FUTURING SMART ENERGY

www.lsis.com



MORE ADVANCED THAN YOU IMAGINE

Power Transformer

LS IS

Growing into a World's Best from Nation's First

The company serves its customers!

Leading company in the industrial electric, electronic, materials and energy field following its separation from LG in 2003. LS aims to develop into a company that provides its clients with total solutions, contributes to the overall society, and offers a business environment where employees can realize their dreams.








Innovators in industrial electrical and automation systems

LSIS goes toward a global leading company in the Industrial electric & Automation field, providing customers with the total solution.

We provide customers with distinctive and eco-friendly products & Win-Win Strategy in the various fields such as Power Transmission & Distribution ; Electric Equipment ; Automation Equipment & Systems and Smart Grid.

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Power Transformer

LS Power Transformer

The power transformer is a static inductive device that can step the voltage up and down to transfer electrical power efficiently. Winding types and methods that offer the least loss were selected using magnetic field analysis, and also used in the LSIS s Power Transformer to ensure high levels of efficiency. Moreover, by selecting the optimal insulating structure through the electric field analysis of insulation between turns, sections, windings and phases, the Power Transformer's electrical stability is achieved. LS fluent analysis technology has enabled the realization of an optimal cooling system, and 3D structure strength analysis has enabled a structural design that can withstand internal mechanical power short-circuits caused by system faults, seismic conditions according to external impacts, and the impact of transportation.

LSIS Power Transformer factory is equipped with the latest core processor machines, the latest winding machines, high-capacity vacuum heat drying equipment, state-of-the-art cleaning facilities, and has the best test room.



LSIS is a NEW & LARGE supplier in the Power Transformer Market. That's why LSIS continues to work longer and harder for you.

As the leading company in Korea s power solutions industry, LSIS is playing a central role in the national power supply network, based on its reliability and technology. LS s experience of transformer manufacturing and production technologies of over 20 years has enabled us to proudly present the Power Transformer. Now, LSIS is going to instill confidence in our customers once again.

Over 30 years of experience for electrical solution. (Since 1974)

LSIS has been walking a single path in the field of industrial electricity / electronics for the past 30 years, and has achieved technological innovations and improved competitiveness through continuous R&D and investments.

Not only 'Latest', but also 'Newest' Technology!

LSIS Power Transformer does not merely possess the latest technologies, but is the state-of-the-art product equipped with the newest technologies. On top of all the merits that are part of existing systems, the Power Transformer provides a Total Solution with a Network Control System for the benefit of the private consumer as well as commercial power plants.

Trust LS Transformer-Perfect performance

Safety and reliability are of the utmost importance in the power transformer. That is why you need to choose a reliable company. LSIS s Power Transformer will ensure optimum reliability through stable performance in any given condition.

Strict test make reliable & safe products.

LSIS conviction, that rigorous testing is the only way to ensure perfectly operational products at industrial sites was also applied to the Power Transformer. If you are concerned with reduced competitiveness caused by maintenance problems and defects, hesitate no more and choose LSIS.

Professional staffs make your project succeed.

LSIS, Korea s top engineers will lead you to perfect success on your business with highly trained skills and careful management.

The newest facilities and equipments make faultless products.

LSIS has constructed an ultramodern factory in an effort to satisfy the diverse demands of its customers. Our clean facilities enable the production of zero-defect products, within which even a single speck of dust is not allowed.

LS always think about efficiency & environment.

LSIS takes into consideration the global environment that is in harmony with future-oriented technologies. We aim to not only provide economic advantages for our customers through increased energy efficiency, but also to fulfill our social responsibilities through the development of environment-friendly products.



Line-up

LSIS's power transformers are produced on a clean, zero-defect production line, and come in capacities up to 550kV, 800MVA.

33kV 69kV 132kV





Power Transformer up to 550kV/800MVA

Applicable Standard		IEC 60076 / ANSI(IEEE) C57
Installation Location		Outdoor / Indoor
Frequency [Hz]		50/60
Insulation		Oil type
Thermal Class [°C]		105(A)
Winding Temp. Rise [K]		65
Oil Temp. Rise [K]		60
Cooling Method	Internal	ON / OF / OD
	External	AN / AF / WF
Capacity (MVA)		Up to 800 for Three Phase
		Up to 500 for Single Phase

220kV 400kV 550kV





Oil Preservation System	Conservator type N_2 Sealing type Air Seal Cell type
Base	Skid , Roller
Insulation	Oil type
Application	Generation Plant (GSU) Substation Transmission & Distribution
Special Purpose	Scott Connection Electric Furnace Shunt Reactor HVDC Converter Transformer

※ LSIS produces and supplies products conform to customer specification as well as IEC & ANSI standards.

Core

Non-aging grain oriented silicon steel sheets with high permeability and low hysteresis loss are used in the construction of cores. They are thinly stratified to reduce Eddy loss, and the joints are arranged with the form of step-lap types to reduce loss and noise.

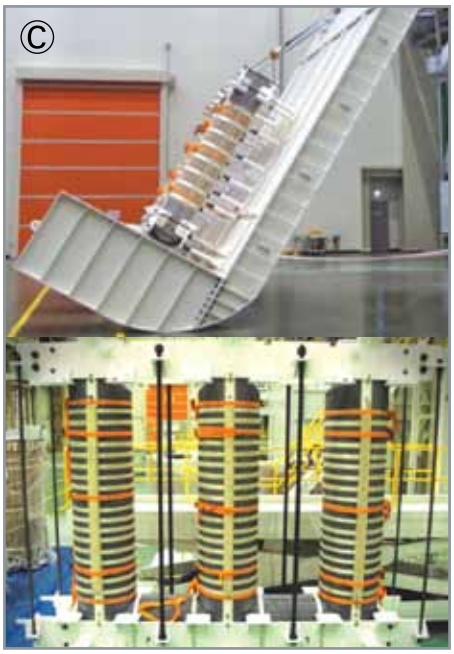
Ⓐ Core Stacking Process (done horizontally)





Ⓑ Cutting & Punching using a Core Processing Devic

The thin silicone steel sheets produced by the core's manufacturing equipment are stacked to form magnetic circuits that can generate a magnetic flux. The stacking process cannot be carried out in an upright position due to the thin and large structure of the silicone steel sheets, and is therefore carried out horizontally on a stand. Upon the completion of the stacking process, the top and bottom are supported by a frame Tie-Plates and Glass Resin Tape are wound securely around the core, and then standing upright.



© Standing uplight after Core Staking

Coil & Winding

Coil & Winding prevent insulation damage caused by the contraction and expansion that takes place during temperature changes, and the agitation and bending caused by abnormal severe conditions.

Ⓓ Winding Part





Ⓔ Horizontal Winding Method - for low voltage, high current winding

The windings are produced by winding pure copper coils of at least 99.9% pure copper around the circular winding machine. The winding machines are separated into vertical and horizontal-types. The vertical type is used for high-voltage, low-current conditions with a small number of conductors and implements a complex winding method. The horizontal type is used for winding methods of a low-voltage, high-current type with a large number of conductors. Winding processes are carried out inside a dustproof room in order to protect it from harmful particles.



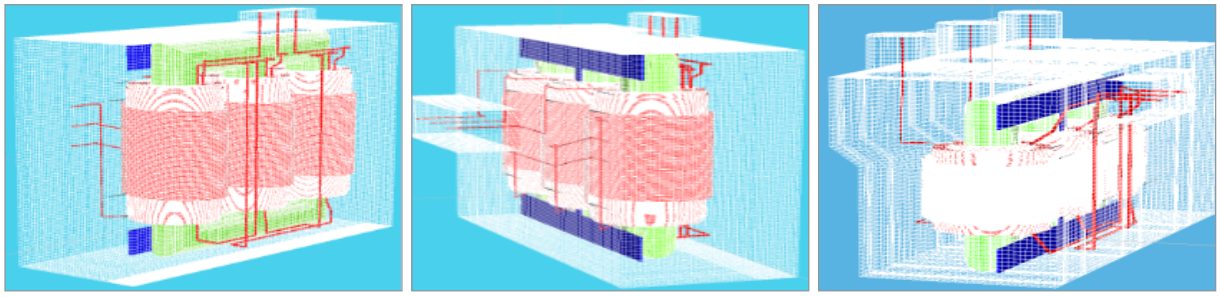
Ⓕ Vertical Winding Method - for high voltage, low current winding

Magnetic Field Analysis

Magnetic fields can be calculated using the 3D Magnetic field analysis, as well as stray losses in structures inside the magnetic fields such as Tank and Frame, and Hot Spot temperatures.

Magnetic Intensity

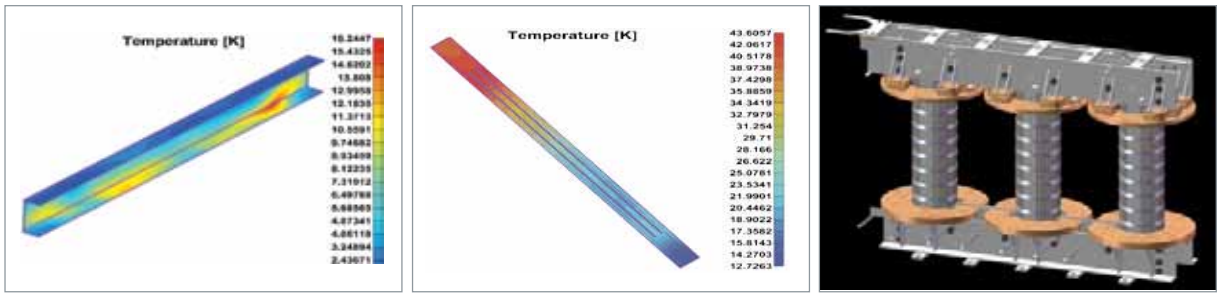
A magnetic field analysis program is used to minimize Eddy current losses that occur in conductors due to magnetic flux. At the ends of the windings, the horizontal component of magnetic flux is high, and in the central parts of the winding, the vertical component of magnetic flux is high. Conductor sizes are differentiated accordingly to minimize Eddy current losses.



Frame Temp. Rise / Tie Plate Temp. Rise

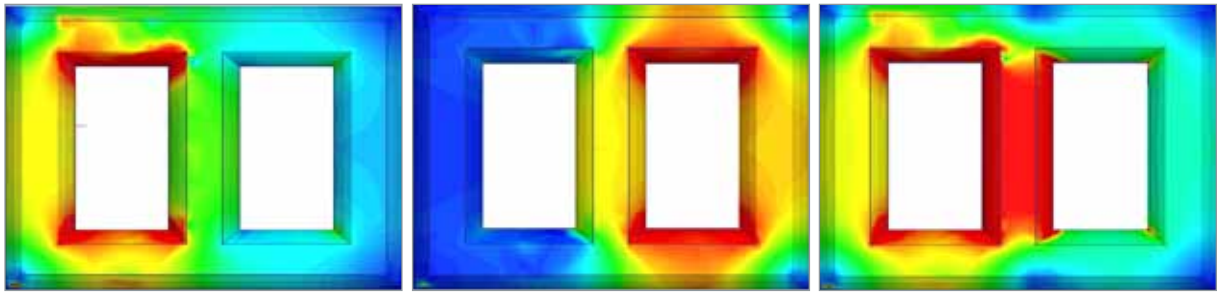
At the design stage, the distribution of leakage magnetic flux in the core-supporting frame is analyzed using 3D modeling.

At the design stage, the distribution of leakage magnetic flux in the leg core-supporting tie plate is analyzed using 3D modeling.



3-D Magnetic Field Analysis

Losses that occur in structures such as the frame or the tank caused by leakage magnetic flux are estimated using the 3D magnetic field analysis program. Adjustments based on the analysis results are made to the frame's structure and dimensions, and magnetic covers such as magnetic shunts are attached to the interior walls in order to minimize losses and temperature rise.

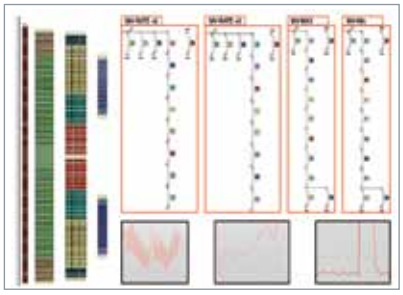
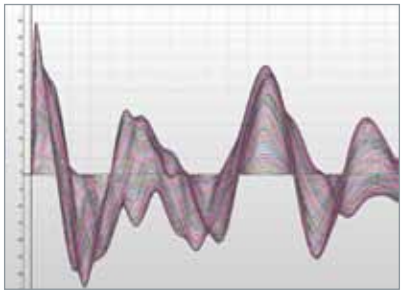


Insulation Analysis

The transient analysis program is used to analyze transienst state when applying impulse voltages, and insulation strength between turns, sections and windings. An electric field analysis program is used to analyze the insulation strength at the main gap in the center of the windings and at the end of the windings.

Transient Stage Voltage Oscillation

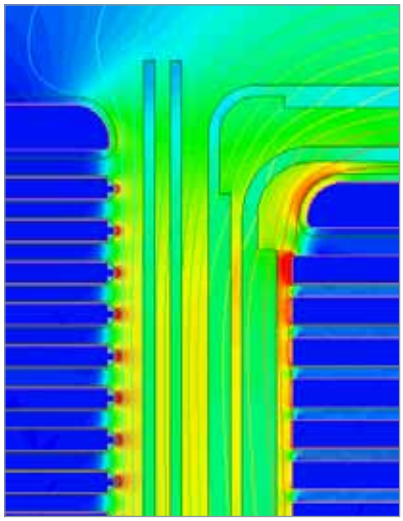
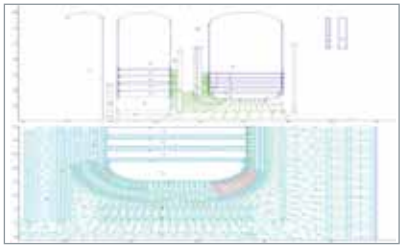
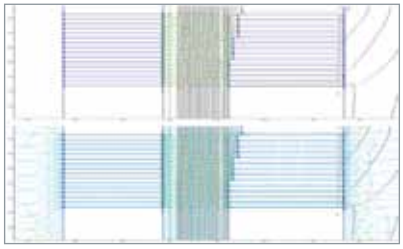
Using the results from an transient voltage analysis program, the insulation strength between specific sections, electrodes and nodes are examined. By measuring the concentrated electrical field of the insulating materials at the middle and end of the widings, as to whether the insulating structure meets the permitted insulating standards. The results are used in deciding the size and number of the insulating barrier's oil gaps, and in deciding whether angle rings to be inserted. At the ends, where electric fields are concentrated, a static shield ring is inserted to relieve the electrical fields. The series capacitance is increased to improve excessive voltage characteristics, resulting in a safe and compact insulating structure.


Electric Field Analysis

UIn order to guarantee the transformer's electrical safety margin, an electric field analysis is carried out. The LSIS' design program can replicate the many possible conditions that may arise if the winding is subjected to basic lightning impulses, chopped wave impulses, and switching impulses. The winding's inductance, resistance and capacitance, together with the electric field of the nodes that are distributed along the windings, can be tested using such conditions. The results of the analysis were used in designing an electrically safe device by inserting contra shields at the winding's ends to relieve electric field, and by using interleaved windings.electric fields are concentrated, a static shield ring is inserted to relieve the electrical fields. The series capacitance is increased to improve excessive voltage characteristics, resulting in a safe and compact insulating structure.



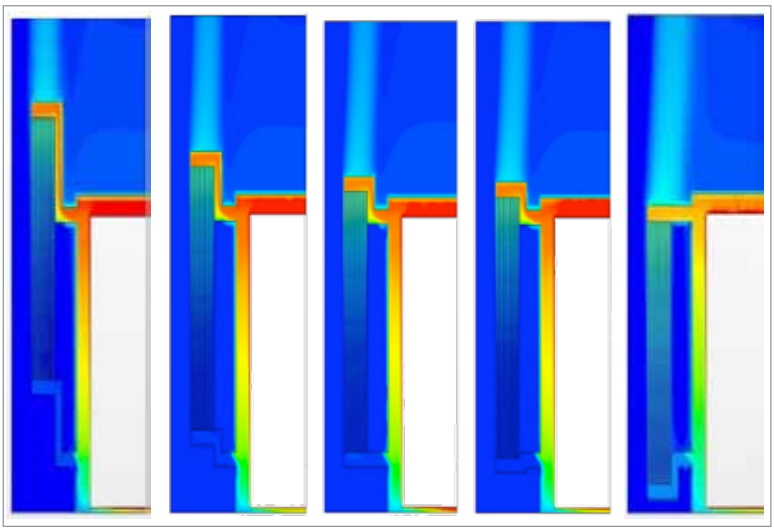





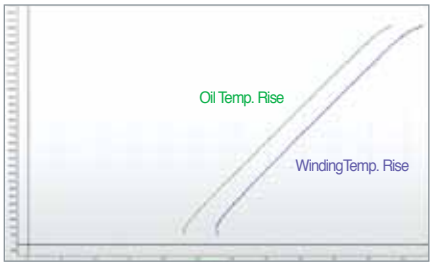
Cooling System Analysis

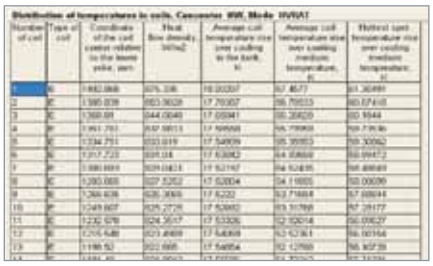
The cores and the windings are designed for optimal cooling efficiency. They are equipped with large heat-radiating surface areas. Others are equipped with fans and pumps for forced cooling. A program that is capable of applying various parameters, such as radiator surface areas, refrigerant types, size and number of fans and pumps, is used for verification.

Heat Analysis

Losses that occur in structures such as the frame or the tank caused by leakage magnetic flux are estimated using the 3D magnetic field analysis program. Adjustments based on the analysis results are made to the frame's structure and dimensions, and magnetic covers such as magnetic shunts are attached to the interior walls in order to minimize losses and temperature rise.







Hottest spot Temp. Rise







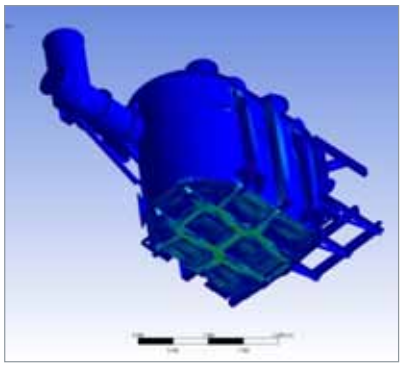
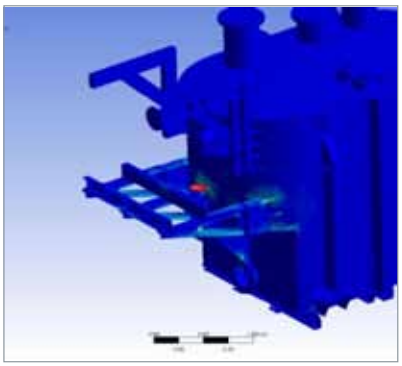
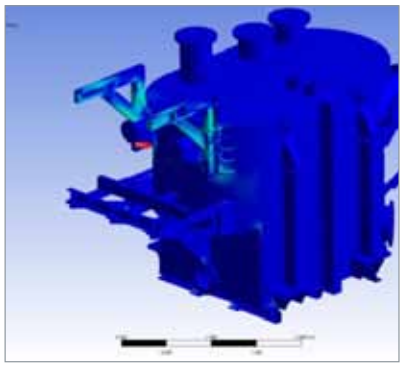
Mechanical Structure Analysis

The transformer,s tank is designed to withstand the impacts and vibrations that occur during its delivery and handling. It is also designed to withstand internal pressures that may arise due to electrical faults. The ANSYS strength analysis program is used to analysis the various strengths of different parts.

Pressure Test Analysis

A program is used to analyse the transformer tank's ability to withstand abnormal internal pressure caused by faults. The tank's mechanical safety is ensured through adding supporting materials to areas that are weak against abnormal internal pressure.



Frame Strength Analysis

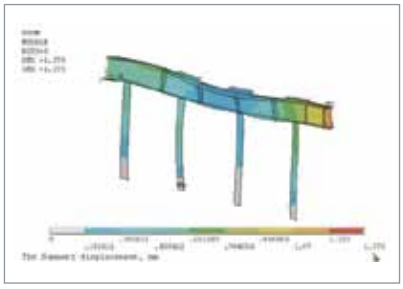
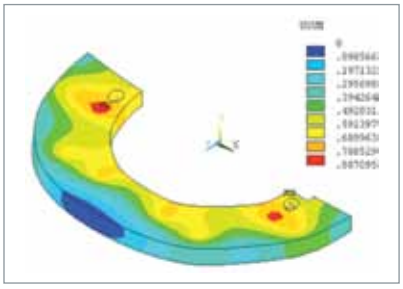
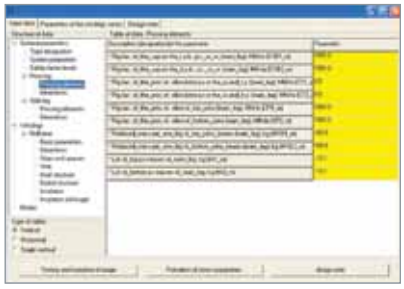
The frame's ability to withstand stress such as short-circuits is analysed using 3D modeling.

Pressure Ring Strength

The pressure ring's ability to withstand stress such as short-circuits is analysed using 3D modeling.

Short Circuit Strength Calculation

A faults mode calculating program is used to calculate the mechanical stress applied to the windings due to faults in the system such as 1-line faults, 2-line faults, 3-phase faults.

Process

1



Winding

Process for manufacturing winding which flows current by winding the rectangular shaped copper wire (purty over 99.999%) to the cylinder shaped winding machine.

2



Core Cutting & Punching

The cores are produced by automatically cutting and punching roll-type silicon steel sheets into designed sizes using the program.

3



Core Stacking & Assembling

The cut silicon steel sheets are stacked to form magnetic circuits that are capable of generating an electric magnetic flux.

4



Assembling for Main Body

Core and winding are conbined together electro-magnetically.

5



Final Assembling

Once the main device is inserted into the tank and the vacuum is achieved, the formation of the electrical circuit is completed by filling the insulation fluid and installing the various supplementary equipment types on the outside of the tank.

6



Final Testing

Upon completion of the final assembly, the transformer's electrical characteristics and electrical insulation performance is checked through final testing to guarantee its utmost quality.

Test

We possess reliable world-class testing and measuring equipment, and a system that provides our customers with products of the highest quality. Characteristic test, insulation test and temperature rise test that meets international standards such as IEC, ANSI/IEEE, NEMA, KS, and ES.





Testing Equipments

Impulse Test	3000kV 300kJ
AC Withstand Voltage Test	600kV 3000kVA
P.D Meaeurement	ERA/RIV 20kHz-20MHz
M.G set	6.6kV 2400kVA
Loss Meaeurement	200kV 4000A
Resistance Meaeurement	100A 1μΩ ~ 500Ω
Condenser Bank	130kV 144MVAR

Routine tests

a) Measurement of winding resistance
b) Measurement of voltage ratio and check of phase displacement
c) Measurement of short-circuit impedance and load loss
d) Measurement of no-load loss and current
e) Dielectric routine tests

Type tests

a) Temperature-rise test
b) Dielectric type tests
c) Tests on on-load tap-changers

Special tests

a) Dielectric special tests
b) Determination of capacitances windings-to-earth, and between windings
c) Determination of transient voltage transfer characteristics
d) Measurement of zero-sequence impedance(s)
e) Determination of sound levels
f) Measurement of the harmonics of the no-load current
g) Measurement of the power taken by the fan and oil pump motors
h) Measurement of insulation resistance

PDPS

(Power Equipment Diagnosis & Preventive System)



GIS/Tr. Diagnosis HMI

1Gbps Fiber Switched Ethernet

(DNP3.0 over TCP/IP)

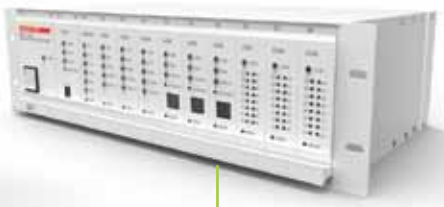
PD DAU





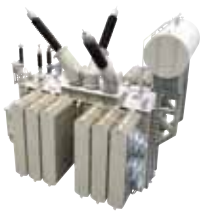
System Rack

RT DAU









GIS Diagnosis

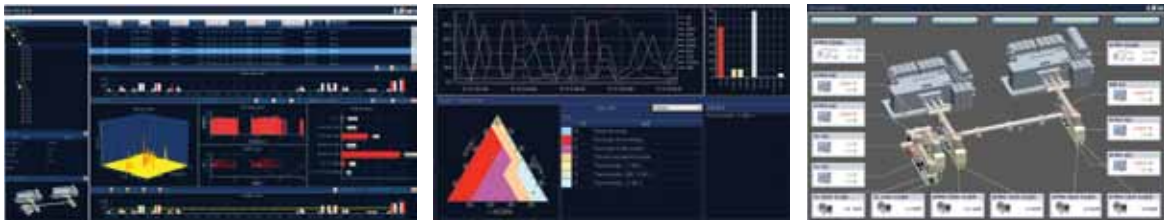
- Partial Discharge (UHF PD)
- SF_6 Gas Density Monitoring
- Analysis of Circuit Breakeroperating & Condition
- Cumulative breaking current
- Cable PD Monitoring
- Lightening Arrester leakage current

Transformer Diagnosis

- Oil contained Gas concentration
- Insulated Oil / Winding temperature
- FAN driving current / time
- PUMP driving current / time
- OLTC operating current / time

Through regular monitoring of major power equipment, accidents can be prevented and database management system of events and history of each unit support efficient management of power equipment

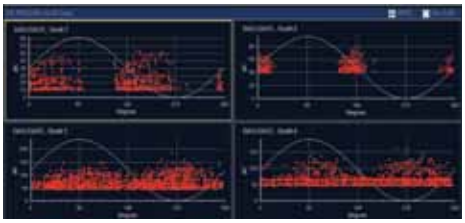
Support for monitoring on-screen editing and diversity reports



PD data analysis & Diagnosis using NN / Fuzzy Algorithm



Multi PD Channel analysis



TR Dissolve Gas analysis

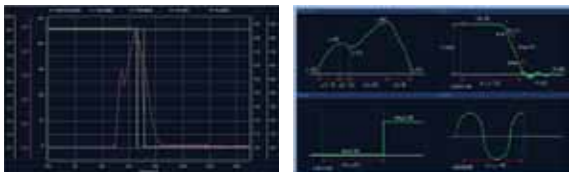


TR Duval's Triangle

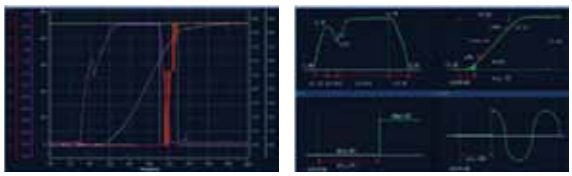


Circuit Breaker operating analysis

3Phase encapsulate, CB Open



3Phase segregate, CB Close



Quality Assurance

Flexible and quick delivery is possible through our computerized management using an ERP System and the rigorous ISO 9001 quality control. Moreover, we have obtained the ISO 14001 environmental management system certification for our environmen friendly production and after-sales service.

Quality Management

The LSIS runs a development library that carries out verifications in various sites of conditions. and comparison tests with other companies' products. This is achieving a growing customer satisfaction level through producing high-quality products. Such quality management has earned LSIS' many certifications and awards, and has become the basis for a realization of products of a global standards.

Customer Technology Training Service

The LSIS offers the industry's first customer training program through the internal training institute. Factory automation and other Industrial electricity and electronic processes are taught through realistic practice apparatus. Technology advice and guidance are offered through this cutting-edge technological service.

Web-based Customer Service.

The LSIS offers globally web-based customer service, aimed at customer satisfaction through providing technological information, quick responses to enquiries, and precise service history. Moreover, by building a supply chain management system-an integrated management for purchasing, production and supply- we are leading the e-business in industrial electrical automation.

KSA
ISO 9001/14001 CERTIFIED
K-OHSMS 18001

PT&T

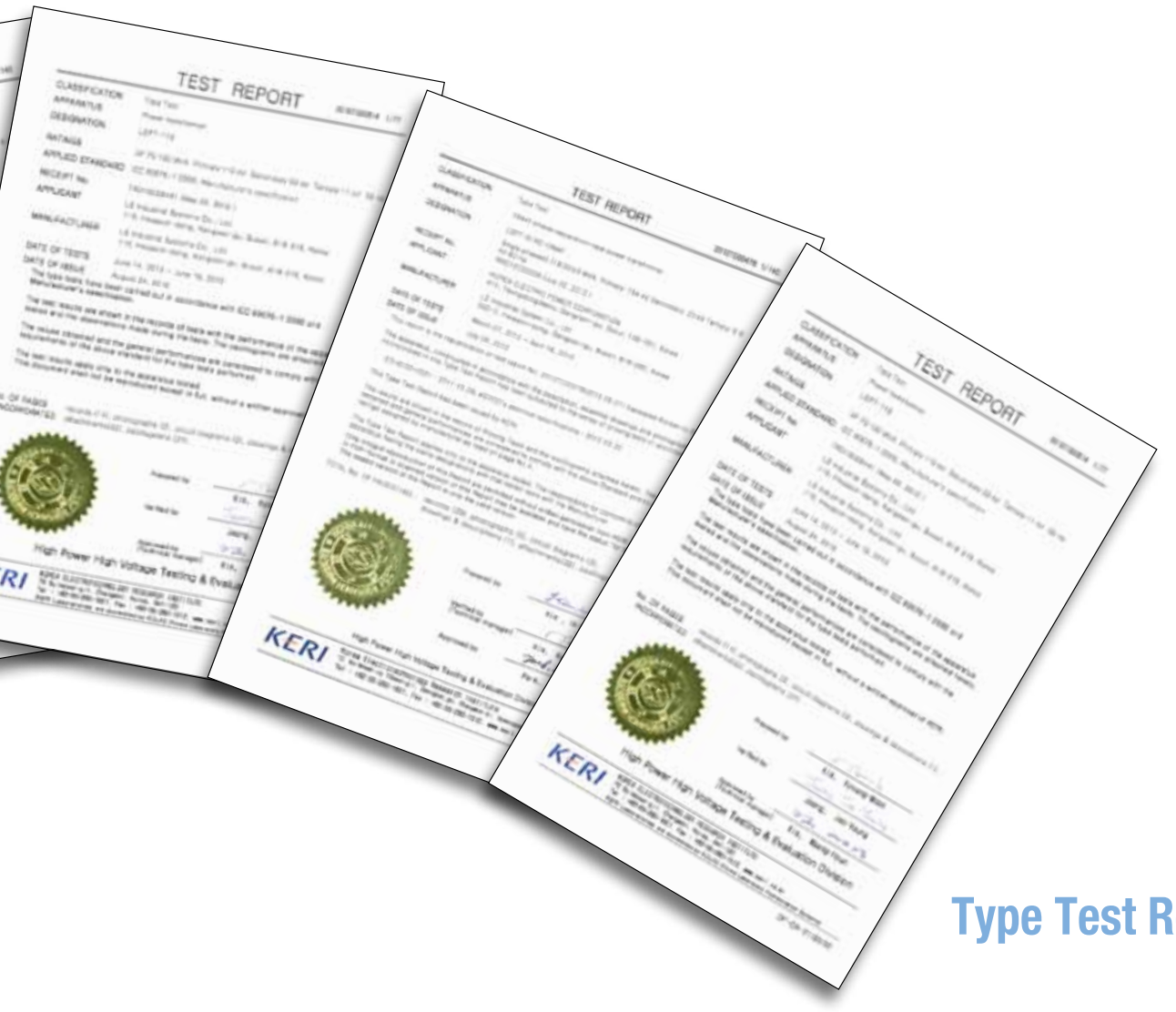
KERI





Power Testing & Technology Institute

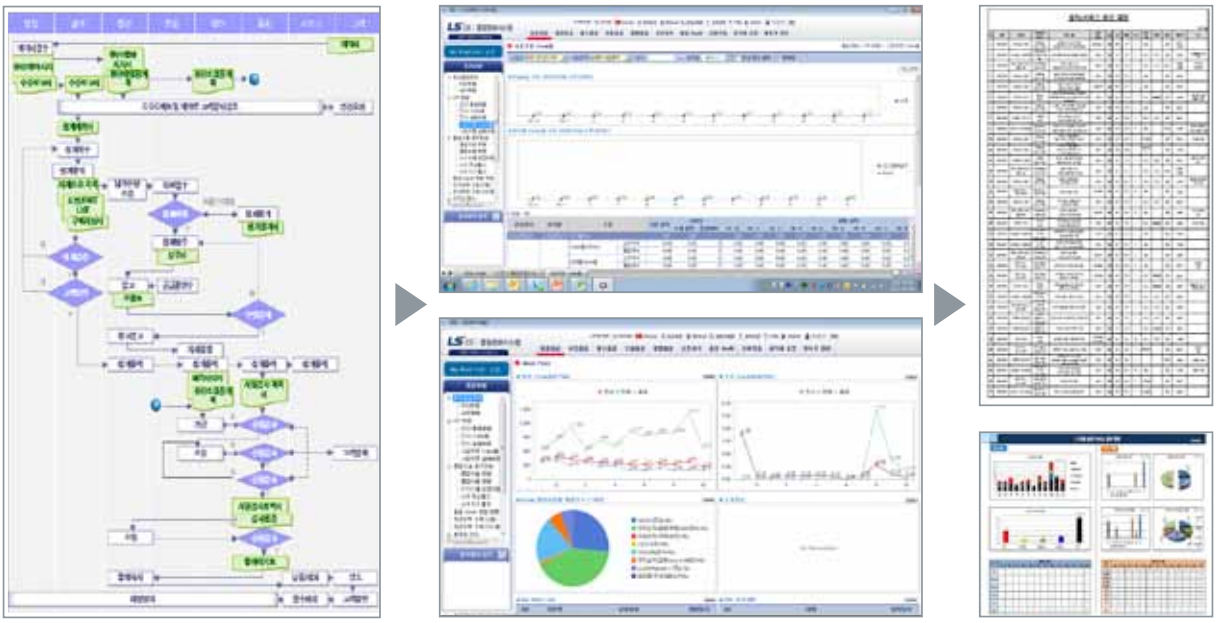
We are the first domestic private enterprise with a short-circuit test equipment of 1,600MVA capacity, high-voltage test equipment, reliability test equipment and a KOLAS recognition, providing globalstandard test assessment services. The institute enjoys a global public confidence, through strategic cooperation, and reciprocal recognition of test reports, with UL (American safety standards), CE (EU recognition logo), The Netherland's KEMA, Italy's CESI and other overseas accredited testing institutes.



Type Test Report

LSIS QIS (Quality Information System)

LSIS has been performing systematic quality management by utilizing Quality Information System(QIS), and awarded the Korea National Quality Grand Award in 2013. As all the factories and products of LSIS are managed in real time with QIS, LSIS gives high satisfaction to the customers by providing quick response and feedback.



Quality Management

LSIS has a world-class quality management system based on superior management competency for process, particle, temperature & humidity and excellent quality management process.

LSIS achieved zero-defect production for 335 transformers from 2010 to 2014, and the faultless production continues even now.





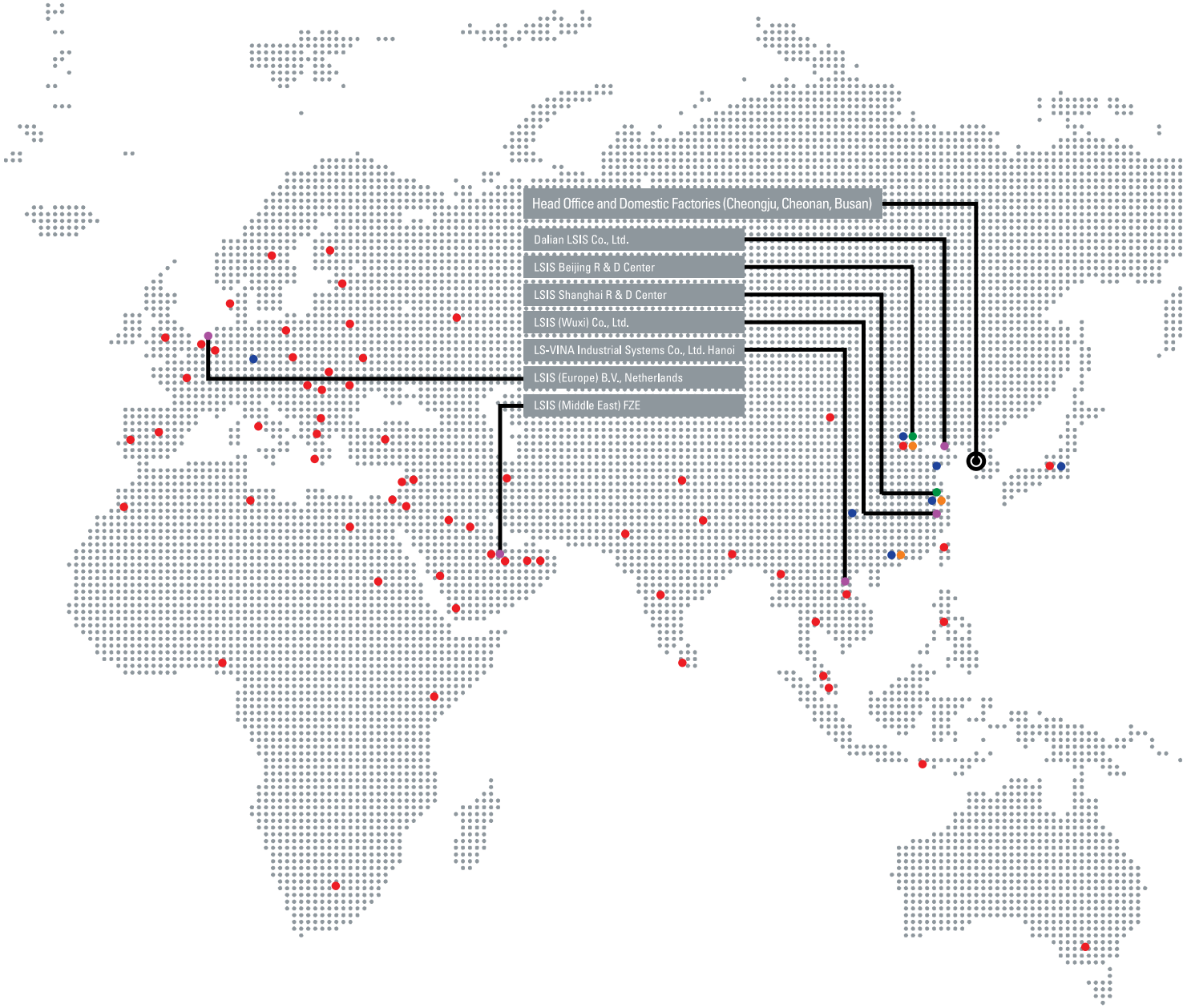




Check List

Item	Content			
Applicable Standard	☐ IEC	☐ ANSI	☐ etc	
Phase	☐ 1 phase	☐ 3 phase	☐ etc	
Place of Installation	☐ indoor	☐ outdoor		
Loading	☐ general-load	☐ etc		
Condition of Installation	☐ new-installation	☐ extension	☐ parallel-operation	
Frequency	☐ 50Hz	☐ 60Hz		
Cooling Type	☐ ONAN	☐ ONAF	☐ etc	
Capacity	☐	/	/	
Rated Voltage	☐ Primary kV	☐ Secondary kV	☐ kV	
Tap Changer	☐ DETC	☐ OLTC	☐ etc	
Tap Range	☐			
Earthing Method	☐ direct	☐ resistance	☐ arrester	☐ etc
Connection	☐ Y-D	☐ D-Y	☐ D-D	☐ etc
Winding / Oil Temp rise	☐ Winding	☐ Oil		
Impedance	☐ %			
	☐ top-top	☐ top-side	☐ side-top	☐ side-side
Bushing Withdraw	☐ etc			
Additional Demand Item	☐			
Painting	☐ LS Standard	☐ etc		
Remarks	☐			

Worldwide Network



Domestic references in recent 5 years

Voltage Class(kV)	2010	2011	2012	2013	2014	Total
154	3	12	9	34	48	124
345	-	3	4	4	6	17
Total	3	15	13	38	54	141



IRAQ



CHINA



KOREA



INDIA

LSIS engages in business activities around the world.
The company has a global network that includes
four overseas corporations and seven overseas branches.
It also has 224 business partners in 77 countries.

Overseas Corporations	Dalian and Wuxi (China), Hanoi (Vietnam), Dubai (UAE), Europe B.V (Netherlands)
Overseas Branches	Shanghai, Beijing, Guangzhou, Chengdu, Qingdao (China), Tokyo (Japan), Germany
Global Service Centers	Shanghai, Beijing, Guangzhou (China)
Global R & D Centers	Shanghai, Beijing (China)
Presence Internationally	77 Countries

Overseas references in recent 5 years

Voltage Class(kV)	2010	2011	2012	2013	2014	Total
~ 138	4	7	104	83	129	327
~ 230	-	-	2	1		3
345 ~	-	-	-	4	-	4
Total	4	7	106	88	129	334





USA



USA



ECUADOR

FUTURING SMART ENERGY



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.

LS IS

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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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