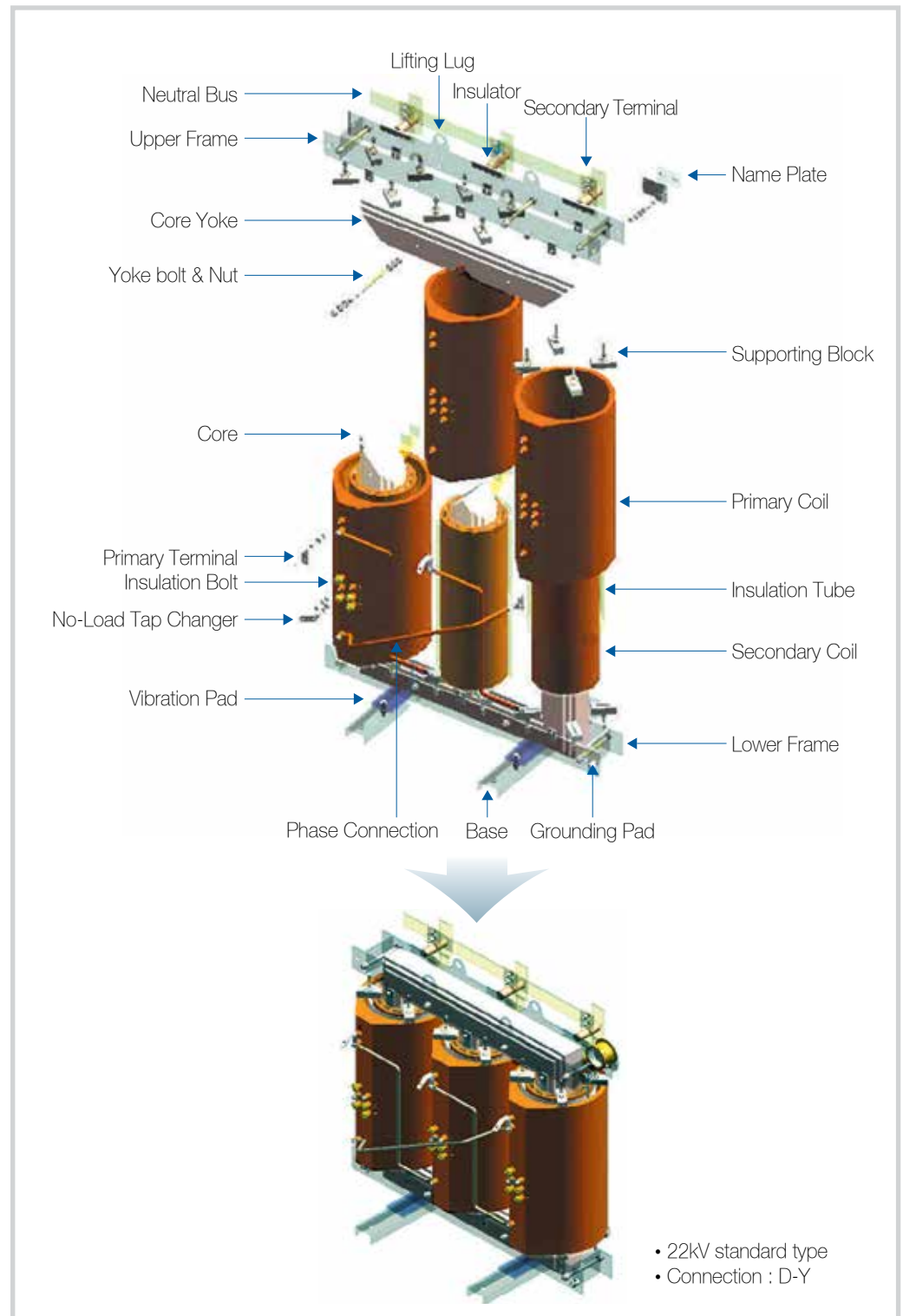
Selection is made in consideration of the cooling requirements, enclosure type and location

Temperature Sensor (GW-03)

A sensor, to measure the winding temperature, is installed in the secondary coil. The controller is equipped with a circuit that enables to turn on/off the Fans

Construction

Assembly Diagram



Products and Details

Product Scope

Hyosung offers three-phase and single-phase Cast Resin Transformers in the following ratings :

- **Rated Frequency** : 50Hz or 60Hz
- **Thermal Insulation Class** : B, F
- **Winding Conductor** : Aluminum or Copper
- **Capacity Available** : From 100kVA up to 40MVA
- **High Voltage** : 36kV, 24kV, 17.5kV, 12kV, 7.2kV, 3.6kV, ≤1.1kV
- **Low Voltage** : 6.6kV or 3.3kV, 600V below
- **Coil Temperature Rise**
 - Primary : 80°C, 100°C
 - Secondary : 80°C, 100°C
- **Applied Standards** : IEC, ANSI, NEMA, DIN, JEC
- **Basic Lightning Impulse Insulation Level (BIL)** : up to 170kV

Item	Description						
Voltage Class	36kV	24kV	17.5kV	12kV	7.2kV	3.6kV	≤1.1kV
BIL	145/170kV	95/125kV	75/95kV	60/75kV	40/60kV	20/40kV	—

Standard Specification

Classification		Description						
Installation Area		Indoor						
Rated Voltage (kV)	1st Voltage and Tap Voltage	F23.9-R22.9-21.9-20.9-19.9				F6.9-R6.6-6.3-6.0-5.7 F3.45-R3.3-3.15-3.0-2.85		
	2nd Voltage	6.6 or 3.3	0.38-0.22	0.22-0.11	0.38-0.22			
Phase		3ph	3ph	1ph	3ph			
Standard Connection		△ -△	△ -Y	1ph 3-wiring	△ -Y			
Rated Capacity(kVA)			75	75	75			
			100	100	100			
			150	150	150			
			200	200	200			
			300	300	300			
			500	500	500			
			750	750	750			
			1,000	1,000	1,000			
			1,500	1,500	1,500			
			2,000	2,000	2,000			
			3,000	3,000	3,000			
			4,000	4,000	4,000			
			5,000	5,000	5,000			
			7,500					
	10,000							
	15,000							
	20,000							
Frequency		50, 60Hz						
Insulation Class		Primary : F, B Secondary : F, B						
Average Winding Temperature Rise Standards		Primary : 100°C, 80°C				Secondary : 100°C, 80°C		
Dielectric Strength / Voltage Class		36kV	24kV	17.5kV	12kV	7.2kV	3.6kV	≤1.1
Power Frequency Withstand Voltage		70kV	50kV	38kV	28kV	20kV	10kV	3kV

Application



General and public buildings



- Apartments
- Hotels
- Shopping centers
- Hospitals
- Other public buildings

Industrial plants



- Vehicle plants
- Semi-conductor plants
- Chemical plants

Marine and new energy generation facilities



- LNG vessel and electric-driven vessels
- Wind Turbines
- Photovoltaic generation

Special public service projects



◀ Wolseong atomic power plant 7.5/10MVA (supplied in 1995, currently in preparation of replacement)



- Power plants (atomic, hydroelectric, thermal, wind, tidal)
- Airports
- Subways
- Container cranes
- Tunnel excavation

Special load applications



- Inverter & Converter
- Electric Arc Furnaces
- Electric Welding Equipment
- Industrial Process Controls
- UPS Systems
- Adjustable Speed Drives

Special Transformers

Customized Transformers for buildings and apartments

Withstands against harmonic waves distortion in general buildings

Hyosung transformers are designed to ensure safe power supply under harmonic distortion.

Low-loss type

Our Cast Resin Transformers are designed to meet today's high efficiency standards requirements.



Transformer for IT Centers

Quiet environment for substations

To create a quiet working environment, the noise level of transformers is kept at a minimum level, Using anti-vibration rubber Pads.

Provision for UPS load

We produce transformers which are designed to withstand neutral harmonics, depending upon work place conditions.



Moisture-proof

Both high and low-voltage coil windings are casted to prevent humidity ingress.

Transformer for Inverters and Converters

Withstands against harmonic waves distortion

Hyosung transformers are designed to withstand harmonic waves by lowering the magnetic flux density thus minimizing noise and vibration.

Strengthened durability

Both high and low-voltage coil windings are designed with increased mechanical strength to bear short-time overload.



Measurement of harmonic wave distortion at customers' site

Hyosung can provide on site THD(Total Harmonic Distortion) and harmonics load distribution measurements after installing a transformer, Providing feedback to customers upon request.

Transformers for Semi-Conductor Plants

Provision for DC and inverter loads

Voltage regulation is minimized, and noise and vibration are kept at low level.

Environment-friendly transformer

With easy and minimum maintenance, Hyosung's Transformer keeps clean and safe the environment.



High reliability and safety

Both high and low-voltage coil windings designed with increased mechanical strength to bear short-time overload.



Transformers for Wind Turbines

More stability during the operation

SA (surge absorber) is equipped as default, and the BIL voltage can be increased up to 170BIL upon request to reflect changing climate conditions.

Locating substation within Nacelle

Considering the vibration caused from the blade, Hyosung transformer is equipped with earthquake-proof design as well.



Transformers for Photovoltaic Power Generation

Minimizing no-load loss(high-efficiency transformer)

Considering long stand-by periods and low average load of 15~20% due to climate conditions, the transformer is designed to minimize no-load loss to enable high quality power generation with remarkable efficiency and performance.



Longest durability of 20 years

The transformer is built with the leading edge technology and high quality materials to ensure maximum durability.

Transformers for Vessels

Special installation

Hyosung transformers are designed to operate optimally at temperatures up to 55°C and reinforced to withstand extreme vibration.

Global service network

To ensure timely customer service, the Hyosung network is established worldwide (Pittsburgh, L.A., Rio de Janeiro, Rotterdam, Singapore, Shanghai, etc.)



Transformers for Other Customers

Hyosung can design and produce customized transformers to accommodate various needs of customers.

Transformers for hotels

24-hour loads, high stability, environment-friendly, low-noise

Transformers for hospitals

Resistance against harmonic waves distortion, stable power supply

Transformers for sewage treatment plants

Transformers for broadcasting systems, colleges, etc.



High Efficiency Cast Resin Transformers

Uses domain refinement core steel to improve the energy efficiency.

Currently more than 5% of transmitted power is lost due to inefficient power and distribution transformers. Market demand is high for energy-saving (high-efficiency) transformers. Hyosung successfully developed a 3000kVA high-efficiency transformer, to save costs and improve quality of electricity service.



Features

Reduction in no-load loss

The use of magnetic's domain-refined steel laminations for the core (magnetic circuit), which saves stand-by electricity usage by decreasing no-load loss by more than 50% compared to Cast Resin Transformers made of regular grain oriented steel.

Reduction in load loss

Improved coils winding method decreases load loss by more than 20%.

Noise reduction

Environmentally friendly as the noise level is lower than international standards from 5 to 11dB

Withstands against harmonic wave distortion

Can be used under harmonic waves (k-factor 8)

Maximum overload capacity

The thermal time constant of our high efficiency transformers is longer, allowing more margins for winding temperature rise during short-time overload.

Large capacity

Can reach capacity up to 40MVA

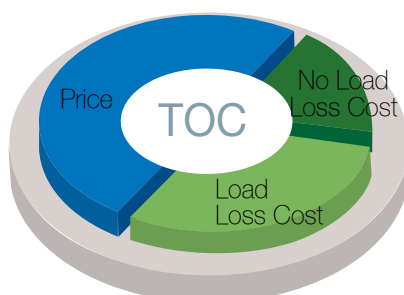


Economic Benefit of Cast Resin Transformers

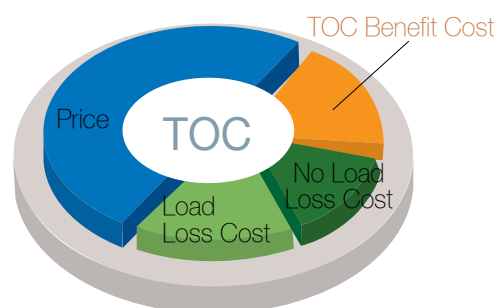
Usually the 'product purchase' method is used to explain economic benefits of high-efficiency Cast Resin Transformers.

Costs are evaluated for the Total Owning Cost (TOC) by adding the product price and operating cost (electricity).

$$\text{TOC (Total Owning Cost)} = \text{Initial Purchase Price} + \text{Energy Losses (No-load Loss + Load Loss) Capitalization Cost}$$



General Cast Resin Transformers



High-Efficiency Cast Resin Transformers

※The following chart shows that a high-efficiency Cast Resin Transformers uses less electricity and saves cost in the long run, although it requires higher initial investment than general Cast Resin Transformers.

Core Laminations made of Magnetic Domain Refined Steel

- The product reduced core loss by forcefully distributing the magnetic domain.
- Both mechanical and chemical methods such as laser treatment and geared roll are used.
- In case of laser treatment, core loss deteriorates if the temperature becomes higher than 500 degrees.

Total Quality Assurance

At Hyosung, our goal is not only to meet the needs of our customers today but also to provide them better life in the future.

Hyosung's total quality commitment to our customers is demonstrated by providing the highest quality product at the most competitive prices with on time delivery. We achieve these high quality levels through our integrated quality assurance program. Our products are used extensively both at home and abroad.

This level of experience allows Hyosung's quality assurance and reliability to exceed those of our competitors. We share our customer's goals with high quality products. From design to assembly, testing and installation, our customers' requirements are our minimum standards.

All tests are based on International standards and our customers' requirements. Through additional testing, Hyosung seeks to exceed established testing criteria, thereby producing more reliable products.

Our special process operators and technicians are highly trained. Continued professional growth and advanced training is encouraged through internal training groups and outside courses.

All our products have ISO 9001 and ISO 14001 certifications.

At Hyosung, we endeavor to maintain the highest quality.

Scope

In line with major international standards for quality assurance, the quality assurance program of our plants includes the following elements.

- Contract review
- Inspection/test control
- Design control
- Measuring and test equipment
- Procurement document control
- Storage, handling and shipping
- Purchased materia
- Nonconforming item
- Identification
- Quality assurance records
- Special Process



ISO 9001



ISO 14001



OHSAS 18001



Product Development History

Year	Milestones
2009	ABS Type Test Transformer for Marine Use
2006	AL Foil Type Transformer
2005	Developed Domain Refinement Cast Resin Transformer
2002	Developed Amorphous Transformer
2001	Developed Cast Resin Transformer for Outdoor Use
2000	Developed F1 Class Transformer
1999	Technical Cooperation with HTT
1998	2221kVA Transformer for Rectifiers KEMA Type Test

Year	Milestones
1997	1600kVA Italy CESI Type Test
1995	Successful Type Test of 1000/1333kVA Transformer for Hydro/Coal-fire P/P
1990	Successful Type Test of M&C Type 1000kVA Transformer
1988	Technical Cooperation with M&C
1985	Developed Pre-Preg Cast Resin Transformer
1982	Developed the First Cast Resin Transformer in Korea

Global Network



Specification for Cast Resin Transformers



1. General Scope
2. Applicable Code & Standard
3. Service Condition
4. Structure
5. Insulation Strength
6. Accessories
7. Technical Particulars & Guarantees
8. Construction & Component
9. Dimension & Weight (Detail)



HYOSUNG Project NO.	Transformer Rating
HS-H400CRT	3 PHASE 50Hz, 400kVA 22kV / 400V
HS-H630CRT	3 PHASE 50Hz, 630kVA 22kV / 400V
HS-H750CRT	3 PHASE 50Hz, 750kVA 22kV / 400V
HS-H1000CRT	3 PHASE 50Hz, 1000kVA 22kV / 400V
HS-H1250CRT	3 PHASE 50Hz, 1250kVA 22kV / 400V
HS-H1600CRT	3 PHASE 50Hz, 1600kVA 22kV / 400V
HS-H2000CRT	3 PHASE 50Hz, 2000kVA 22kV / 400V
HS-H2500CRT	3 PHASE 50Hz, 2500kVA 22kV / 400V
HS-H3150CRT	3 PHASE 50Hz, 3150kVA 22kV / 400V

Specification for Cast Resin Transformer

1. General Scope

This specification describes three phases, cast resin transformer suitable for indoor installation under the climatic condition mentioned herein and information about the following transformer designed and manufactured by Hyosung Corporation.

2. Applicable Code & Standard

The transformer covered by this specification will be manufactured and tested in accordance with IEC 60076 Code. Any other details specifications not specified here will be applied by the standards of Hyosung.

IEC 60076-11
Dry type power transformer

ISO 9001:2000
Quality Management System
Requirements

3. Service Condition

The transformer will be designed for use in following conditions.

Site Condition	Indoor
Altitude	Up to 1000 m above sea level
Monthly average of the hottest month	Less than 30 °C
Ambient Air Temperature	Maximum 40 °C Minimum -5 °C
Test Reference Temperature	120 °C
Relative Humidity	Less than 100%

4. Structure

4. 1 Core

The iron core of high-grade alloy low-loss grain oriented cold rolled sheets, with resistance double sided insulation. The limbs and yokes are circular, carefully interleaved and multiply stepwise arranged. The whole core is coated with resin as a protection against corrosion by means of a rigid core pressing construction.

4. 2 Windings

The high voltage and low voltage windings are of Aluminum conductors and both impregnated and casted under high vacuum into moulds, which process forms the insulation system of uniform glass-fiber-epoxy laminated highest electrical and mechanical quality. The high voltage and low voltage windings withstand the highest mechanical and short circuit strength. The thermal shock proof even at the highest and at the lowest temperature.

4. 3 De-Energized Tap-Changer (DETC) / No-Load Tap-Changer (NLTC)

In case of necessary, the variation of the transformer ratio is effected by reconnectable links on the high voltage sides. (The transformer is only de-energized.)

Power Loss Saving & High Efficiency

5. Insulation Strength

Rated Voltage	Applied Potential Test Voltage (kV)	Impulse Voltage Full Wave (kV)	Induced Voltage (V)
22kV	50	125	Rated Voltage x 2
Below 600V	3	-	Rated Voltage x 2

6. Accessories

<input type="checkbox"/> Name plate	<input type="checkbox"/> PT 100 ohm (Sensor)
<input type="checkbox"/> Primary & Secondary Terminals	<input type="checkbox"/> Anti-Vibration rubber pads
<input type="checkbox"/> Grounding Terminal	<input type="checkbox"/> Cooling Fan (w/duct)
<input type="checkbox"/> Neutral terminal	<input type="checkbox"/> Temperature controller
<input type="checkbox"/> De-energized tap changer links	- Power supply : Free voltage, AC 90~260V, 50~60Hz - Power consumption : 6.5W - Measuring range : 0~200°C - Case dimension : 164(W) x 117(D) x 81.5(H), mm
<input type="checkbox"/> Protective caps for tap	
<input type="checkbox"/> Danger Marks	
<input type="checkbox"/> Lifting lugs	

Certificate List

Short circuit test	Climatic, environmental and fire behavior classes
- 3P 3000kVA certified by KERI - 3P 2000kVA certified by KERI - 3P 1600kVA certified by CESI - 3P 1500kVA certified by KERI - 3P 1000kVA certified by KERI - 3P 300kVA certified by KERI	- Fire Behavior Class : F1 (certified by FILK) - Environment Class : E2 (certified by FILK) - Climatic Class : C2 (certified by FILK)

Specification for Cast Resin Transformer

7. Technical Particulars & Guarantees

Rating		400kVA	630kVA	750kVA	1000kVA	1250kVA
Connection		Dyn11	Dyn11	Dyn11	Dyn11	Dyn11
Cooling Method		AN	AN	AN	AN	AN
Insulation Class		F	F	F	F	F
Temperature Rise		100℃	100℃	100℃	100℃	100℃
%Impedance (p.f=1.0)		5.0%	6.0%	6.0%	6.0%	6.0%
No Load Loss (W)		1,165	1,580	1,750	2,110	2,510
Load Loss (W) at 100% load	at 75℃	4,500	5,670	6,690	8,495	9,280
	at 120℃	5,140	6,500	7,675	9,740	10,625
Efficiency (%) at 100/75/50% load	at 75℃	98.6/ 98.8/ 98.9	98.9/ 99.0/ 99.1	98.9/ 99.0/ 99.1	99.0/ 99.1/ 99.2	99.1/ 99.2/ 99.2
	at 120℃	98.4/ 98.7/ 98.8	98.7/ 98.9/ 99.0	98.8/ 98.9/ 99.0	98.8/ 99.0/ 99.1	99.0/ 99.1/ 99.2
Exciting Current (p.f=1.0)		0.6	0.6	0.6	0.6	0.5
Voltage Regulation (p.f=1.0)		1.4	1.2	1.2	1.2	1.1
Terminal Connection		Cable	Cable	Cable	Cable	Cable
Tap Range		F23,100 - F22,550 - R22,000 – 21,450 – 20,900				

(Test Reference Temperature : 120℃)

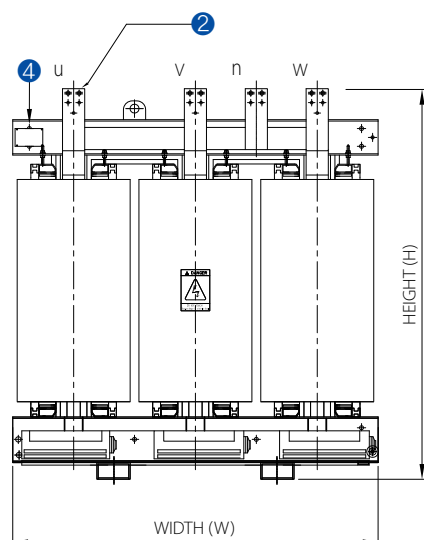
Power Loss Saving & High Efficiency

Rating		1600kVA	2000kVA	2500kVA	3150kVA
Connection		Dyn11	Dyn11	Dyn11	Dyn11
Cooling Method		AN	AN	AN	AN
Insulation Class		F	F	F	F
Temperature Rise		100℃	100℃	100℃	100℃
%Impedance (p.f=1.0)		6.0%	6.0%	7.0%	7.0%
No Load Loss (W)		2,875	3,625	4,065	5,280
Load Loss (W) at 100% load	at 75℃	12,230	14,450	17,350	19,280
	at 120℃	14,010	16,500	19,800	21,900
Efficiency (%) at 100/75/50% load	at 75℃	99.1/ 99.2/ 99.3	99.1/ 99.2/ 99.3	99.2/ 99.3/ 99.3	99.2/ 99.3/ 99.4
	at 120℃	99.0/ 99.1/ 99.2	99.0/ 99.1/ 99.2	99.1/ 99.2/ 99.3	99.1/ 99.3/ 99.3
Exciting Current (p.f=1.0)		0.5	0.5	0.4	0.4
Voltage Regulation (p.f=1.0)		1.1	1.0	1.0	0.9
Terminal Connection		Cable	Cable	Cable	Cable
Tap Range		F23,100 - F22,550 - R22,000 – 21,450 – 20,900			

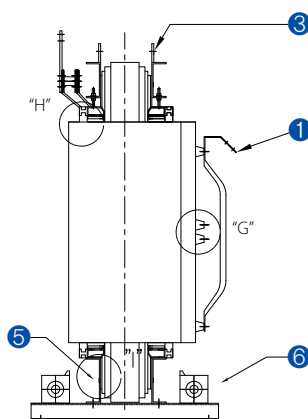
(Test Reference Temperature : 120℃)

Specification for Cast Resin Transformer

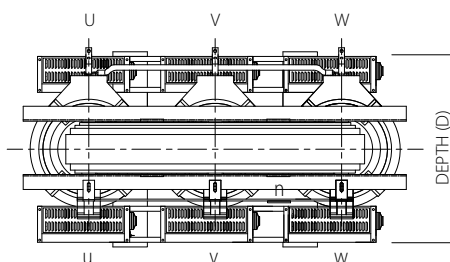
8. Construction & Component



SECONDARY VIEW (LV)

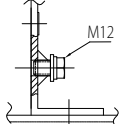

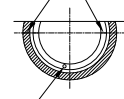


SIDE VIEW



TERMINAL ARRANGEMENT

- ① Primary, HV Terminal
- ② Secondary, LV Terminal
- ③ Lifting Lugs
- ④ Name Plate
- ⑤ Earth Terminal
- ⑥ Fan & Duct

EARTH TERMINAL "T" Detail	TAP CHANGER, "G" Detail	PT-100ohm, "H" Detail												
	<div><table><thead><tr><th>VOLT.(V)</th><th>CON.</th></tr></thead><tbody><tr><td>F23100</td><td>4 - 5</td></tr><tr><td>F22550</td><td>3 - 5</td></tr><tr><td>R22000</td><td>3 - 6</td></tr><tr><td>21450</td><td>2 - 6</td></tr><tr><td>20900</td><td>2 - 7</td></tr></tbody></table></div>	VOLT.(V)	CON.	F23100	4 - 5	F22550	3 - 5	R22000	3 - 6	21450	2 - 6	20900	2 - 7	<div><div>HV Winding</div><div>LV Winding</div><div>PT-100hm Hole</div></div>
VOLT.(V)	CON.													
F23100	4 - 5													
F22550	3 - 5													
R22000	3 - 6													
21450	2 - 6													
20900	2 - 7													



Cooling Fan



Temperature Controller

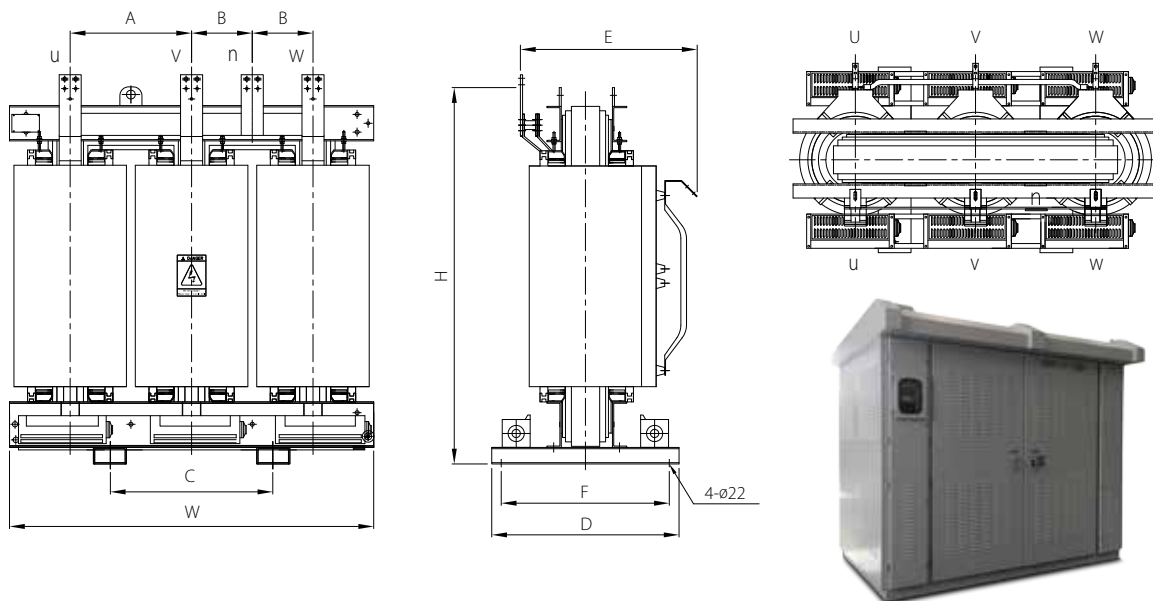
(IEC 60076-11 Std., 50Hz, 22kV/400V, Aluminum conductor, F Class, 100°C Temperature Rise)

Rated Power (kVA)	Impedance Voltage (%)	Losses (W), at 75°C		Efficiency (%), at 75°C			Dimension (mm)			Weight (kg)
		No Load	Load	100%	75%	50%	Width	Depth	Height	
400	5.0	1,165	4,500	98.6	98.8	98.9	1400	1500	1595	1650
630	6.0	1,580	5,670	98.9	99.0	99.1	1520	1500	1735	2150
750	6.0	1,750	6,690	98.9	99.0	99.1	1565	1500	1775	2410
1000	6.0	2,110	8,495	99.0	99.1	99.2	1640	1500	1815	2830
1250	6.0	2,510	9,280	99.1	99.2	99.2	1760	1500	1925	3330
1600	6.0	2,875	12,228	99.1	99.2	99.3	1850	1500	2065	4000
2000	6.0	3,625	14,450	99.1	99.2	99.3	2000	1500	2105	4800
2500	7.0	4,065	17,350	99.2	99.3	99.3	2120	1600	2295	5930
3150	7.0	5,280	19,280	99.2	99.3	99.4	2315	1600	2335	7430

(Load Loss & Efficiency, at 75°C)

Power Loss Saving & High Efficiency

9. Dimension & Weight (Detail)



(HV-LV Terminal)

PRIMARY TERMINAL "H1"	SECONDARY TERMINAL "L1"	SECONDARY TERMINAL "L2"	SECONDARY TERMINAL "L3"	SECONDARY TERMINAL "L4"	SECONDARY TERMINAL "L5"
<p>Thickness "4t"</p>	<p>Thickness "8t"</p>	<p>Thickness "10t"</p>	<p>Thickness "12t"</p>	<p>Thickness "12t"</p>	<p>Thickness "12t x 2EA"</p>

(IEC 60076-11 Std., 50Hz, 22kV/400V, Aluminum Conductor, F Class, 100°C Temperature Rise)

kVA	Dimension (mm)								Weight (kg)	HV-LV Terminal
	W	D	H	A	B	C	E	F		
400	1400	1500	1595	480	240	640	725	1400	1650	"H1" - "L1"
630	1520	1500	1735	520	260	690	765	1400	2150	"H1" - "L2"
750	1565	1500	1775	535	267.5	710	780	1400	2410	"H1" - "L2"
1000	1640	1500	1815	560	280	750	805	1400	2830	"H1" - "L3"
1250	1760	1500	1925	600	300	800	845	1400	3330	"H1" - "L3"
1600	1850	1500	2065	630	315	840	875	1400	4000	"H1" - "L4"
2000	2000	1500	2105	680	340	900	925	1400	4800	"H1" - "L4"
2500	2120	1600	2295	720	360	960	965	1500	5930	"H1" - "L5"
3150	2315	1600	2335	785	392.5	1050	1030	1500	7430	"H1" - "L5"

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