

Reliability and Creativity



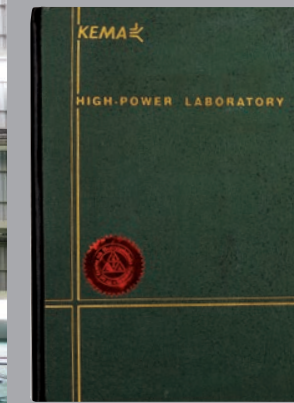
ISO 9001 QMS02061/506
ISO 14001 EMS08021/294

DAIHEN

DAIHEN ELECTRIC CO., LTD.

is the first power transformer manufacturer in THAILAND and has supplied more than 870 units (as of September 2012) to domestic power authorities and industries and overseas countries including JAPAN.

DAIHEN ELECTRIC transformers are manufactured under technical collaboration with **DAIHEN CORPORATION**, which is one of the leading transformer manufacturers in JAPAN and has experience of more than 90 years (established in 1919) in this field. Employing the most up-to-date technical know-how transferred from **DAIHEN CORPORATION** and latest manufacturing facilities, **DAIHEN ELECTRIC** can offer highly reliable products to the customer not only domestic but also international market in compliance with their requirements.



KEMA TEST REPORT

Superior Quality

A reputation for quality has been built by supplying products of high reliability. DAIHEN ELECTRIC CO., LTD. intends to provide reliable products and services with high quality in a cost-competitive manner to achieve customer satisfaction. Resulting from our severe quality control of products, we passed short-circuit test for 50 MVA transformer at KEMA high-power laboratory in Netherlands.



History

- 1989

August

The company was established.
- 1991

August

Delivered first 2 units of 115 kV, 40MVA to Provincial Electricity Authority (PEA), Thailand
- 1997

December

Passed short circuit test of 115kV, 50MVA at KEMA high-power laboratory, Netherlands
Transformer was delivered to Electricity Generating Authority of Thailand (EGAT)
- 2002

June

Awarded ISO 9001 : 2000 certificate
- 2003

September

Delivered 2 units of 50/80 MVA 132/33 kV to Sarawak Electricity Supply Corporation, Malaysia
- 2004

May

Delivered 5 units of 100 MVA 15.75/11.5-11.5 kV to Umm At Nar IWPP, Arabian Power Company, U.A.E
- 2006

March

Delivered 3 units of 120 MVA 26/11.5-11.5 kV to Tanjung Bin Power Sdn. Bhd., Malaysia
- 2007

February

Delivered 2 units of 100 MVA 115/33 kV to Thai Oil Public Company Limited, Thailand
- September

Type test of 90MVA 132kV transformer for Tenaga Nasional Berhad (TNB), Malaysia was performed under witness of independent laboralory, CESI, Italy.
- October

Delivered 2 units of 120 MVA 26/11.5-11.5 kV to Jimah Energy Ventures Sdn, Bhd., Malaysia
- 2008

February

Delivered 1 unit of 50 MVA 230 kV transformer to Pedaeng Industry Public Company Limited, Thailand
- March

Delivered 2 units of 75/100 MVA 69 kV transformer to Sadui Aramco, Saudi Arabia
- November

Awarded ISO 14001 certificate
- 2009

May

Delivered 3 units of 100 MVA 150 kVA generating transformer to Indonesia
- 2012

June

Completed new factory for manufacturing large power transformer (up to 300kV 500MVA)



230kV Transformer



150kV Generating Transformer



GIS direct connection type

Outline of Company

Capital.....	600 million Baht
Founded.....	August, 1989
Technology.....	Licensed by DAIHEN Corporation
Products	Medium and Large Power Transformer (Capacity 3-500 MVA, Voltage 36-300 kV)
Scale of Factory.....	Size : Land 78,300 m ² , Building 16,850 m ² Annual Production Capacity : 10,000 MVA Number of Employees : 300



Fig. 1 Core Cutting Machine



Fig. 2 Core Stacking

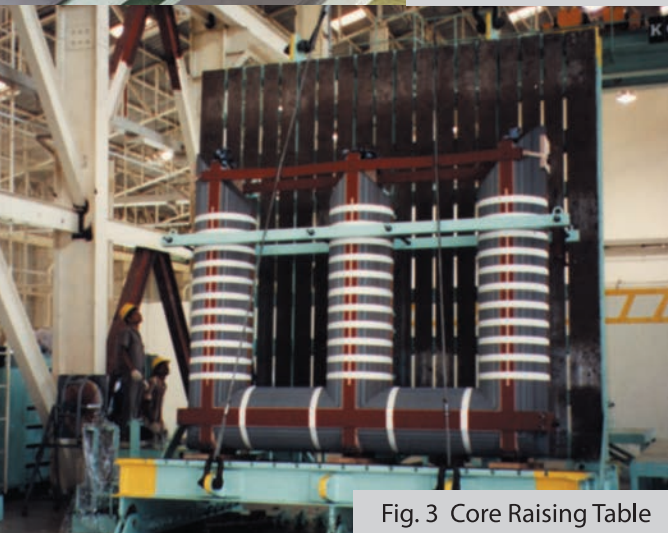


Fig. 3 Core Raising Table



Fig. 4 Coil Winding Room

Manufacturing facilities

1. Core production

- Automatic silicon steel sheet cutting machine (Fig. 1)
- Core stacking and core raising table (Fig. 2, 3)

2. Winding and its insulation production

- Winding machine in air-conditioned, humidity control and dust-proof room (Fig. 4)
- Insulation paper processing machine
- Kraft paper wrapping machine

3. Assembling, drying and oil treatment

- Coil stabilizing treatment (Fig. 5)
- Drying oven (Fig. 6)
- Vacuum oil purifying equipment
- Vapour phase drying equipment

4. Tank-fabrication and painting (Fig. 7, 8)

- Plate cutting and bending machine
- Automatic and semi-automatic arc cutting machine
- CNC plasma cutting machine
- Shotblasting equipment
- Painting booths

5. Lifting installation

- Overhead travelling crane 200/20Ton, 70/20 Ton, 16/5 Ton etc.

6. Radiator production (Fig. 11,12,13)

- Panel molding press machine
- Automatic panel welder
- Automatic panel processing line

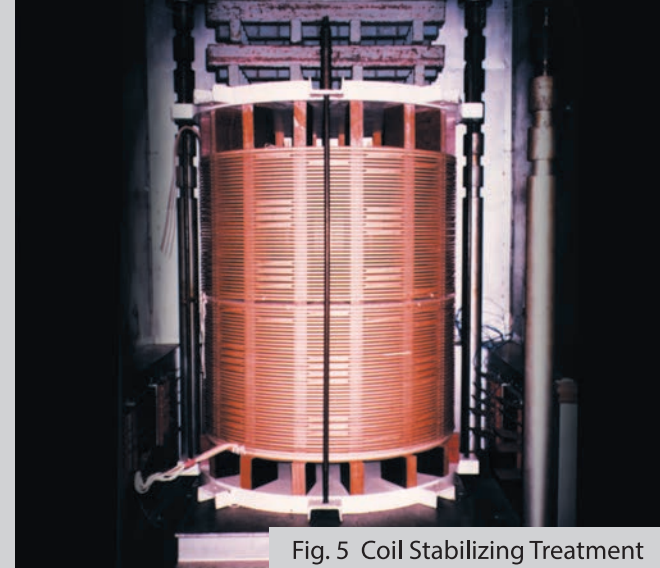


Fig. 5 Coil Stabilizing Treatment



Fig. 6 Drying Oven



Fig. 7 Tank Fabrication Hall



Fig. 8 Tank Fabrication Work



Fig. 9 Core - Coil Assembly



Fig. 10 Internal Wiring



Fig. 11 Panel Molding Press Machine

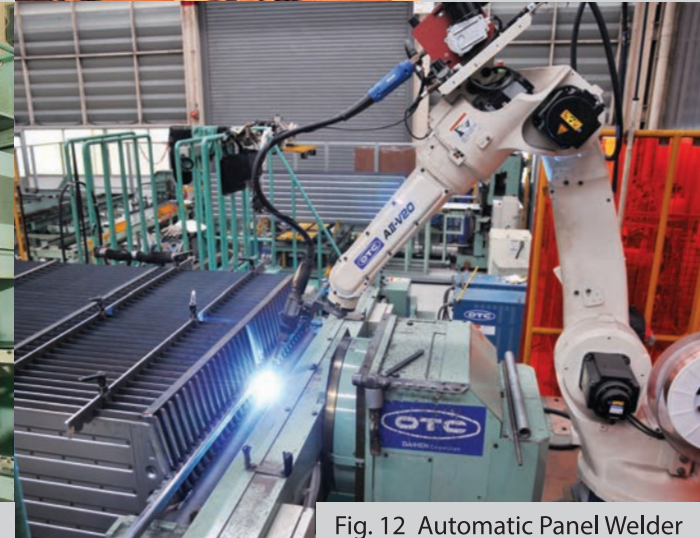


Fig. 12 Automatic Panel Welder

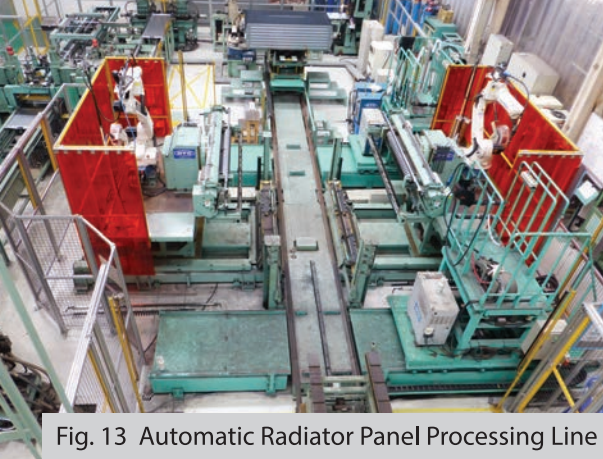


Fig. 13 Automatic Radiator Panel Processing Line



Fig. 14 Shipment

Process flow

1. Coil winding

Coil winding is performed in the dust-proof air-conditioned and humidity-controlled room in order to raise the quality of product. The transformer coils are made of electrolytic copper strip conductors with rectangular cross-section and rounded corners which are wrapped with several layers of kraft paper. Several winding methods are employed to meet the requirement of the customers.

2. Insulation production

Insulations for the transformer are produced and stocked in the air-conditioned room in order to prevent insulation material from absorbing moisture.

3. Coil stabilizing treatment

The coil is pressurized while being heated at the proper temperature for 36-48 hours in the coil stabilizing treatment chamber to acquire enough strength to withstand the electromagnetic force under severe short circuit condition. (Fig. 5)

4. Core assembly

The high quality silicon steel strips are cut by modern automatic cutting machine into sheets. These sheets are stacked horizontally on the core raising table, each corner being carefully miter-jointed to make the best use of properties of the core material. The stacked core is clamped to the table and is gradually raised to the upright position together with the table to avoid undue mechanical stress in the core, so that high quality of the core can be assured. (Fig. 2,3)

5. Wiring connection

The connection between the winding ends and the bushings, as well as between the winding and the tap changer, are made of copper cables insulated by wrapping with kraft paper. All joints between conductors are tightly well-connected with smooth surface to reduce the electric stress. (Fig. 10)

6. Tank-fabrication

Tank parts are carefully welded both inside and outside and are thoroughly checked for oil leakage when the tank is completed. These tanks can withstand a full vacuum and also the proper internal pressure test. Both inside and outside surfaces of tank are shotblasted thoroughly before being coated with the rust proof primer and final painting. (Fig. 7,8)

7. Radiator Production

High quality panel type radiators are produced by automatic line consisting of panel welding, molding press, assembling and painting. (fig.11,12,13)

8. Shipment

During transportation, bushings and other accessories are removed from the main tank and the transformer oil is replaced by dry nitrogen gas to reduce weight. (Fig. 14)

Transformer test

DAIHEN ELECTRIC has all facilities to perform all tests normally required by the customers in compliance with existing transformer standards such as IEEE, IEC, BS, JEC and others. Those facilities have capabilities sufficient to test transformer of rated capacity up to 500 MVA and rated voltage up to 300 kV.

Temperature-rise test and impedance test can be carried out under full load conditions, since three phase motor-generator 1,000 kVA, capacitor banks 130 MVAR and matching transformers are available for that purpose.

Dielectric tests are carried out with a high frequency generator 1 phase 200 Hz 300 kVA or 3 phase 200 Hz 800 kVA, a high-voltage testing transformer 1 phase 50/60 Hz 460 kV 690 kVA and an impulse voltage generator 1,600 kV 160 kJ in

addition, partial discharge can be observed during the dielectric test or prolonged over voltage test.

Analysis of the various gases dissolved in the transformer oil, which can also be performed before and after temperature-rise test and dielectric test, is the most reliable means for the diagnosis of the transformer under operation. By this means even a small discharge or locally heated hot spot can be detected before they may develop to a serious failure.

The testing shop is also provided with a wide range of measuring apparatus to facilitate such tests as noise and characteristics of transformer.

Testing equipments

- Motor-generator sets
 - 3 phase 50/60 Hz 6900 V 1000 kVA
 - 3 phase 180/200 Hz 6200/6900 V 650/800 kVA
 - 1 phase 200 Hz 6600 V 300 kVA
- Impulse voltage test facilities and testing transformers for power frequency test
 - Lightning/switching impulse voltage generation : 1600 kV 160 kJ
 - Testing transformer 50/60/200 Hz 460 kV 690 kVA
 - Potential divider : 2400 kV for lightning impulse test : 2000 kV for switching impulse test : 680 kV for power frequency
- Auxiliary testing transformers
 - 3 phase 50/60 Hz 130 kV 113 MVA
 - 3 phase 50/60 Hz 34.5 kV 20 MVA
 - IVR 3 phase 6.6 kV 3000 kVA
 - IVR 1 phase 6.6 kV 3000 kVA
- Phase modifiers
 - Compensation capacitors : 3 phase 50/60 Hz 38.1kV 108/130 MVAR
 - Reactor : 1 phase 180 Hz 6600 V 4000x3 kVAR
- Measuring and investigating equipments
 - Partial discharge measuring equipments : Electrical PD fully digital system
 - Gas chromatograph (gas dissolved in oil analyzer)
 - Moisture meter
 - Oil tester
 - FRA

Fig. 15
Testing Control Room



Fig. 16
Gas-Chromatograph Analyzer



Fig. 17
Moisture Meter



Fig. 18
Generator For Characteristic Tests



Fig. 19
Partial Discharge Detector (Fully digital system)





Fig. 20 High Voltage Testing Hall

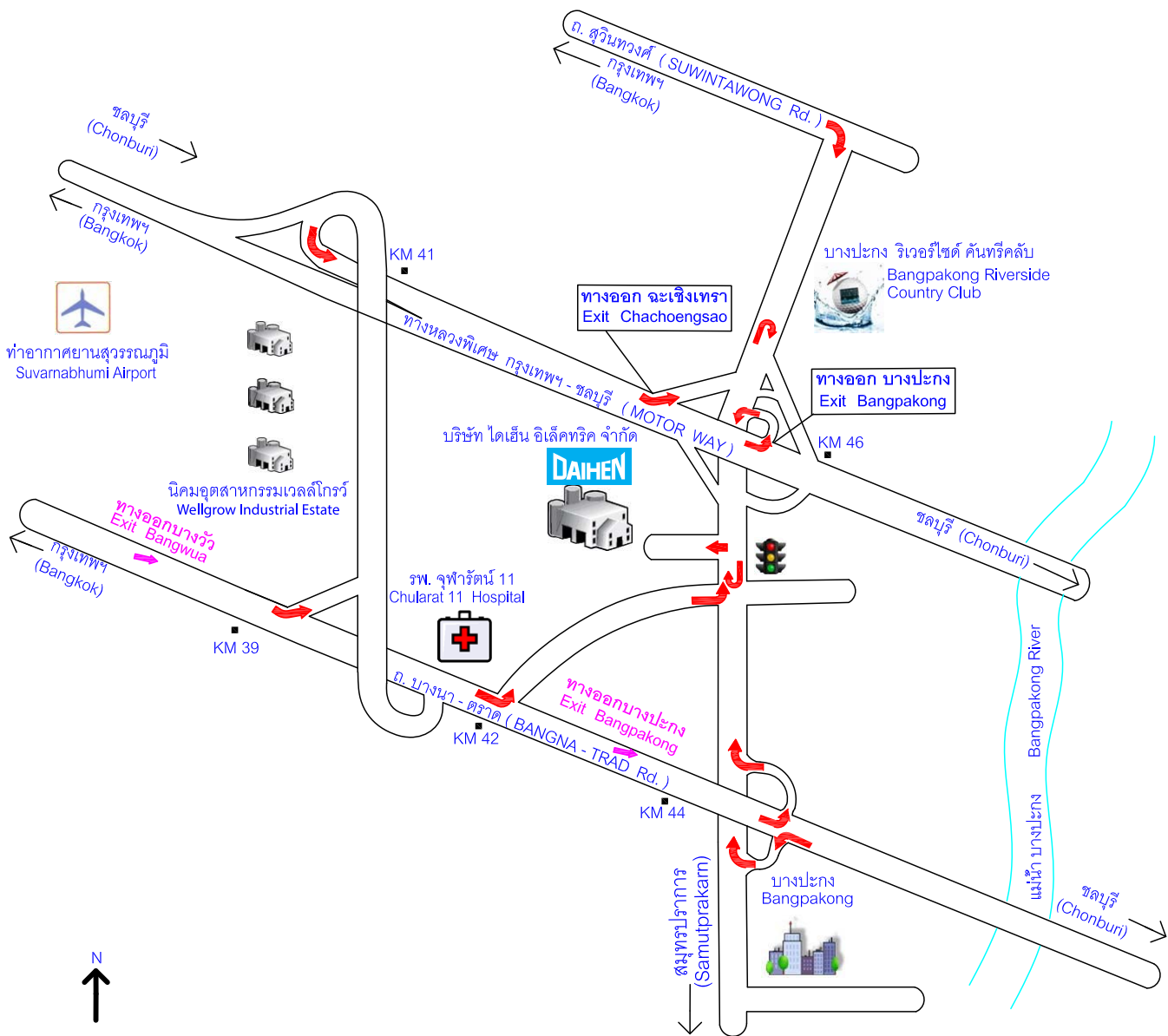
Customer

Customer (Overseas)	Capacity (MVA)	Voltage	Quantity	Customer (Thailand)	Capacity (MVA)	Voltage	Quantity
Tenaga Nasional Berhad, Malaysia	90,30,45,15	132	43	Provincial Electricity Authority	25,40,50	115	146
Sabah Electricity Sdn. Bhd., Malaysia	15,30,60,45,20,7,5	132,66,33	39	Metropolitan Electricity Authority	40,60	115,69	45
Sarawak Electricity Supply Corporation, Malaysia	35,25,5	11	8	Electricity Generating Authority of Thailand	13,5,28,38,50	115,28	29
Syarikat SESCO Berhad, Malaysia	15,25,20,45,75	11,33	15	Metropolitan Waterworks Authority	7,5,15	115,69	7
Tanjung Bin Power Sdn. Bhd., Malaysia	120	26	3	Metropolitan Rapid Transit Authority	80	67	2
Jimah Energy Ventures Sdn Bhd, Malaysia	120	26	2	Port Authority of Thailand	12,5,25	67	4
The Kansai Electricity Power Co.,Inc. , Japan	20,30,10,7,5	75,25,77	46	Royal Irrigation Department	20,15	115	3
Gadong Power Station 1 / Brunei DES, Brunei	8,46	66	6	Padaeng Industry Public Company Limited	50	230	1
Rabigh Refinery & Petrochemical Company, Saudi Arabia	25	34.5	3	Thaioil Public Co., Ltd.	100	115	2
The Hokkaido Electric Power Co.,Inc. Japan	10,6	64,5,72,33	3	Amata Power	26,43,48,2,50,52,5	120,115	24
The Chugoku Electric Power Co.,Inc. Japan	15	64.5	1	Wind Energy Holding Co., Ltd.	60,70	115	5
The Chubu Electric Power Co.,Inc. / Japan	10,9	77,33	5	Thai National Power Co.,Ltd.	25,40,55,90	115	6
Batangas Cogeneration Corporation, Philippines	32,19,6,5,3	115,13,8	6	Sahacogen (Chonburi) Public Co., Ltd.	30,50	22,115	4
Philippines National Oil Company Energy Development Corporation, Philippines	67,88,7,5	138,13,8	2	Rojana Power Co., Ltd.	60,94,50,40	115	19
National Power Corporation , Philippines	19	22	2	Nawanakorn Electric Co., Ltd.	56,32,30	120,23	4
Electricite Du Laos, Laos	20,16,30,20,50	115	15	Glow Energy Public Co., Ltd.	50,51,5,63,5	112,5,118,123	5
Electricity of Vietnam, Vietnam	25,15,40,30,63	115,110	7	Central Plaza Rama II	25	115	2
Cambodia Power Transmission Lines Co.,Ltd. , Cambodia	25,50	115	4	Honda Automobile (Thailand) Co., Ltd.	25,20	115	3
Myanmar Electric Power Enterprise, Myanmar	44,15,20,5,13,33	66,132	13	Toyota Motor Thailand Co.,Ltd.	12,5,30,15	115,69,22	6
P.T. Central Java Power , Indonesia	54	22.8	4	Isuzu Motors Co. (Thailand) Ltd.	15, 20, 30	115, 67	3
PT Asahimas Chemical, Indonesia	80	150	1	Thai Yamaha Motor Co., Ltd.	30	112	1
PT. PLN (Persero) , Indonesia	100	150	3	Ford Motor Company (Thailand) Limited	18	115	1
Arabian Power Company.,Umm Al Nar IWPP U.A.E	100	15.75	5	Mitsubishi Motors (Thailand) Co., Ltd.	20	115	1
Saudi Arabian Oil Company , Saudi Arabia	100	69	2	PTT Chemical Public Co., Ltd.	85,55	115	5
Compahia Siderurgica Paulista (COSIPA), Brazil	72	88	3	PTT Utility Co., Ltd.	40,55	115	6
Hydrochem(s) Pte. Ltd., Singapore.	36	66	2	PTT Polyethylene Co., Ltd.	45	22,115	4
Mitsui Elastomer Singapore Pte, Ltd, Singapore	19	22	1	The Aromatics (Thailand) Public Co., Ltd.	80	115	2
Mighty River Power Limited, New Zealand	14	11	2	IRPC Public Co., Ltd.	50	115	1
Kawerau Geothermal Limited, New Zealand	12.5	11	1	Bayer Polymers Co.,Ltd. & Bayer Thai Co., Ltd.	63	115	2
Kenya Electricity Generating Company Ltd. , Kenya	23	132	1	Chow Steel Industries Co., Ltd.	40, 100	115	2
Niger Delta Power Holding Company of Nigeria Plc. , Nigeria	60,8	132,15	14	NMB-Minebea Thai Ltd.	25	115	4
West Australia Biomass Pty Limited, Australia	56.25	132	1	Gulf JP Co., Ltd.	5,20,10,40,25	115	14
				Praxair (Thailand) Co., Ltd.	30	115	2

Servicing

The transformer(s) is one of the most important equipments in electrical system that affects the reliability of the power system. When there is outage of electricity, it causes loss of chance, property, and even life, as we realize such importance so we are committed to be a part of the security system of customers by providing service teams who are qualified to ensure customers for our following servicing.

- Transformer installation, removal and relocation
- Transformer pre-commissioning
 - * Measurement of insulation resistance (IR)
 - * Measurement of tan delta and capacitance of transformer
 - * Measurement of magnetizing current
 - * Measurement of short circuit impedance
 - * Measurement of voltage ratio
 - * Check of vector group
 - * Measurement of winding resistance
 - * BCT test
- Transformer repairing
- Transformer preventive maintenance
- OLTC Maintenance
- Oil treatment (dehumidifying & degassing)
- Oil test (DGA, breakdown voltage, water content etc.)
- Training



DAIHEN

บริษัท ไดเฮ็น อิเล็กทริก จำกัด DAIHEN ELECTRIC CO.,LTD.

Head Office And Factory
258-259 Moo 6 Tambon Thasa-an, Amphur Bangpakong,
Chachoengsao 24130 Thailand
Tel.(66)3853-0230-7, Fax.(66)3853-0228-9

Sales Office
14th Floor, KPN Tower 719 Rama 9 Road, Bangkapi,
Huaykwang, Bangkok 10320 Thailand
Tel.(66)2717-0233-5, Fax.(66)2717-0230
E-mail: sales@daihen.co.th
www.daihen.co.th

