Top 100
Global
Innovator
for 10 years

CAST RESIN TRANSFORMER

LS ELECTRIC


High quality


High efficiency


Eco-friendly

CAST RESIN TRANSFORMER

Closer than you imagine

Where there is light brightening and moving the world, from homes to offices, from factories to airports, power is supplied everywhere, with LS ELECTRIC by the side. We are bringing you the light, to wherever you are.

Contents

Metasol D1
CAST RESIN TRANSFORMER

The LS Cast Resin Transformer is in compliance with IEEE/IEC standard and satisfies both standard consumption efficiency and minimum consumption efficiency as a low-noise and high-efficiency transformer. It can improve use environments via low noises and reduce power costs according to reduction of loss by observing the efficiency control equipment operation regulation and by using oriented silicon iron sheets of excellent quality

In compliance with efficiency regulations in US, LS Cast Resin Transformer implements eco-design, satisfy the requirement on DOE 2016 Energy Efficient (225–2500 kVA) and shows the highest efficiency. It allows a reduction in power consumption and contributes a reduction in greenhouse gas emissions.

"We have an authorized power test technology center, operating ISO 9001-certified quality assurance system, and performing tests according to IEEE, IEC or international standards."

This is a compact and high-efficiency product made with cutting-edge technology that is easy to maintain, excellent in short circuit strength, humidity resistance and non-combustibility, and also suitable for equipment with severe load variations such as electric-train power supply systems, etc.

Short circuit strength

The coils are vacuum-cast with epoxy resin with excellent electrical and mechanical strength to be strong against short circuit accidents.

Suitable for supplying power to equipment with rapidly changing loads

Suitable for equipment such as electric-train power supply equipment and rolling equipment.

Impulse voltage strength

This has excellent impulse voltage strength owing to the outstanding insulation performance of epoxy resin and the design of split winding type.

Easy to maintain

This doesn't need insulation oil exchange or separate fire-fighting equipment.

Humidity resistance

The high voltage coils are vacuum-molded to prevent moisture ingress during long-term storage so that it is possible to input power without drying.

Reduction of environmental impact

We obtain the certification F1,E2,C1 from CESI(Italia) and E3,C3 from FILK(Korea), according to IEC 60076-11.

Overload tolerance

LS Cast Resin Transformer has an excellent overload tolerance compared to the oil immersed type transformer to be used normally even at a temporary overload state.

Non-combustibility

LS Cast Resin Transformer uses non-combustible epoxy resin to prevent fires due to electric arcs and has self-extinguishability.

Overload capability

LS Cast Resin Transformer has an excellent overload capability compared to the oil immersed type transformer to be used normally even at a temporary overload site

Applicatlon fields

" LS Cast Resin Transformers can be used in various fields. Here are a some possible applications."

1	2	3
4	5	6
7	8	9

1. Semiconductor factory, LCD factory
2. High-rise building, Apartment
3. Subway, Express railway
4. Thermal power plant, Transformer station, Petrochemical plant
5. Hospital
6. Solar photovoltaic
7. Car factory, Rolling factory
8. Airport, Port
9. Hydro-power plant, Water treatment facility

Places requiring high reliability

Nuclear power plant, semiconductor factory, car factory, petrochemical factory, drilling ship, dock crane, Rolling factory, international airport, thermal power plant, transformer station, performance place

Power supply for complex facilities

High-rise building, multipurpose building, apartment

Public places where fire prevention is important

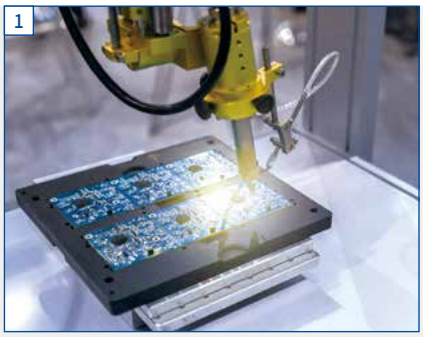
Underground store, subway, hotel, hospital

Places requiring resistance against environments such as water contamination, etc.

Water treatment facility, hydro-power plant

Renewables energy

Solar photovoltaics, Wind power, etc.



Special-purpose Cast Resin Transformer

LS Cast Resin Transformer is not only being widely used for general power distribution and power generation but is also customized conforming to customer's order specification.

* For special-purpose transformers, please contact us for more information

Ground transformer

- This is a transformer installed to supply a neutral point for grounding in power systems where it is difficult to take a proper grounding method.
- This mainly uses Wye-Delta connection or Zig-Zag connection, and is made for short time rating.

Equipment test transformer

- This is a transformer used for short circuit tests, etc. for equipment, so it deals with large currents and requires special insulation design considering transient voltages due to frequent switching

Subway power supply transformer

- Places requiring resistance against environments such as water contamination, etc.

Transformer for nuclear power plant

- This is a transformer fulfilling the characteristics(seismic, environmental) of class 1 electric equipment required by nuclear power plants.
- It is required to have a quality assurance qualification certificate required by the Korea electric power industry criterion(KEPIC).

Harmonic enduring transformer

- If a conventional transformer is used on a load that contains harmonic rather than a since wave, it causes problems such as overheating, noise increase, etc.
- This transformer is specially designed considering Harmonic component analysis data(K-Factor) It can be applied on loads such as communication equipment, rectifier, inverter.

Ship transformer

- This is a transformer fulfilling the severe environment condition of ships that requires high reliability such as vibration resistance, salt resistance, etc.
- An AFWF(forced water cooling type transformer) technology is used considering the fact that the temperature in transformer stations is high due to the characteristics of ships.
- We have secured ship class certification such as ABS, BV, GL, DNV, KR, etc.

VVVF transformer

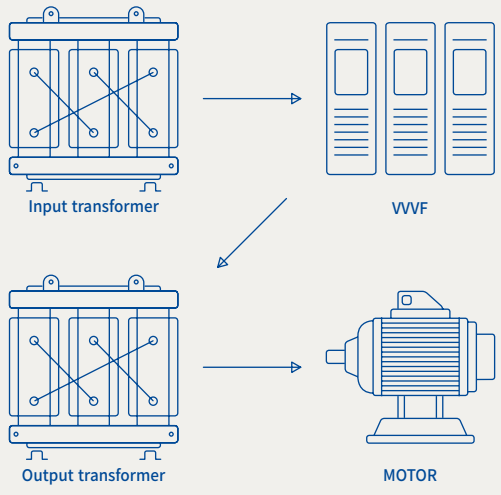
- This is used as an input/output transformer for 6Pulse, 12Pulse, 24Pulse.

Input transformer

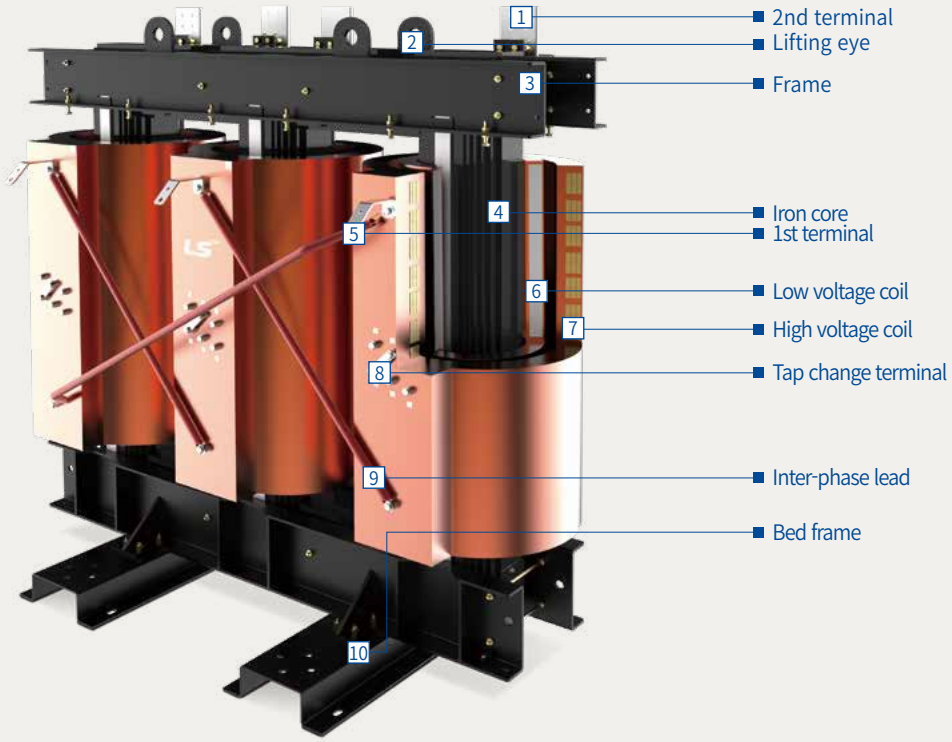
- This is used when the system voltage is different from the VVVF input voltage or when isolation is needed.
- The input transformer isolates VVVF from the system and reduces short circuit currents.
- Using an electro-magnetic shield specially designed between high and low voltage coils not only reduces harmonics generated from VVVF but also reduces transient voltages introduced from the system to protect VVVF.

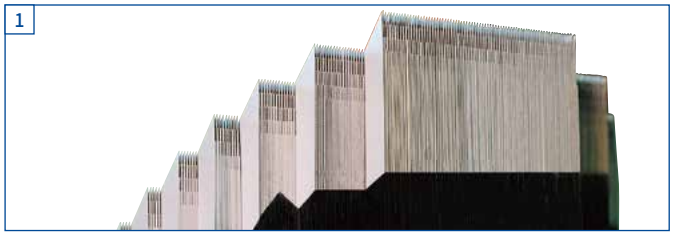
Output transformer

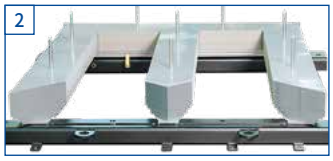
- This is used when the VVVF output voltage is different from the motor voltage or when isolation is needed.
- This is made as a step-up transformer in general.
- This is designed and made based on the data from the rectifier maker because output voltages contain frequency variations, harmonic components and DC components transiently.



Components



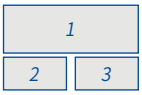




Iron core

The iron core uses cold-rolled oriented silicon steel plates of good quality and uses a step-lap method to conserve the characteristics of silicon steel plates to function in no-load loss and exciting current characteristics.
The surface of the iron core is protected by antirusting painting.

1. Step lap core
2. Core stacking
3. Core assembly



High voltage coil

This is vacuum-cast with epoxy resin with excellent mechanical and electrical performances using conductors with high conductivity to be outstanding in short circuit strength and insulation performance.

Low voltage coil

Using conductor and Prepreg insulating paper and it's casted in epoxy resin to work well in short circuit strength and humidity resistance.

1. HV coil vacuum cast type
2. LV coil encapsulated cast type
3. LV coil vacuum cast type (Optional)

Standard components

HV terminal
This is connected to the inlet cable, so please check the bolt tightening conditionbefore inputting power.

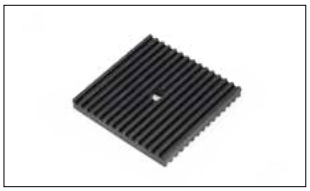
LV terminal
This is connected to the flexible bus and cable in the low voltage load side, so please check the bolt tightening condition before inputting power.

Grounding terminal
This is attached on the bottom frame, so please check the grounding condition before inputting power.

Tap change terminal
To change the 2nd voltage of the transformer, turn off the power and adjustthe tap terminal.

Danger mark
Touching the coil surface during operation of the transformer can cause danger, so please do not touch it during operation

Lifting eye
This is attached on the top frame, so use it to lift the transformer.



Anti-vibration pad
Insert anti-vibration pad between the transformer and ground to prevent iron core vibrations from transferring to the ground during operation.

Tap change terminal cover
The conductor part of the tap terminals secures, insulation distance and improve safety.

Option components

Digital thermometer / Controller

P2-100
1 point temperature measurement, alram,trip, fan control

P2-300M
3 points temperature measurement, alram,trip, fan control

P2-300F
3 points temperature measurement, alram, trip, fan control, fan fault check, fan operating time/alarm, fan step-by-step operating

P2-400
4 points temperature measurement, alram,trip, fan control

P2-400CH
4 points temperature measurement, alram,trip, fan control, measuring harmonic current/voltage

Cooling fan

Low noise cooling fan

Large cooling fan

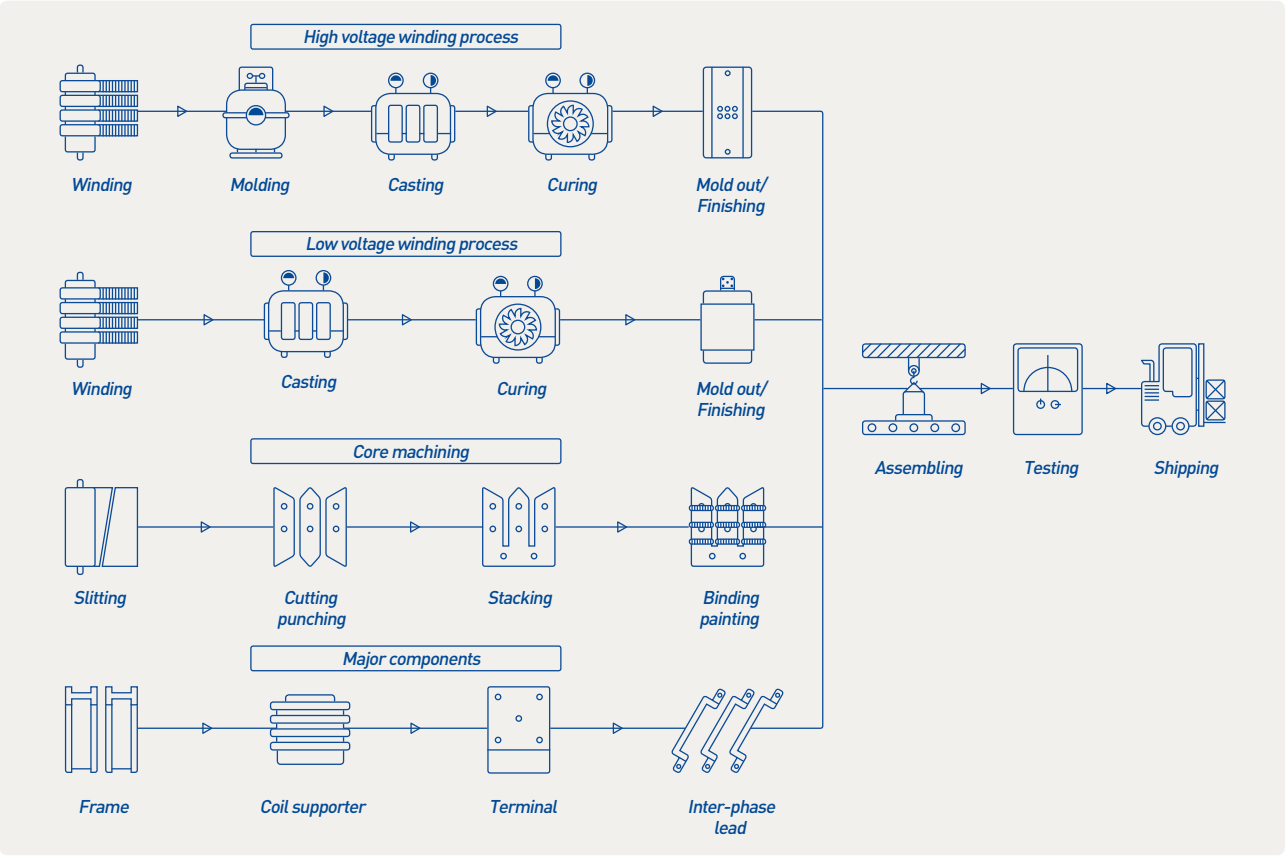
Other accessories

Bidirectional wheel

Enclosure

Extension busbar

Manufacturing and quality management



We have an authorized power test technology center, operating ISO 9001-certificates quality system and performing tests according to IEC 60076-11, IEEE C57.12.01, KSC 4311, Etc.

Routine test

We manage the quality of all transformers produced by our factory according to the ISO 9001 system, and perform tests according to National Standard.

- Structure inspection
- Coil resistance measurement
- Transformation ratio, polarity and angular displacement test
- No-load current and no-load loss test
- Load loss and impedance voltage test
- Normal frequency withstand voltage test
- Induction withstand voltage test
- Partial discharge test (10pC or less)

Type test

The type test is executed when there is a demand from customers or when changing the type of a transformer.

- Full wave lightning impulse test (LI)
- Temperature rise test

Special test

LS Cast Resin Transformer has completed the following tests during the product development stage to exert the performance of products to be used in environments.

- Short circuit test certified by KERI and PT&T
- Noise test according to IEC 60076-10, using a Pressure Level (Lp)

$$Lw(A) = Lp(A) + 10\log(S)$$

S = 1.25×H×P
H : Transformer height
P : Length of the ellipse connecting the measurement positions

An environment resistance test was performed on LS Cast Resin Transformer according to the revised standard IEC 60076-11 at an international institution CESI(Italia) for the first time in Korea.

- Environmental test (Moisture-resistance test) Test on whether the transformer works normally in moisture/water condensation or contamination conditions at the place of use
- Climatic test (Thermal shock test) Internal crack performance test depending on rapid temperature or load changes during transportation, storage and operation
- Fire behavior test (Non-flam mability and toxic gas test) Test on self-extinguishability and whether toxic gases are generated in the case of fire

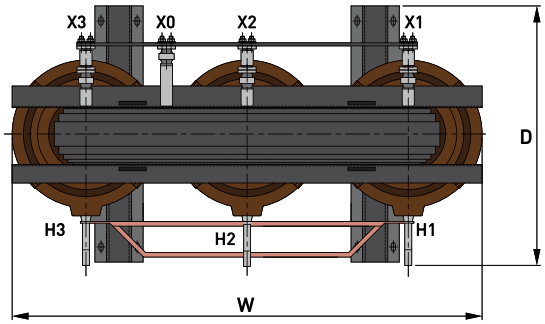
Standard specification

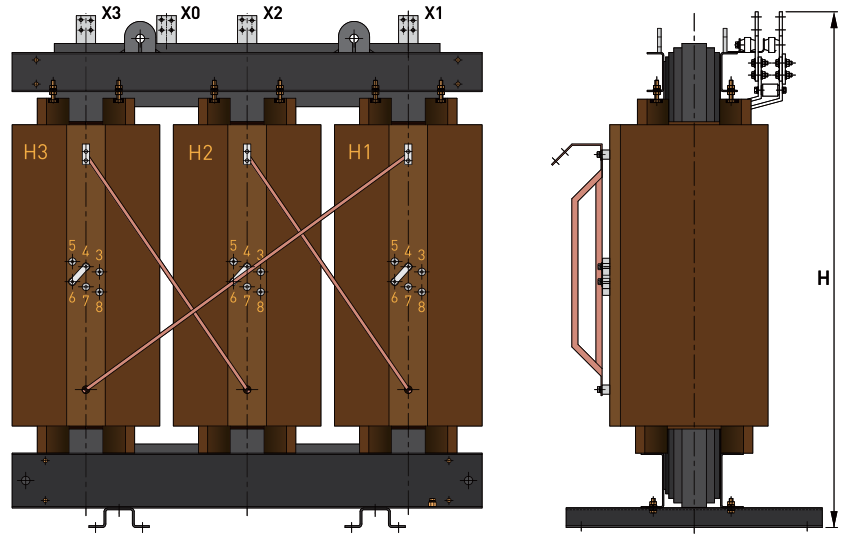
Division		Standard specification		
Installation place		Indoor, Outdoor with enclosure		
Applicable standard		IEEE C57.12.01		
Rated frequency, fr	[Hz]	60		
Insulation system temperature class (°C)		180°C	155°C	
Average winding temperature rise (°C)	[k]	80°C, 115°C (Optional)	80°C, 95°C (Optional)	
Nominal L-L system voltages	[kV]	34.5	15	5
HV rated voltage, Ur	[kV]	34.5	13.8	4.16
Tapping volatge step, range		5 Taps, ±2x2.5%		
LV rated voltage, Ur	[V]	480		
Connection symbol		Dyn1 (or Dyn11, Dd0, YNd1, Etc.)		
Basic lightning impulse insulation levels (HV/LV)	[kV]	150 / 10	95 / 10	60 / 10
Low frequency voltage insulation level (HV/LV)	[kV]	70 / 3	40 / 3	34 / 3
Rated Power, Sr	[kVA]	225	225	225
		300	300	300
		500	500	500
		750	750	750
		1000	1000	1000
		1500	1500	1500
		2000	2000	2000
		2500	2500	2500
Enclosure		NEMA 1, 2, 3R, etc.		

* The above descriptions are standard specifications, but other specifications are available according to orders. (~34.5kV, ~25MVA)

Metasol D1
Typical Performance Data & Dimensions / Weights

Standard : IEEE C57.12.01, DOE 2016 Energy Efficient (225–2500 kVA)





Rated voltage(Ur) : 4.16kV/480V

60kV BIL, CU/CU, Temperature Rise : 80°C (180°C Class)

kVA	%IZ [%]	%IR [%]	%IX [%]	X/R ratio	No load losses [W]	Full load losses [W][1]	Total losses [W]	Exciting current [%]	Regulation [%]				% Efficiency at different loads				Audible sound levels [dB]	Width [inches]	Depth [inches]	Height [inches]	Weight [lb]
									at 50% load		at 100% load										
									pf=1	pf=0.8	pf=1	pf=0.8	25%	50%*	75%	100%					
225	5.75	1.17	5.63	4.8	690	3,220	3,910	0.5	0.76	2.28	1.60	4.60	98.44	98.69	98.54	98.29	58	44.7	31.5	49.2	2,535
300	5.75	1.21	5.62	4.6	780	4,100	4,880	0.5	0.73	2.30	1.53	4.54	98.64	98.81	98.65	98.40	58	45.3	31.5	57.1	2,976
500	5.75	1.02	5.66	5.5	1,180	5,500	6,680	0.5	0.60	2.16	1.30	4.36	98.80	98.99	98.87	98.68	60	51.2	35.4	59.1	3,968
750	5.75	0.83	5.69	6.9	1,620	6,800	8,420	0.6	0.50	2.10	1.07	4.23	98.92	99.12	99.04	98.89	64	53.0	39.4	65.0	5,181
1,000	5.75	0.65	5.71	8.8	2,150	7,600	9,750	0.6	0.43	2.04	0.93	4.12	98.96	99.20	99.15	99.03	64	56.9	39.4	66.9	6,393
1,500	5.75	0.55	5.72	10.4	3,250	8,300	11,550	0.8	0.32	1.97	0.72	4.00	99.00	99.30	99.30	99.24	65	75.2	47.2	76.8	11,023
2,000	5.75	0.45	5.73	12.7	4,200	9,100	13,300	0.9	0.27	1.93	0.62	3.90	99.06	99.36	99.38	99.34	66	79.1	47.2	76.8	12,787
2,500	5.75	0.37	5.74	15.5	5,100	9,300	14,400	0.9	0.23	1.90	0.54	3.94	99.10	99.41	99.45	99.43	68	80.7	47.2	86.6	15,432

* Meets DOE 2016/NRCan 2019 Energy Efficiency Regulation for Medium- voltage dry-type distribution transformer
1) At a reference temperature of 75°C

Rated voltage(Ur) : 13.8kV/480V

95kV BIL, CU/CU, Temperature Rise : 80°C (180°C Class)

kVA	%IZ [%]	%IR [%]	%IX [%]	X/R ratio	No load losses [W]	Full load losses [W][1]	Total losses [W]	Exciting current [%]	Regulation [%]				% Efficiency at different loads				Audible sound levels [dB]	Width [inches]	Depth [inches]	Height [inches]	Weight [lb]
									at 50% load		at 100% load										
									pf=1	pf=0.8	pf=1	pf=0.8	25%	50%*	75%	100%					
225	5.75	1.30	5.60	4.3	720	3,080	3,800	0.6	0.73	2.25	1.53	4.53	98.40	98.69	98.57	98.34	58	49.2	32.3	57.3	2,866
300	5.75	1.07	5.65	5.3	850	3,800	4,650	0.6	0.68	2.22	1.43	4.48	98.57	98.81	98.69	98.47	58	49.8	32.5	59.1	3,307
500	5.75	0.94	5.67	6.0	1,230	5,250	6,480	0.6	0.57	2.20	1.22	4.32	98.77	98.99	98.90	98.72	60	53.3	35.4	65.0	4,409
750	5.75	0.63	5.72	9.1	1,900	5,700	7,600	0.8	0.43	2.05	0.93	4.13	98.81	99.12	99.10	99.00	64	57.5	39.4	66.1	5,842
1,000	5.75	0.72	5.70	7.9	2,150	7,450	9,600	0.8	0.42	2.03	0.91	4.11	98.96	99.20	99.16	99.05	64	63.2	39.4	71.7	7,275
1,500	5.75	0.53	5.73	10.8	3,050	8,800	11,850	0.8	0.34	2.14	0.76	4.00	99.05	99.30	99.29	99.22	65	68.5	47.2	73.4	9,480
2,000	5.75	0.50	5.73	11.5	3,750	10,900	14,650	0.8	0.32	1.97	0.71	3.97	99.12	99.36	99.35	99.27	66	70.5	47.2	80.1	11,685
2,500	5.75	0.45	5.73	12.7	4,350	12,250	16,600	0.8	0.29	1.94	0.66	3.93	99.19	99.41	99.40	99.34	68	73.8	47.2	84.8	13,338

* Meets DOE 2016/NRCan 2019 Energy Efficiency Regulation for Medium- voltage dry-type distribution transformer
1) At a reference temperature of 75°C

Rated voltage(Ur) : 34.5kV/480V

150kV BIL, CU/CU, Temperature Rise : 80°C (180°C Class)

kVA	%IZ [%]	%IR [%]	%IX [%]	X/R ratio	No load losses [W]	Full load losses [W][1]	Total losses [W]	Exciting current [%]	Regulation [%]				% Efficiency at different loads				Audible sound levels [dB]	Width [inches]	Depth [inches]	Height [inches]	Weight [lb]
									at 50% load		at 100% load										
									pf=1	pf=0.8	pf=1	pf=0.8	25%	50%*	75%	100%					
225	6.50	0.74	6.46	8.7	1,160	1,900	3,060	0.7	0.48	2.31	1.06	4.67	97.78	98.57	98.70	98.66	58	64.0	42.3	71.5	4,850
300	6.50	0.88	6.44	7.3	1,330	2,640	3,970	0.7	0.50	2.32	1.09	4.68	98.05	98.69	98.76	98.69	58	64.0	42.3	72.6	4,960
500	6.50	0.86	6.44	7.5	1,730	4,300	6,030	0.6	0.49	2.31	1.07	4.66	98.43	98.89	98.91	98.81	60	65.2	43.1	76.4	5,842
750	6.50	0.59	6.47	11.0	2,560	4,590	7,150	0.6	0.36	2.22	0.83	4.49	98.50	99.02	99.09	99.06	64	68.7	47.4	77.6	7,275
1,000	6.50	0.60	6.47	10.8	2,900	6,330	9,230	0.6	0.37	2.23	0.85	4.51	98.70	99.11	99.15	99.09	64	76.0	48.8	81.1	9,480
1,500	6.50	0.55	6.48	11.8	3,750	8,890	12,640	0.6	0.35	2.22	0.81	4.48	98.86	99.21	99.23	99.16	65	77.6	49.0	87.6	11,574
2,000	6.50	0.47	6.48	13.8	4,680	10,250	14,930	0.6	0.32	2.20	0.74	4.43	98.95	99.28	99.31	99.26	66	81.3	50.2	90.2	13,779
2,500	6.50	0.38	6.49	17.1	5,990	9,770	15,760	0.6	0.25	2.14	0.61	4.34	98.95	99.33	99.39	99.37	68	90.0	51.2	94.9	17,747

* Meets DOE 2016/NRCan 2019 Energy Efficiency Regulation for Medium- voltage dry-type distribution transformer
1) At a reference temperature of 75°C

Installation and operation conditions

"Pre-inspection and maintenance are essential to increase the lifespan and efficiency of the product." "Please follow the recommendation instruction below for the simple maintenance of our cast resin transformer."

Checkpoints when installing cast resin transformers

Installation condition

- The installation place shall be clean, free from flooding and falling water from the ceiling.
- The installation place shall have a ventilation structure to ventilate the heat generated from the transformer.

Checking of cast resin transformers that are in a long -term storage condition

- If dust is accumulated after long-term storage of cast resin transformers, then remove dust using a vacuum cleaner or blow out dust with compressor and wipe out dust using a dry cloth. (too many using a, Rephrase).

The vinyl packing for prevention of foreign substances such as dust, screws, nuts and washers from invading shall be maintained until power is input after installation.

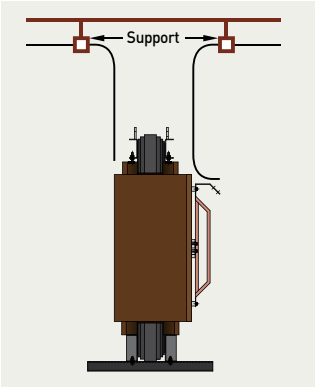
Torque values for connecting with low voltage terminals

Bolt	M8	M10	M12	M16
Torque	125	250	405	1,500

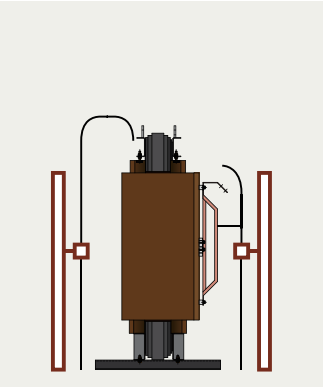
Unit : kgf·cm

Caution when connecting the terminals

When connecting cables or bus-bars to the HV, LV terminals, avoid mechanical stresses to the HV, LV terminals, and especially when connecting bus-bars, use flexible bus-bars by all means to reduce mechanical stresses due to transformer vibrations. Connecting bus-bars directly to the HV, LV terminals can loosen the connection parts or cause abnormal noises due to transformer vibrations during operation.



Top cabling (Cable)


Bottom cabling (Cable)

How to minimize transformer noises when installing transformers

- Install cushion rubber beneath the bed frame.
- When installing transformers, separate them mechanically from their enclosures to prevent vibrations of the enclosures.
- When connecting terminals, use flexible busbars.
- The transformer installation places shall be rigid and maintain horizons well.
- Large-capacity transformers shall be installed near pillars of the building to reduce vibrations.
- Avoid corners of the wall for installation.
- Install non-flammable sound-absorbing materials inside the panels if necessary.

Considerations for ventilation

Height and area of the vent

- In the case of natural cooling, ventilation of the enclosure shall discharge the heat generated from total heat loss of the transformer via natural convection.
- Proper ventilation is realized by the inflow of cold air from the inlet A and the outflow of hot air through the outlet A' located at a height H.

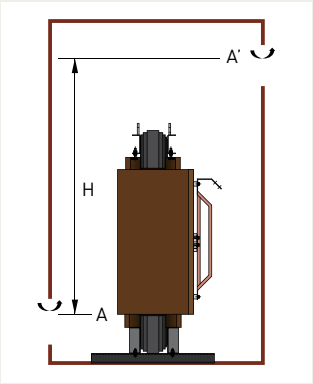
$$A = \frac{HL}{0.1\sqrt{H\triangle\theta a^3}} (m^2)$$

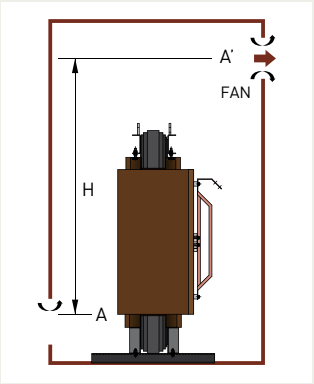
$$A' > A110\% (min.)$$

A : Required inlet area (m^2)
A' : Required outlet area (m^2)
$\Delta\theta a$: Air temperature rise (K) = 15K (Approximate value)
HL : Heat loss (kW)
H : Distance from the center of the outlet and the center of the TR (m)

Forced ventilation

- When the average ambient temperature is higher than 20°C or the transformer is often operated in an overload condition, forced ventilation using fans is necessary if the vent area is less than the standard.





Minimum insulation distance

- Epoxy resin surface
- Ground
- Insulation-reinforced inter-phase lead surface
– Insulation cable

Highest voltage (kV)	BIL (kV)	Minimum clearance (mm)	
		Active – Earthed	Surface of epoxy Resin– Earthed
≤1.1	-		10
3.6	40	60	50
7.2	60	90	50
12	75	120	75
17.5	95	160	100
24	125	250	150
36	170	350	200

Checkpoints before receiving power

- Remove the packing vinyl cover and check the wiring condition, isolation distance, foreign substance residuals, component breakage, bolt torque, etc.
- Compare the connecting inter-phase leads of cast resin transformer with vector diagram on name plate.
- Measure the insulation resistance using a DC1000V insulation tester(Megger).

Maintenance / Repair

Environment for general use

Remove dust using a vacuum cleaner and blow out the over-accumulated dust using a dry compressor every year.
The cleaning period can differ depending on the use environment.
During maintenance work, check the bolt mounting conditions using a torque wrench.

How to request A/S

In case transformer related A/S is necessary, identify the serial number on the nameplate of cast resin transformer and the exact condition for quick and proper A/S.

Memo

Global Network

LS has expanded its business all around the world
Our global network includes 9 overseas corporations,
13 overseas branches, in 12 countries.

▶R&D

R&D Campus

Focuses on gaining competitive advantages through development of next generation platforms

Power Device R&D Center

Leading technology in electric industry and continuously developing future-growth dynamic engines

Automation R&D Center

Serves as the main research institute for LS

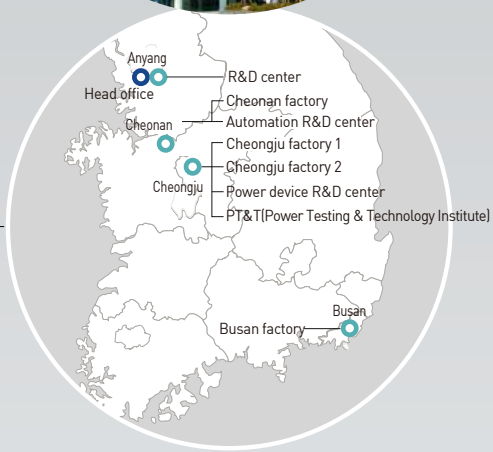
▶Factory

PT&T (Testing laboratory)

Internationally-renowned testing center that has formed partnerships with the UL, CE, KEMA and CESI

Cheongju Factory (Korea)

Electric products, mold TR, MV/LV switchgear, HV GIS



Cheonan Factory (Korea)

PLC, AC drive, HMI, DCS, PV module

Busan Factory (Korea)

HV TR, HVDC, FACTS

Wuxi Factory (China)

Electric products

Dalian Factory (China)

MV/LV switchgear, MV contactor

Hanoi Factory (Vietnam)

MV/LV switchgear, Mold TR

FUTURING SMART ENERGY

We open up a brighter future through
efficient and convenient energy solutions.

Safety Instructions

- For your safety, please read user's manual thoroughly before operating.
- Contact the nearest authorized service facility for examination, repair, or adjustment.
- Please contact qualified service technician when you need maintenance.
  Do not disassemble or repair by yourself!
- Any maintenance and inspection shall be performed by the personnel having expertise concerned.

- According to The WEEE Directive, please do not discard the device with your household waste.

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Technical Question or After-sales Service

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Specifications in this catalog are subject to change without notice due to continuous product development and improvement.