

# Hyundai Cast-Resin Transformers



Cast-Resin Transformers

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HYUNDAI  
CAST-RESIN TRANSFORMERS





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# Features

Hyundai cast-resin transformers are designed for easy installation and maintenance. They are also designed to withstand the highest mechanical short circuit stress that may occur in service.

By undergoing strict quality control during manufacturing and an entire series of tests at our laboratories, Hyundai cast-resin transformers have been type tested & proven to be of high quality by international inspection agencies.

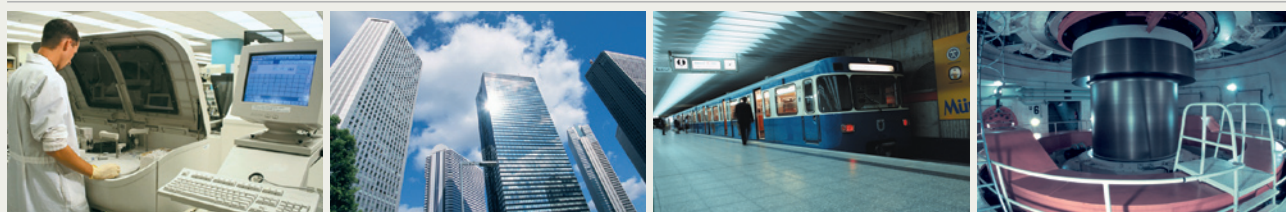
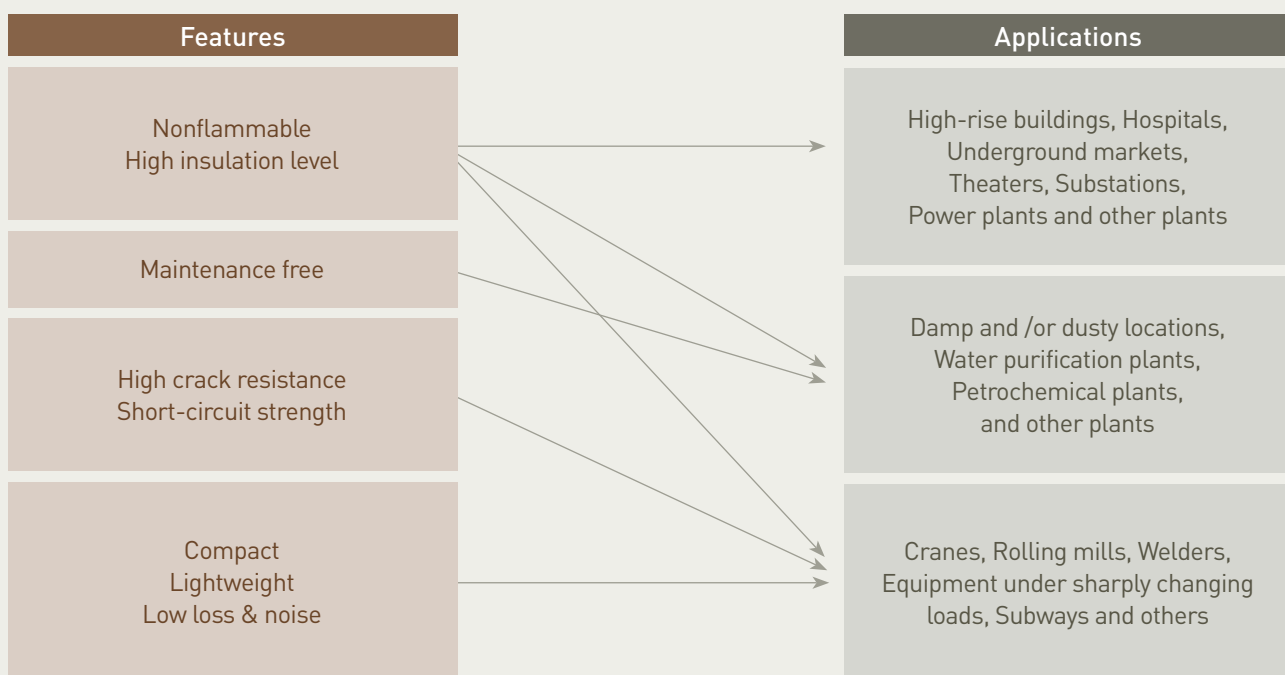
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- Self-extinguishing and environmentally friendly
  - Low loss, low maintenance cost
  - Space saving compact design
  - Excellent short - circuit strength
  - High overload capacity
  - Perfect isolation, high resistance against over voltage
  - Free from partial discharge
  - Crack resistant
  - Moisture proof
  - Virtually maintenance free
  - Easy installation and connection
  - Available both copper and aluminium
- 



# Applications

Hyundai cast-resin transformers are particularly suitable for applications where fire or groundwater regulations would result in additional expenses when oil-immersed transformers are used, like warehouses, underground railways, sports stadiums, and water retaining areas.

They are also being used more frequently in industrial applications for load center substations and supply feeder stations because there are no extra civil engineering costs for oil catch pits and fire protection.



# Product Range

## Manufacturing Scope

Classification				Cast-Resin Transformer									
Installation				Indoor or Housing in Outdoor Cubicle									
Frequency [Hz]				50 or 60									
Primary Voltage				36kV Class		24kV Class		12kV Class		3.6 to 7.2kV Class		Below 1.1kV	
Phase				3		3		3		3	1	3	1
Capacity(kVA)		Secondary Voltage		3 to 10kV Class	400V Class	3 to 10kV Class	400V Class	3 to 10kV Class	400V Class	200 to 400V Class		Below 1.1kV Class	
AN	IEC	ANSI	KSC										
		30											
	31.5												
	40	45											
	50												
	63	75											
	80												
	100		100										
		112.5											
	125												
		150	150										
	160												
	200		200										
		225											
	250		250										
		300	300										
	315												
	400		400										
	500	500	500										
			600										
	630												
		750	750										
	800												
	1000	1000	1000										
	1250		1250										
		1500	1500										
	1600												
			1750										
	2000	2000	2000										
	2500	2500	2500										
			3000										
AF	3150												
		3750											
	4000												
	5000	5000											
	6300												
		7500											
	8000												

The shadowed portion shows our standard manufacturing range. For ranges and ratings other than those listed above, Hyundai offers consulting services

## Dielectric Strength

System Voltage [kV]	AC Withstand Voltage [kV]			Basic Lightning Impulse Insulation Level [kV]		
	IEC	IEEE (Standard)	KSC	IEC (LIST2)	IEEE (Standard)	KSC
1.2	3	4	3	-	10	-
2.5	10	10	10	40	20	40
3.6	10	12	10	40	30	40
5.0	20	12	20	60	30	60
7.2	20	19	20	60	45	60
8.7	28	19	-	75	45	-
12.0	28	31	-	75	60	-
15.0	38	31	-	95	60	-
17.5	38	37	-	95	110	-
24.0	50	37	50	125	110	125
25.0	70	37	-	170	110	-
34.5	70	50	-	170	150	-
36.0	70	-	-	170	-	-

## Permissible Temperature Rise

IEC, KSC	Insulation System Temperature [°C]	Average Winding Temperature Rise [K]
B Class	130	80
F Class	155	100
H Class	180	125
IEEE	Insulation System Temperature [°C]	Average Winding Temperature Rise [K]
B Class	130	75
F Class	150	90
H Class	180	115

### Applicable Standards

IEEE Std C57.12.01 (Institute of Electrical and Electronics Engineers)

IEC 60076-11 (International Electrotechnical Commission)

KS C4311 (Korea Industrial Standards)

Classification Society (LRS, DNV, BV, GL, RINA, ABS, NK, KR)

### Manufacturing Scope

The standard manufacturing range is up to 36kV in primary voltage and up to 20MVA in capacity.

Although this is indoor equipment, it can be housed in outdoor cubicles. If any special specifications are required, please notify Hyundai.



# Construction



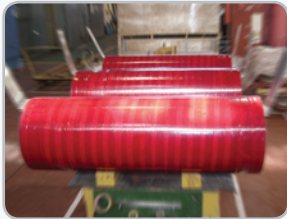
## Spacers

Spacers insulate the core and windings from mechanical vibrations, bringing about low emissions.



## Low-voltage Terminals

Normal arrangement : Top / Special version : Bottom



## Low-voltage Windings

Aluminium or copper is used for the conductor material in low-voltage windings.

The width of conductor strip is equal to the total coil height (width).

This considerably reduces the axial short-circuit forces.

The conductor and insulating materials are bonded together with heat treatments and form a compact unit, which is sealed against moisture and can safely withstand radial forces.



## High-voltage Windings

The high-voltage coils are wound together with a high-grade insulating sheet from aluminium or copper strips and potted under vacuum up to the terminals.

The external insulation is composed of a mixture of epoxy resin and quartz powder.

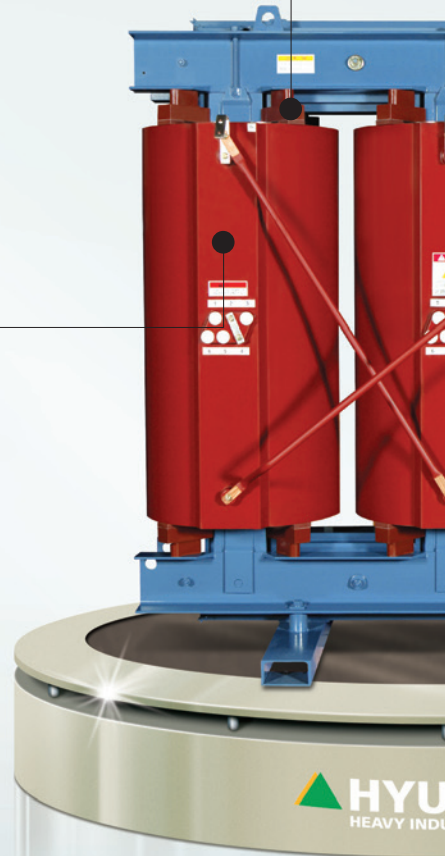
This environmentally friendly material makes windings maintenance-free, moisture-proof and suitable for service in the tropics.

Furthermore, electrical tests prove that the cast resin material of Hyundai transformers stops burning when the energy source is removed.

Apart from the CO gas generated in any incomplete combustion process, no toxic or explosive gases are generated in case of fire.

Reconnectable tapping links in the high-voltage windings permit the adjusting of system conditions.

They are mounted on the low-voltage side of the transformer.







### Clamp

A clamping frame holds the iron core and coils together. The coils are supported by resilient spacing blocks, which provide effective coil to coil and core to coil damping.

This results in low transformer noise.

Lifting eyes and earthing bolts are fitted to the top and bottom clamping frame members.



### High-voltage Terminals

Variable arrangements for optimal station design



### Tap Links

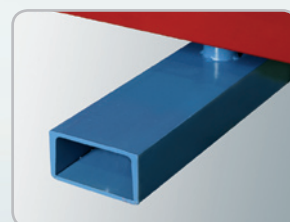
Tapping links on high voltage side can be adjusted according to system conditions, and are reconnectable in deenergized state.

Tap-changing terminals are fitted with insulating caps to prevent bare live parts from being exposed.



### Base Frame and Truck

Roller can be rotated around for lengthways or sideways mobilization.



### Core

The three limbs of the iron core are arranged on the same plane and interconnected by yokes.

The core, requiring little, consists of grain-oriented laminations, which are insulated on both sides and effect low-losses.

The core-limb laminations are mitred at the joints with the yoke.

The limb and yoke have the same cross section, which is nearly circular.

An adequate number of core bandages ensure uniform compression of the limbs.

Several coats of paint protect the core against corrosion.



# Accessories

The following standard and special accessories are available

## Standard Accessories

→ Name Plate / Digital Temperature Controller / Caution Plate



### Name Plate

The transformer is provided with a stainless steel name plate



### Digital Temperature Controller

Platinum Resistance Protection (PT100Ω) can be incorporated into the transformer as a standard option.

The thermostat system consists of a single sensor in each low-voltage winding, and a digital monitor that contains an alarm and trip relays.

The settings for both relays are independently adjustable on the monitor.

The resistance of the PT100Ω sensor increases proportionally with the rising temperature.

This resistance value is converted into a temperature equivalent and continuously displayed on the digital monitor.

The system is compatible with a supply voltage of 1PH AC220V, 50/60Hz.

In addition to the separate alarm and trip relays, an extra set of contacts are supplied with the cooling fans which can provide higher ratings for future use.

The monitor can be to the transformer enclosure a tour factory, or fitted by the client in their own control cubicle.

## Special Accessories

→ Wheel / Dial Type Thermometer / Cooling Fan / Enclosure



### Wheel

Hyundai cast-resin transformers are equipped with wheels for traveling lengthways or sideways.

The wheels are normally fitted for travel lengthways, but can be repositioned by loosening the mounting bolts.

The base is bolted to the lower clamping frame member and has four pulling eyes.



### Dial Type Thermometer

Dial type thermometer devices are of the liquid expansion type, with a brass bulb and flexible capillary.

The bulb is located on the upper part between the low-voltage winding and the High-voltage winding.

The temperature indicator is composed of a temperature needle, an upper-limit setting needle and adjustable bar.

The upper-limit setting needle has an electrical contact and the electrical circuit is configured when temperature needle reaches the location of upper- limit setting needle.



### Cooling Fan

To increase power reserves, Hyundai cast-resin transformers can be equipped with auxiliary ventilation permitting 30~40% power increase.

The ventilation systems of the transformer room must be capable of handling added power loss.

Short-circuit losses of twice the rated value are normally expected where the power is increased by 30~40%. Depending on the power rating of the transformer, either two or three radial fans must be mounted alongside the frame. Because of space limit, low-voltage terminals should be put on top. Single-phase A.C. motors drive the radial fans. These motors are the external-rotor type with the degree of protection IP10 casing.

These motors are in perforated sheets to prevent accidental contact (indoor model).

The overall length of the transformer is slightly increased by the motor overhang.

# Enclosure

The standard models of Hyundai cast-resin transformers have the degree of protection IP00. When added protection against accidental contact or water is required, the transformer can be placed in protective housing.

Hyundai cast-resin transformers can be put in protective housings with the protection degrees of :

IP20 : Protection against the ingress of foreign bodies → 12mm diameter

IP23 : IP20 Protection with added drip-protection

(More elaborate protection available on request)

## Protective IP20 Housing

This housing has plain sheet steel walls. The top and floor are of perforated sheet steel.

The connecting cables are inserted through cut-outs in the floor. Hand hole covers in the sides of the housing enable the cables to be connected and the tapplings to be changed.

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## Protective IP23 Housing

This housing is similar to IP20 housing, but is covered at the top by a plain sheet steel and has prod-proof cooling slots in the upper part of the walls.

The color of the protective housing will be munsell No. N7, unless otherwise specified.

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## Outdoor Installation

Cast-resin transformers with IP44 protection can also be installed outdoors because their housings protect them from rain and direct sunlight.

The iron parts are also given additional surface treatments for added weather protection.



## Enclosure Protection Degree

IP20



IP23



IP44



Outdoor



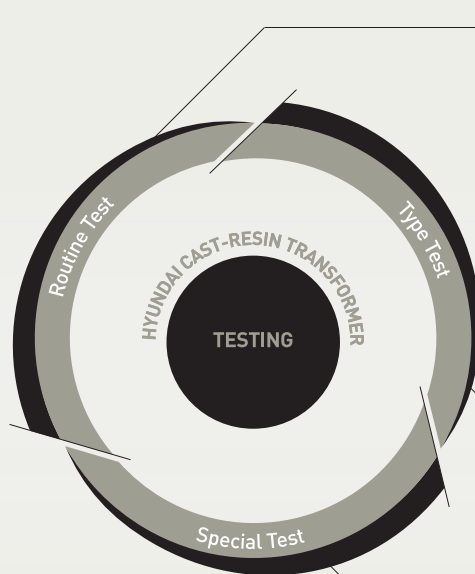
Air Cooler



Water Cooler



# Testing



## Routine Test

- ① Construction & dimension check
- ② Measurement of winding resistance
- ③ Measurement of voltage ratio and check of phase displacement
- ④ Measurement of short-circuit impedance and load loss
- ⑤ Measurement of no-load loss and current
- ⑥ Separate-source AC withstand voltage test
- ⑦ Induced AC withstand voltage test
- ⑧ Measurement of insulation resistance

## Type Test

- ① Lightning impulse test
- ② Temperature-rise test

## Special Test

- ① Partial discharge measurement
- ② Measurement of sound level









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