Technical Performance

LS Cast Resin Transformers

50kVA Through 15,000kVA
Primary Voltage: 2.3kV Through 36kV
Secondary Voltage: 120V Through 24kV

LS Cast Resin Transformer

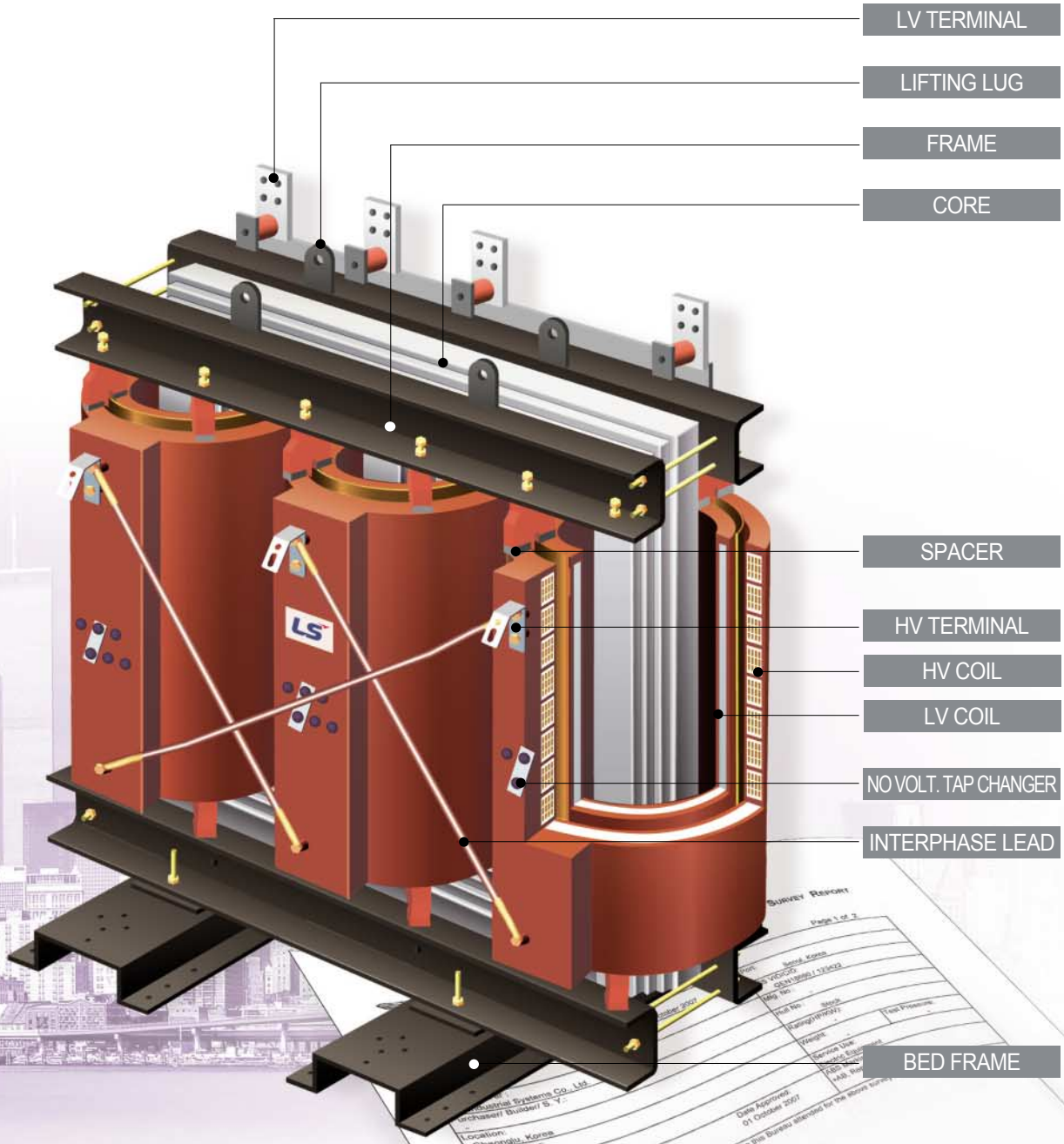
Introduction

Great progress has been made in the development and improvement of distribution transformers over the last decades.

The application of high quality insulation material and suitable selection of the coil structure for high stress have contribute to the development of LS CAST RESIN Transformers.

The LS CAST RESIN Transformer has succeeded in combining the advantage of oil-filled and conventional dry type transformers, which are fabricated with an epoxy resin. The windings are completely embeded under vacuum conditions. This casting method makes it possible to assure void-free epoxy penetration of both the inner layer and turn to turn insulation.

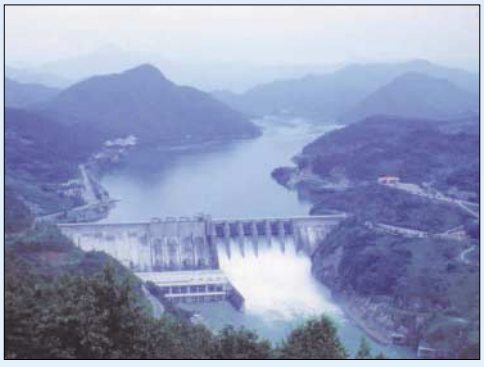
CONTENTS


LV TERMINAL
LIFTING LUG
FRAME
CORE
SPACER
HV TERMINAL
HV COIL
LV COIL
NO VOLT. TAP CHANGER
INTERPHASE LEAD
BED FRAME

Applications

LS CAST RESIN Transformers can be used in various fields.
Here are just a few possible applications.

- Indoor and outdoor unit substations
- Off-shore flatforms
- Commercial buildings
- Hospitals
- Shopping centers
- Water supplies
- Traction systems
- SCR Power supplies
- Ships
- Power Plants



Environmentally safe

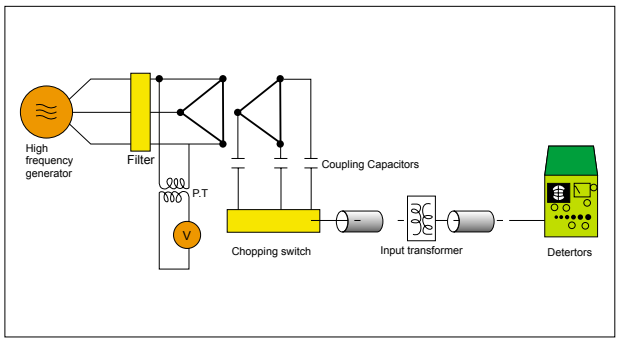
LS CAST RESIN Transformers will not emit oil or toxic gases into the atmosphere. Therefore, they do not pollute the environment and are strongly recommended as a replacement for askarel(PCB)-filled transformers.

Moisture proof

The complete casting of coils under vacuum prevents the penetration of moisture into the winding.
Therefore, it is suitable for both storage and operation in harsh environment and is capable of being switched on immediately after such storage without pre-drying.

No partial discharge

There is no possibility of partial discharge in LS CAST RESIN Transformers.
Whole core & coil is tested to guarantee the life expectancy of the insulation system.
LS CAST RESIN Transformers are free of partial discharge at least up to 1.3 times of the rated voltage.



Low noise

The coating of the core with an epoxy resin have lead to an appreciable noise reduction. Noise is also reduced due to the sound suppresing effect of the step lap cutting.

High overload capability

Based on the high thermal time constant factor of the windings, LS CAST RESIN Transformers can be overloaded for a short duration considerably higher than oil-immersed transformers. It has a greater capability to withstand sudden high overloads such as might be encountered in heavy traction applications.

High impulse strength

LS CAST RESIN Transformers are very resistant to impulse voltage.
Impulse withstand levels to 200kV are available because of careful design and special structure.

Maintenance free

Maintenance is almost completely eleminated. No checking of liquid level and no dielectric test for moisture absorption is required.
Due to the smooth coil surface, heavy dirt and dust build up is eleminated even under the worst circumstances.
The recommended routine maintenance is an occasional visual inspection.

Fire resistant

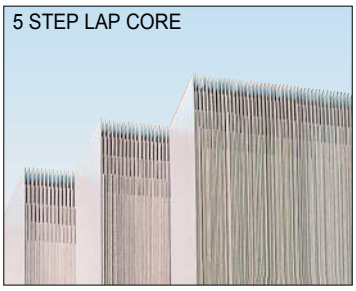
LS CAST RESIN Transformers have a very excellent characteristic of self fire-extinguishing and fire resistance.
So there would be no fear of spread of fire even if fire took place around the electricity room.

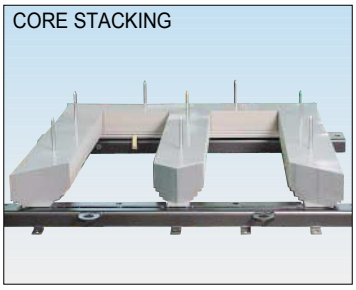
Construction

LS CAST RESIN Transformers take pride in the ability to offer a wide variety of designs and configurations necessary to satisfy customer needs. Computer and CAD/CAM systems are used for quick and accurate design and manufacture to meet specific customer requirements.

CORE & FRAME

The core is made of highest quality, cold rolled, grain-oriented, silicon steel and step lap joint.
Three legs of the core are arranged in a single plane and interconnected with a yoke.
The legs are circular structure and are carefully interlaced with stepwise arranged yokes.
The core is mitred at a 45 degree angle and care-fully stacked and pressed to obtain low loss, exciting current and noise.
The core is insulated on both side of each lamination and protected against corrision by a resin coating and grounded in frame.
The frame consists of upper and lower steel channels. It holds the core and coil together.
To protect against corrosion, all steel parts are coated with epoxy paint.

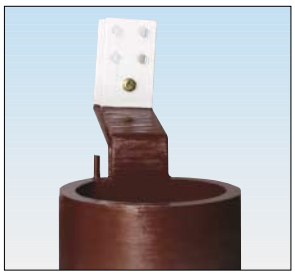




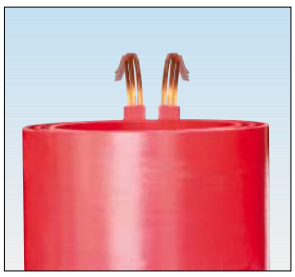
HV & LV Coils

- **HV COIL (Vacuum Cast type)**
  - HV COIL Vacuum Cast in epoxy with a mold.
  - Aluminum / Copper conductor.

- **LV COIL (Encapsulated Cast type)- standard**
  - LV COIL Encapsulated after winding with prepreg layer insulation.
  - Aluminum / Copper conductor.



- **LV COIL (Vacuum Cast type)- optional**
  - LV COIL Vacuum Cast in epoxy with a mold.
  - Aluminum / Copper conductor.



Conductor insulated with a high grade is used in the winding construction.
Turns are arranged in multiple sections and layers in order to decrease transient maximum voltages. High voltage windings are cast in a mold under vacuum, using a computer controlled mixing and vacuum casting process.
So there is no void in the coils. The windings are fiberglass reinforced to provide additional mechanical strength.
After assembly, all HV coils are partial dischage tested to verify void free in the coils.

Specification Data

LS CAST RESIN Transformers are normally available with specification as follows:

- **Rated voltage**
  HV COIL : up to 36kV
  LV COIL : up to 600V
  * Dual voltage coils can also be supplied.

- **Standard Tapping range :** ±2.5%, ±5%
  * Other ratings are available by request

- **Power capacity**
  Single phase : 20 ~ 2,000kVA
  Three phase : 50 ~ 15,000kVA

- **Frequency :** 50Hz, 60Hz
  * Other frequency is available by request

- **% Impedance voltage**
  IEC STD. : 4.0 ~ 8.0%
  IEEE STD. : 5.75 ~ 8.0%
  * Other % impedance voltages are available.

- **Connections**
  HV COIL : Delta
  LV COIL : Star with neutral point
  * Other connections are available to meet requirement.

- **Temperature class (According to IEC 60076-11)**
  HV COIL and LV COIL : F CLASS
  * H class coils are available by request.

- **Conductor**
  Aluminum (standard)
  Copper (optional)

- **Noise Level (according to NEMA Std.)**
  500kVA - 60dB
  750kVA - 64dB
  1000kVA - 64dB
  1500kVA - 65dB
  2000kVA - 66dB
  2500kVA - 68dB
  *Noise reduction TRs are available by request.

Standards

LS CAST RESIN Transformers confirm to the requirements of IEC 60076-11 (2004).
However we can also meet the requirements of the following standards, upon request.

- **IEEE C57.12.01 (2005)**
  General requirement for dry-type distribution and power transformers.

- **CSA Standard C9-02 (R2007)**
  Dry type transformers.

- **HD538.1,2,3(1995)**
  3 Phase Dry type distribution transformers.
  50Hz from 100kVA to 2500kVA

- **BS 7806 (1995)**
  Dry type Power transformers

- **AS 2374 (1982)**
  Power transformers
  * Transformers for rectifier applications and other special purposes can be supplied according to the client's specification.

Certificates

CESI ABS

KAB KSA EMS KAB KEMA

ISO14001, ISO 9001

Accessories

- **Normally provided accessories**
  - · HV & LV terminals
  - · Lifting lugs
  - · Grounding terminals
  - · Name plate
  - · Danger label
  - · Tap terminal link
  - · Protection cap for tap terminal
  - · Anti-vibration pads

HV terminals

LV terminals

Lifting lugs

Grounding terminals

Danger label

Tap terminal link

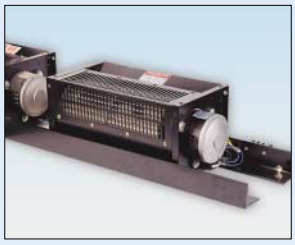
Protection cap

Anti-vibration pads

- **Optional accessories**
  - · Wheels
  - · Cooling fan & temp. controller
  - · Digital thermometer & PT 100 OHM (1 Phase)
  - · Digital thermometer & PT 100 OHM (3 Phase)
  - · Enclosure

Wheels

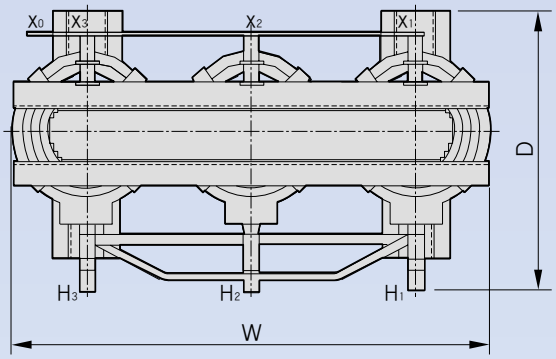
Cooling fan

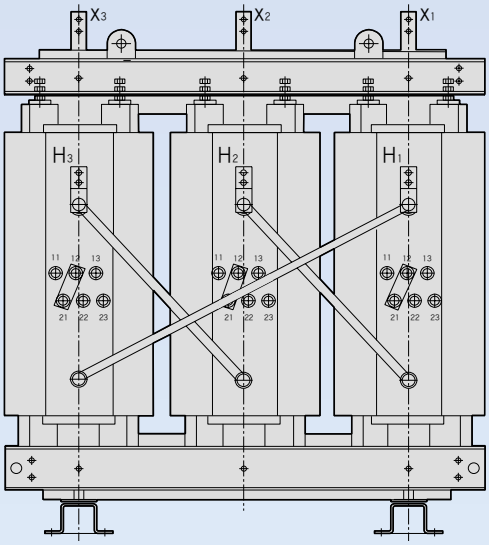


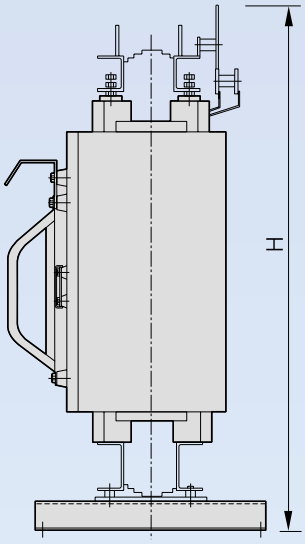
Temperature controller

Enclosure

Technical Data (IEEE Standard)





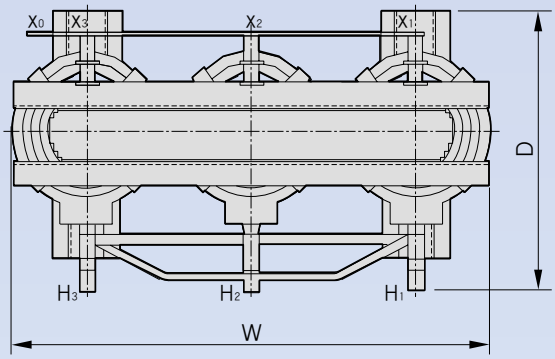


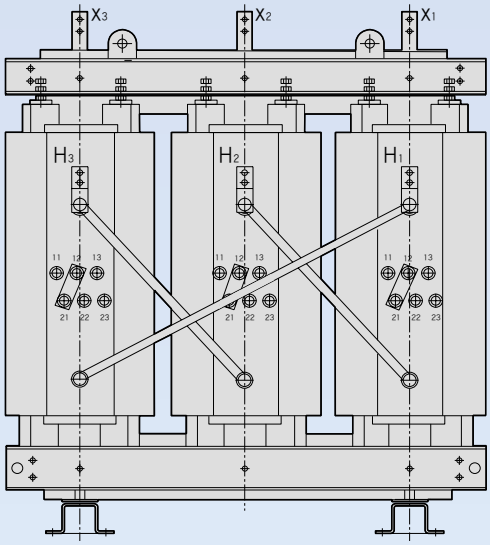
IEEE C 57.12.01 (2005)
F CLASS, 90K TEMP.RISE, 60Hz
5kV CLASS, 75kV BIL

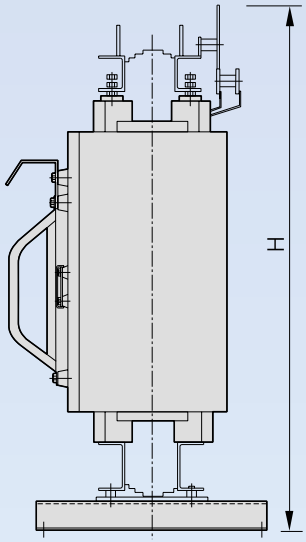
Rated Power (kVA)	Impedance Voltage (%)	No Load Loss (W)	Load Loss (W)	Efficiency (%)			Dimension (mm)			Weight (kg)
				100% Load	75% Load	50% Load	Width (W)	Depth (D)	Height (H)	
500	5.75	1,300	6,000	98.5	98.7	98.8	1,290	800	1,430	1,350
750	5.75	1,750	8,000	98.7	98.8	98.9	1,380	900	1,600	1,790
1,000	5.75	2,300	8,600	98.9	99.0	99.1	1,510	1,000	1,710	2,350
1,500	5.75	3,150	10,200	99.1	99.2	99.2	1,690	1,000	1,790	3,250
2,000	5.75	3,900	12,500	99.1	99.2	99.2	1,805	1,200	2,050	4,150
2,500	5.75	4,900	13,500	99.2	99.3	99.3	2,015	1,200	2,100	5,150

* Other kVA is available according to request.

Technical Data (IEEE Standard)





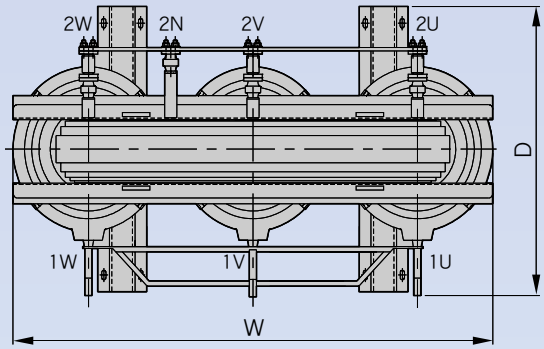


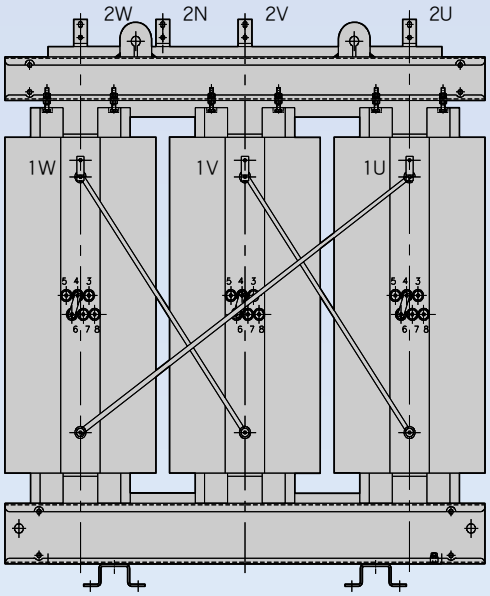
IEEE C 57.12.01 (2005)
F CLASS, 90K TEMP.RISE, 50Hz
15kV CLASS, 110kV BIL

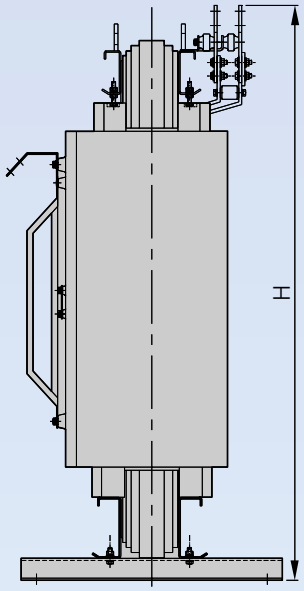
Rated Power (kVA)	Impedance Voltage (%)	No Load Loss (W)	Load Loss (W)	Efficiency (%)			Dimension (mm)			Weight (kg)
				100% Load	75% Load	50% Load	Width (W)	Depth (D)	Height (H)	
500	5.75	1,550	5,600	98.5	98.7	98.8	1,390	900	1,640	1,600
750	5.75	2,150	6,700	98.8	98.9	98.9	1,495	920	1,700	2,050
1,000	5.75	2,700	8,400	98.9	99.0	99.0	1,660	1,005	1,780	2,650
1,500	6.00	3,600	9,100	99.1	99.2	99.2	1,840	1,025	1,885	3,650
2,000	6.00	4,550	13,300	99.1	99.2	99.2	1,945	1,200	2,140	4,450
2,500	8.00	5,100	15,000	99.2	99.2	99.3	2,160	1,200	2,160	5,250

* Other kVA is available according to request.

Technical Data (IEC Standard)





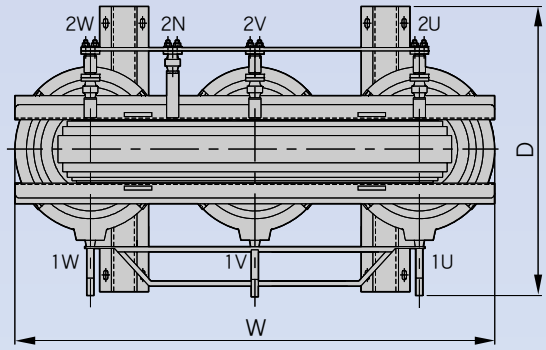


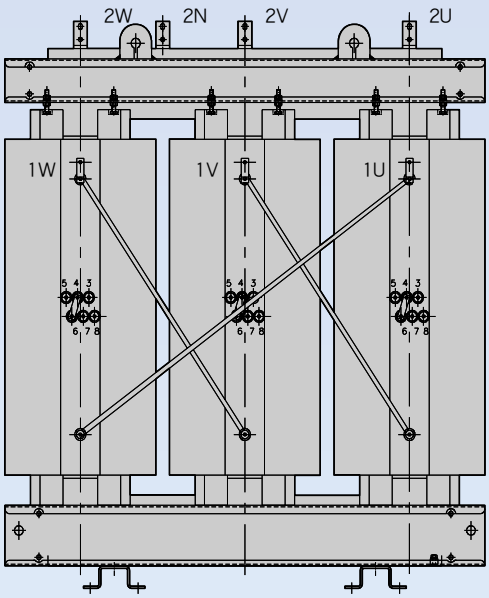
Standard : IEC 60076-11 (2004)
F CLASS, 100K TEMP.RISE, 50Hz
12kV CLASS, 75 BIL

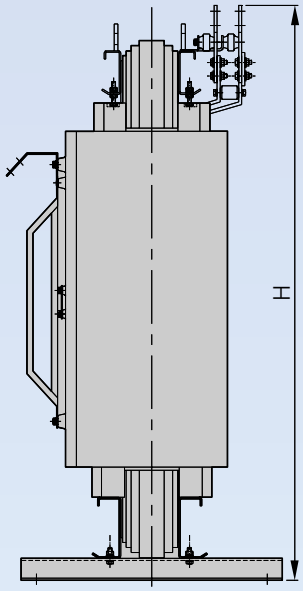
Rated Power (kVA)	Impedance Voltage (%)	No Load Loss (W)	Load Loss (W)	Efficiency (%)			Dimension (mm)			Weight (kg)
				100% Load	75% Load	50% Load	Width (W)	Depth (D)	Height (H)	
400	4.0	1,150	4,900	98.5	98.7	98.8	1,220	800	1,430	1,300
630	6.0	1,500	7,300	98.6	98.8	98.9	1,400	900	1,570	1,750
1,000	6.0	2,000	10,000	98.8 9	8.9	99.1	1,520	1,000	1,700	2,400
1,250	6.0	2,500	12,500	98.8	98.9	99.1	1,700	1,000	1,780	3,000
1,600	6.0	2,800	14,000	98.9	99.1	99.2	1,750	1,000	1,820	3,400
2,000	6.0	3,700	16,500	99.0	99.1	99.2	1,805	1,200	2,040	4,200
2,500	6.5	4,300	21,000	99.0	99.1	99.2	1,985	1,200	2,150	5,000
3,150	7.0	6,200	22,000	99.1	99.2	99.2	2,220	1,205	2,190	6,250

* Other kVA is available according to request.

Technical Data (IEC Standard)





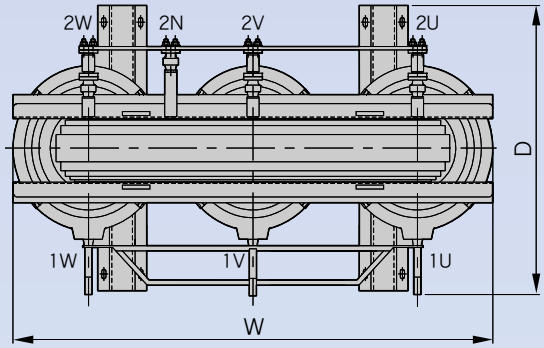


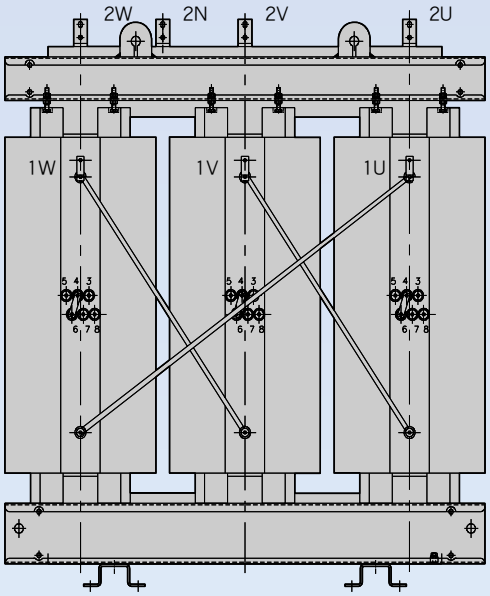
Standard : IEC 60076-11 (2004)
F CLASS, 100K TEMP.RISE, 50Hz
24kV CLASS, 125 BIL

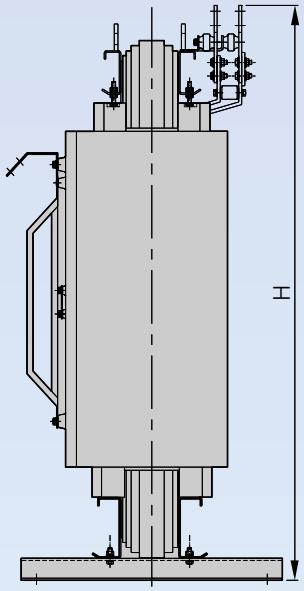
Rated Power (kVA)	Impedance Voltage (%)	No Load Loss (W)	Load Loss (W)	Efficiency (%)			Dimension (mm)			Weight (kg)
				100% Load	75% Load	50% Load	Width (W)	Depth (D)	Height (H)	
400	6.0	1,200	5,500	98.3	98.5	98.7	1,360	840	1,500	1,400
630	6.0	1,650	7,800	98.5	98.7	98.8	1,450	905	1,670	1,850
1,000	6.0	2,300	11,000	98.6	98.8	99.0	1,675	1,000	1,810	2,700
1,250	6.0	2,850	13,000	98.7	98.9	99.0	1,750	1,010	1,860	3,100
1,600	7.0	3,100	16,000	98.8	99.0	99.1	1,810	1,200	2,060	3,650
2,000	7.5	4,050	17,500	98.9	99.0	99.1	1,950	1,200	2,120	4,450
2,500	7.5	5,000	21,000	98.9	99.1	99.1	2,155	1,200	2,190	5,400
3,150	7.5	6,500	22,000	99.1	99.2	99.2	2,305	1,215	2,250	6,600

* Other kVA is available according to request.

Technical Data (IEC Standard)







Standard : IEC 60076-11 (2004)
F CLASS, 100K TEMP.RISE, 50Hz
36kV CLASS, 170 BIL

Rated Power (kVA)	Impedance Voltage (%)	No Load Loss (W)	Load Loss (W)	Efficiency (%)			Dimension (mm)			Weight (kg)
				100% Load	75% Load	50% Load	Width (W)	Depth (D)	Height (H)	
630	6.5	2,200	8,000	98.4	98.6	98.6	1,700	1,105	1,920	2,500
1,000	7.0	3,100	11,500	98.5	98.7	98.8	1,835	1,125	1,980	3,200
1,250	7.0	3,700	14,000	98.6	98.7	98.8	1,850	1,220	2,190	3,700
1,600	7.5	4,200	17,000	98.6	98.8	98.9	2,030	1,250	2,250	4,500
2,000	7.5	5,350	19,000	98.7	98.9	99.0	2,225	1,300	2,330	5,350
2,500	8.5	6,100	20,000	98.9	99.0	99.1	2,440	1,330	2,360	6,400
3,150	9.5	7,400	22,000	99.0	99.1	99.1	2,555	1,350	2,390	7,250

* Other kVA is available according to request.

Maunfacturing Process

CORE CUTTING

COIL WINDING

CORE STACKING

CASTING

ASSEMBLY

TEST

Routine Test

the following test are made on all transformer.

- **Resistance measurements**
- **Ratio test**
- **Polarity and phase relation test**
- **Impedance and load loss**
- **No load loss and exciting current**
- **Applied potential tests**
- **Double induced potential test**
- **Partial diacharge test(below 10 PC)**

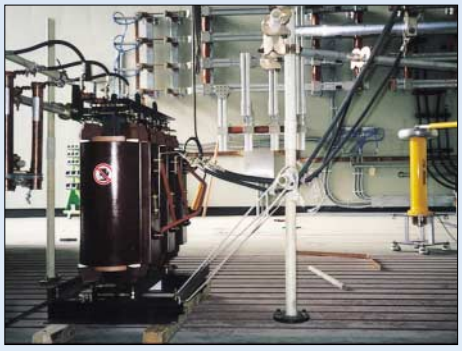
Optional Test

- **Impulse test**
- **Temperature-rise test**
  Temperature-rise test carried out according to the simulated loading method.
  - no load loss
  - load loss
  The total temperature rise is calculated in accordance with IEC 60076-11 or IEEE
- **Short circuit test**
  · 3P 1600kVA Certified by KEMA
- **Audible sound level test**
  · test by IEC 60076-10
  · LS use Pressure Level (Lp).
  Lw(A) = Lp(A) + 10 LOG S
  S = 1.25 X H X P
  H : Transformer height
  P : Measurement contour perimeter
- **Climatic, environmental and fire behaviour classes**
  - Certificated at CESI according to IEC 60076-11
  Fire Behavior Class : F1
  Environmental Class : E2
  Climatic Class : C1
  - Class C2 is available

ROUTINE TEST

IMPULSE TEST

SHORT CIRCUIT TEST



FIRE BEHAVIOR TEST

Ordering Sheet

Ref. No. :

Date. :

End User and Location :

ITEM		TR.-1	TR.-2	TR.-3	TR.-4
Rated kVA					
Q'ty (sets)					
Rated Voltage(V)	Primary(V)				
	Secondary(V)				
Connection	Primary				
	Secondary				
Phase (ϕ)					
% Impedance (%)					
1. Frequency		☐ 50Hz	☐ 60Hz	☐ Other	
2. Conductor		☐ Maker Standard	☐ Copper	☐ Aluminum	☐ Other
3. Primary Taps		☐ ±2 x 2.5%	☐ ±2.5%	☐ Other	
4. Applied standard		☐ IEC	☐ IEEE	☐ BS	☐ Other
5. Insulation Class					
	Primary	☐ Maker Standard(155°C)			☐ Other
	Secondary	☐ Maker Standard(155°C)			☐ Other
6. Winding Temperature Rise					
	Primary	☐ Maker Standard	☐ 80°C	☐ 100°C	☐ 125°C ☐ Other
	Secondary	☐ Maker Standard	☐ 80°C	☐ 100°C	☐ 125°C ☐ Other
7. Accessories		☐ Digital Thermometer			
		☐ Cooling Fans controller			
		☐ Cooling fans	☐ User Spec . (P V Hz)		
			☐ Maker Standard.		
8. Protection		☐ IP00	☐ IP21	☐ IP31	☐ Other
9. Attached specification (☐ Yes , ☐ No) , If "Yes" (Total page : pages)					
10. Remarks					
	1.				
	2.				
	3.				

Memo

Memo

Green Innovators of Innovation

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 a 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.

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

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