

Power Transformer



INTEGRATION
OF POWER SYSTEM

We Light Up the Taipei 101, Once the highest building in the world



22.8KV Substation in every 10 floor.

- CRTR :3P 22.8KV 2~4MVA * 70 PCS
- PANEL :3P HV&LV* 1780 SETS



161KV Substation in B4 Belong to TPC

- TR :3P 161/22.8KV 60MVA * 4 PCS
- GIS:3P 161/22.8KV 60MVA * 4 PCS



Contents

The Course of Change and Development	2
Main Products	3
Manufacture Capability & Scope	4
Manufacture Technology	5
Technology R&D	6
Quality Assurance	7
Products Characteristics	
Cores	8
Windings	9
Tanks	10
Manufacture Process of Oil Immersed Transformer	11
Main Domestic Customers	12
Main Export Customers	12

The Course of Change and Development

In 1955, Shinlin Electric Joint Stock Company made its first step to manufacture heavy-duty electrical equipments in collaboration with Mitsubishi Electric Corporation, and developed 69kV, 161kV, 345kV power transformers. In 2003, successfully developed 345kV 650MVA transformer, the maximum capacity in Taiwan, for Taichung Thermal power Plant. And 161kV 60MVA SF₆ Gas Insulated Transformer for underground transformer station in Taipei World Trade Center. The 50-year-long relentless improvement, reliable expertise and superb quality enable Shihlin Electric to deliver customized products and services.



Heavy Electric Plant's picture (front gate)



Heavy Electric Plant's picture (inside view)

Main Products

- 345kV including and below oil Immersed Power Transformers
- 161kV including and below SF₆ Insulated Power Transformer
- Furnace Transformers
- Rectification Transformers
- Mobile Transformers
- Reactor
- 69kV Oil Immersed Current Transformers
- 69kV Oil Immersed Voltage Transformers
- 69kV Oil Metering Outfits Transformer (MOF)



345kV, 500MVA in TPC (Taiwan Power Company)

Capability & Range of Manufacture

- 345kV Power Transformer:
Max. performing capacity 716.8MVA, since 2008
Max. Capability 1000MVA
- 161kV Power Transformer:
Max. performing capacity 390MVA, since 2004
Max. Capability 500MVA
- 161kV Gas Insulated Power Transformer:
Max. performing capacity 60MVA, since 2002
Max. Capability 200MVA
- 69kV Power Transformer:
Max. performing capacity 220MVA, since 1999
Max. Capability 250MVA
- 33kV Power Transformer:
Max. performing capacity 130MVA, since 2001
Max. Capability 1000MVA



345kV, 650MVA in TPC (Taiwan Power Company)



Fully Automated Core cutting & Stacking Robots



Automated Core Cutting Machine

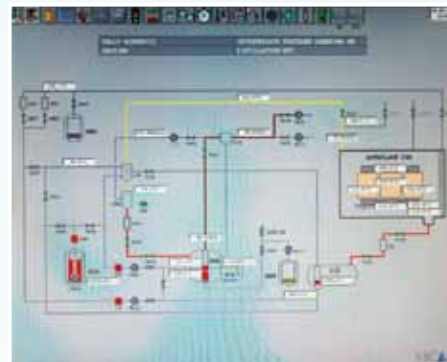
Manufacturing Technology

Strict Control of Working Environment with Advanced Automatic Equipments

- Manufacture operations such as material receiving, insulation substance production, core cutting, core stacking, core assembly, and drying are all in precisely controlled dust-free clean room environment to reduce foreign particle contamination.
- State-of-the-art Swiss-made Vapour-Phase Drying with computer-controlled automatic monitoring feature provides uniform core heating which ensures the core insulation quality.
- Fully automated core cutting machine and core stacking machine work together provide excellent core quality by reducing core processing degradation to the utmost.



Dual Clean rooms for Coil winding and Internal Assembling

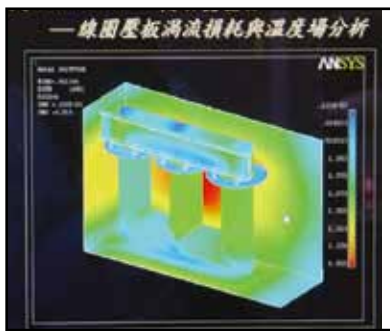


Vapour-Phase Drying process

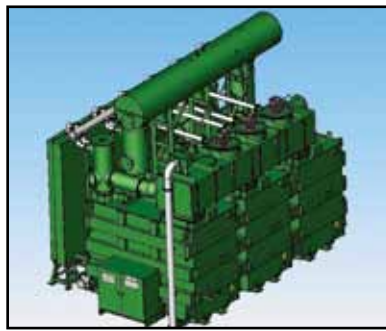
R&D

Technology Transfer, Independent R&D, and Advance Software Applications

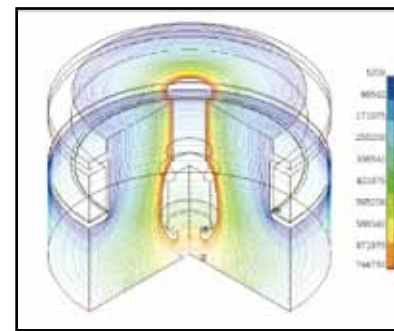
- With the transfer of up-to-date Mitsubishi Electric Corporation know-how and technical support of Shihlin R&D team, customers receive reliable highest quality products.
- A wide range of 3D CAD software and CAE software applications guarantee a synchronized design and development.
- Utilizing computer aided analytic procedure including impedance calculation, coil short circuit/mechanical stress, magnetic field and coil eddy current loss, engineers can accurately calculate transformer's internal stress field and electromagnetic field effect.
- With the applications of finite element analytic software and 3D computer aided drawing software, it's possible to build a 3D model to carry out analytic simulation in 3D on solid model's dynamic electromagnetic field, stress field and coupling heat flow field for parallelly processed product develop and specification verification test.



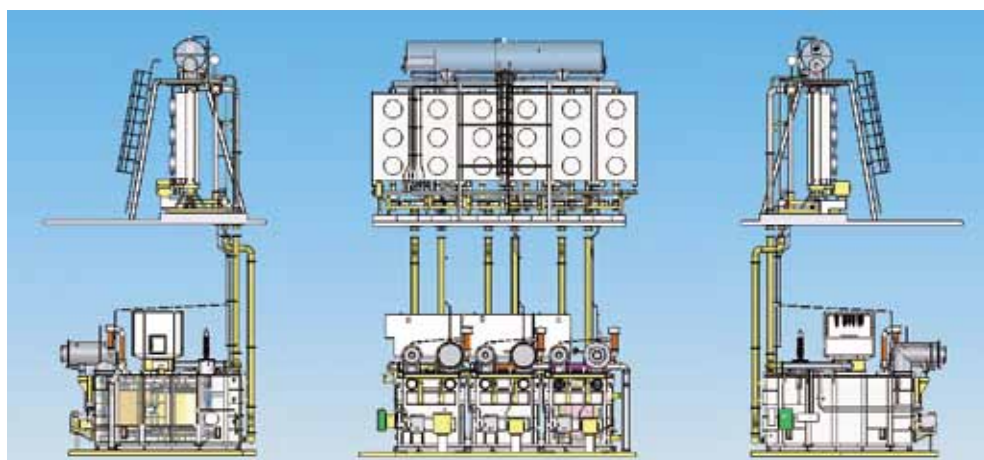
Finite Element Analysis of Eddy current & Temp.



3D Computer Aided Drawing work



Analysis Electric Field Intensity

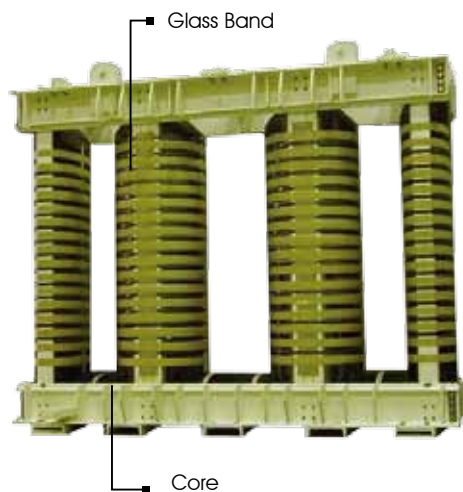


Multi-Layer type Power Transformer, 3D Lay-out.

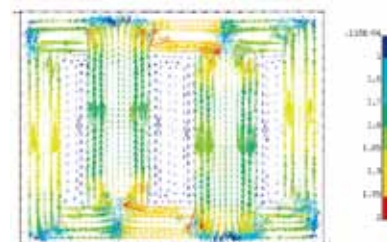
Products' Characteristic

(1) Cores

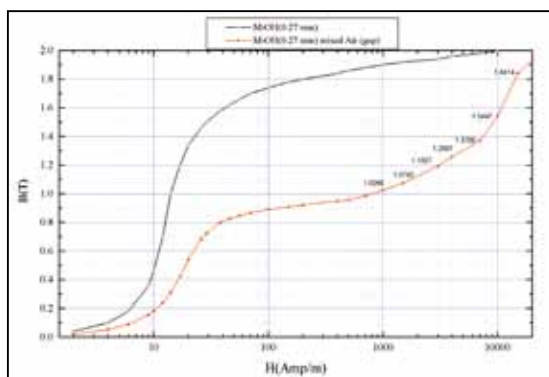
- Low Loss, Low Noise and High Short-Circuit Mechanical Endurance
- Full-automatic cutting and stacking equipments allow high magnetic inductivity and low magnetic hysteresis loss silicon sheets to keep excellent unique properties.
- Insulation film are applied onto core surface to increase layer insulation resistance and reduce eddy current loss, also to prevent corrosion.
- Advanced V-NOTCH and STEP-LAP lapped-type stacking with GLASS BAND ensure exceptional high short-circuit mechanical endurance and low noise.
- Rake-type clamping construction reduces efficiently the inrush current of leakage magnetic flow. Moreover, through analyzing core magnetic circuit and air space's accumulated magnetic flow via finite element model, the characteristics of core magnetic circuit and low loss characteristics of transformer core construction are controlled..



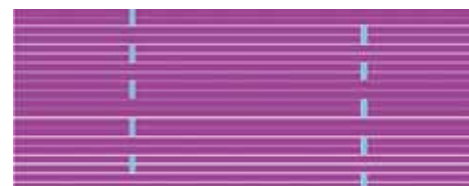
Rake-type Clamping Construction



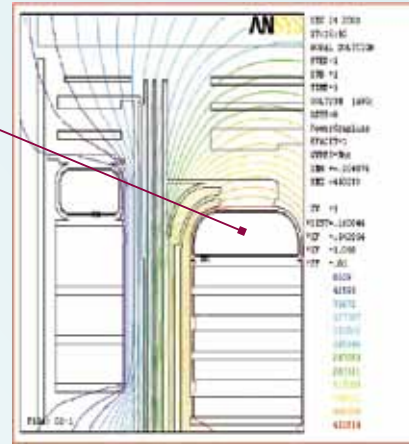
Analysis of Magnetic Field



Core Air Space B-H Curve Analysis



Core Magnetic Circuit Air Gap



Analysis of Potential Curve

(2) windings

High abrasion-resistance and surge capacity with high short circuit mechanical endurance. End electrostatic ring and R-type insulation construction fully absorb the external surge energy. And, based upon potential vibration simulation analysis within the winding, Engineers fully understand potential allocation of windings for optimized insulation configuration.

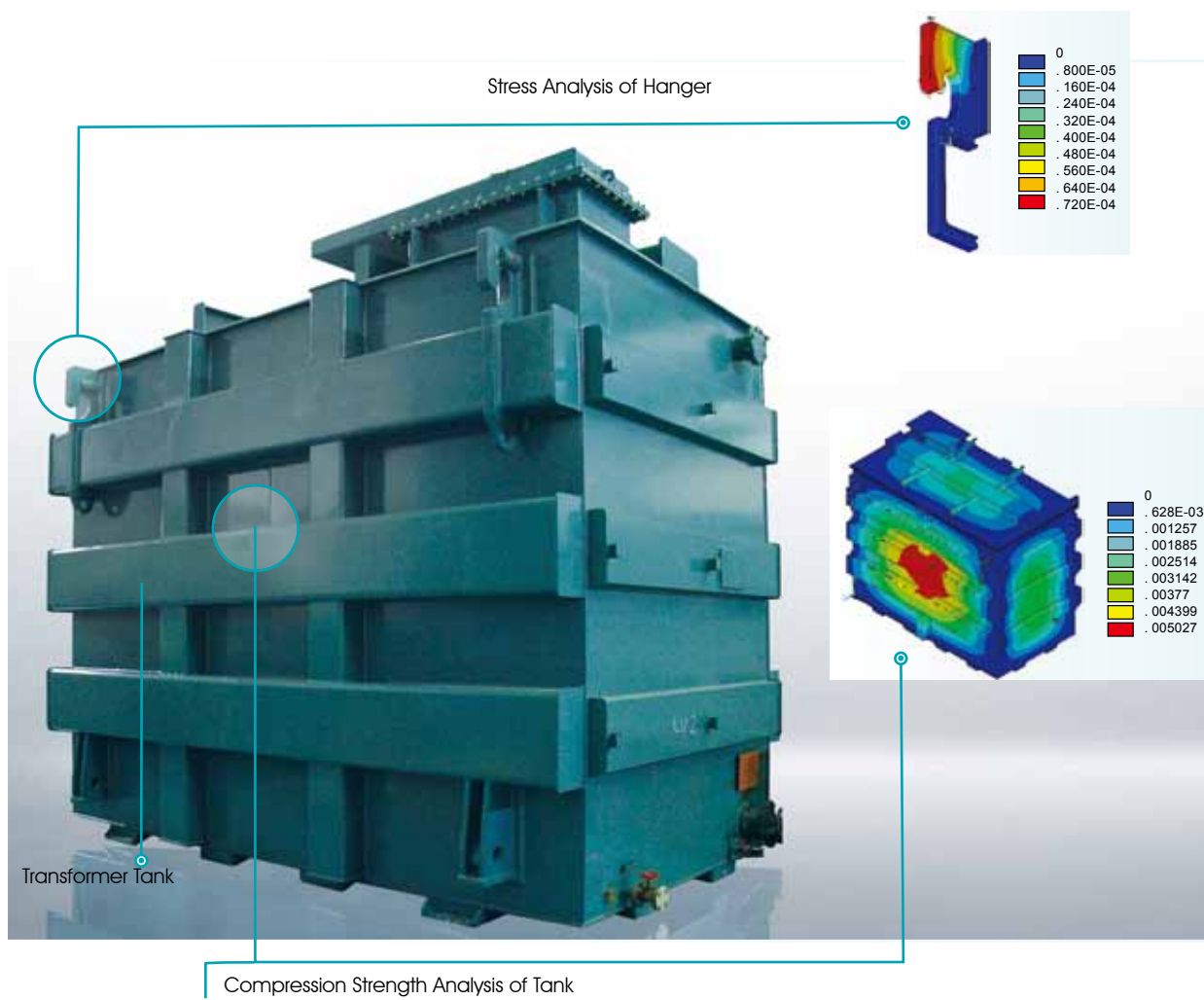
The windings' oil duct design provides accurate insulant processing and avoids current interference, thus, efficiently controls oil flow conductivity and ensures a long-term transformer insulation property. The selection of winding conductors and horizontal / vertical layout of oil duct are determined by detailed balance computation of installed windings. And, computer software are utilized for windings' stress distribution and winding conductors' endurance in order to provide a desirable windings' short-circuit mechanical endurance.



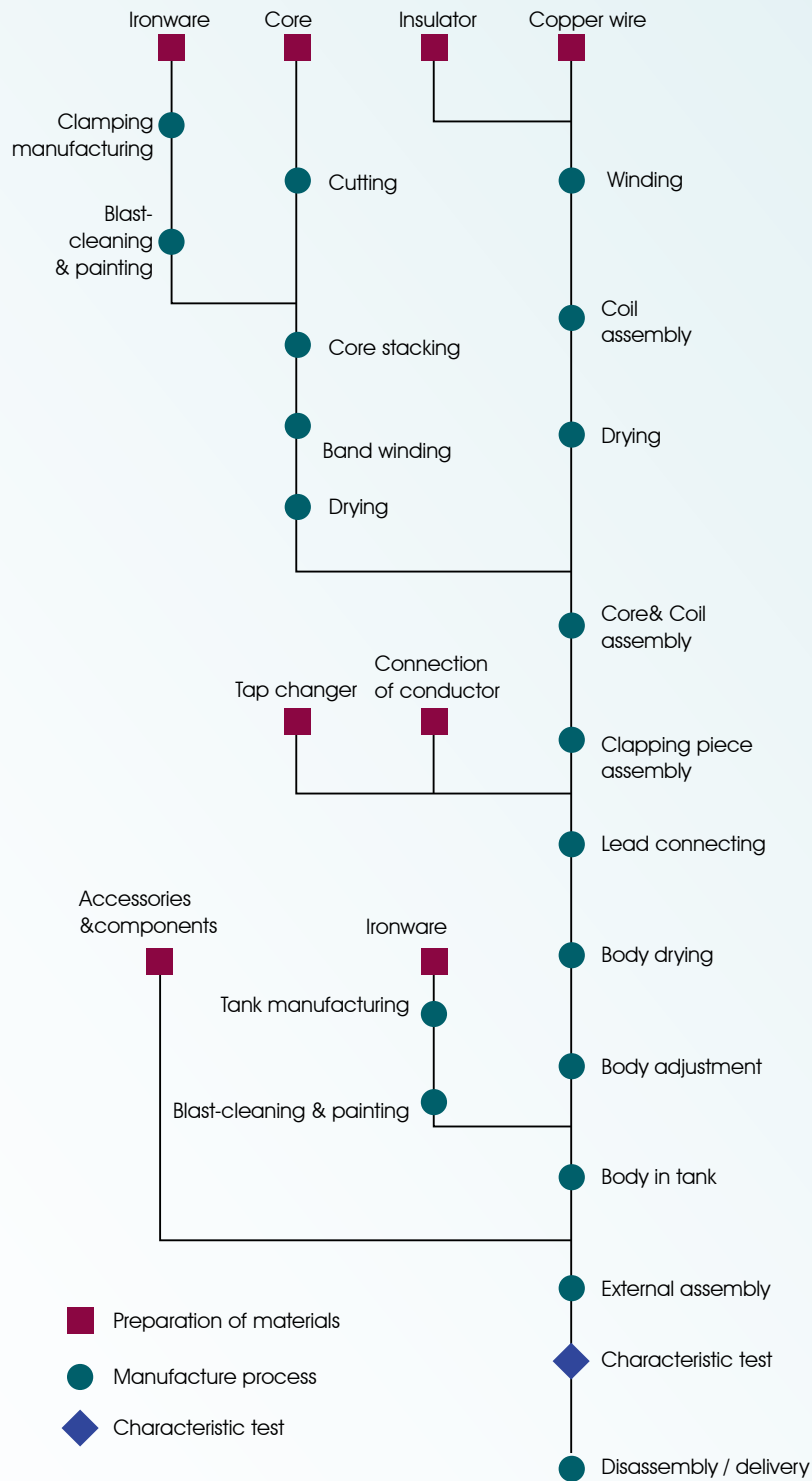
Construction of Oil Duct

(3) Tanks

- The tanks and relevant accessories are subject to leakage test to ensure sufficient compression strength.
- To fully guarantee the tank's compression strength, structure analysis on critical structure elements with 3D model and finite element method are performed.



Manufacture Process of Oil Immersed Transformer



Coil assembly



Body assembly



Body drying



Body in tank



Erected Transformer in AUS.

Accessories

Name plate
Bushing
Mineral oil
Dial type thermometer with alarm contact
Dial type oil level gauge with alarm contact
Oil filter valve
Oil drain and sampling valve
Radiator and radiator valve
Grounding pad
Pressure relief device with alarm contact
Nitrogen-sealed device
Conservator
Buchholz relay
No-voltage tap changer
Lifting lug
Foundation bolt
Jacking boss
Ladder
Base
Manhole or handhole
Common terminal box

Special Accessories

Cooling fans / Cooler
Sudden pressure relay
Winding thermometer with trip & alarm contact
Lighting arrester
B.C.T
On-load tap changer
Oil pump (for FOA rating only)
P.T.
Neutral grounding resistor
Diaphragm type conservator
Breather
Cable/Bus connection duct
Cable/Bus connection duct
No-voltage tap changer
Lifting lug
Foundation bolt
Jacking boss
Ladder
Base
Manhole or handhole
Common terminal box

Main Export Customers

Industry		Utility	
U.S.A	Delta Power	U.S.A	LADWP
	Mitsubishi Heavy Industries, Ltd.		AES
	Mitsubishi Electric Corp.	Japan	Tokyo Electric Power Company
Japan	Toshiba Mitsubishi-Electric Industrial Systems Corp.		Mitsubishi Heavy Industries, Ltd.
	JFE Steel Corp.		Kyushu Electric Power Co., Inc.
	Sumitomo Metal Industries, Ltd.	AUSTRALIA	SP-Ausnet
Philippines	SKK Steel Corp.		Powercor
	Cathay Pacific Steel Corp.		Alinta
Indonesia	Asia Pulp & Paper	Philippines	National Electrification Administration
	PT Gunung Garuda		Davao Light and Power Corp.
	TSMC (Shanghai) Company Ltd.		Visayan Electric Company
Main land of China	Jiangxi Yadong Cement Ltd.		Mirant Philippines, Inc.
	Toppoly Optoelectronics (Nanjing) Corp.		Asia Pacific Electric Corp.
	Cheng Shin Rubber (China) Co., Ltd.	Saudi Arabia	SCECO (Eastern)
Thailand	Maxxix International Thailand Co., Ltd.		
	CMC		
Vietnam	Vedan Vietnam Enterprise Corp.		
Singapore	McConnell Dowell South East Asia Private Ltd.		

Main Domestic Customers

Taiwan Power Company	RITEK Corp.
Taipei Rapid Transit Corp.	CMC Magnetics Corporation
CPC Corporation, Taiwan	DragonSteel Corp.
ChinaSteel Corp.	Feng Hsin Iron & Steel Co., Ltd.
Taiwan Semiconductor Manufacturing Company Limited	Chi Mei Medical Center
Powerchip Semiconductor Corp.	China American Petrochemical Corp.
Inotera Memories.	Lee Chang Yung Chemical Industry Corp.
Winbond Electronics Corp.	Chang Chun Plastics Corp.
Advanced Semiconductor Engineering Inc.	China Man-made Fiber Corp.
Siliconware Precision Industries Co., Ltd.	Formosa Plastics Group
King Yuan Electronics Corp.	Nan Ya Plastics Corp.
Chi Mei Corp.	CHENG SHIN RUBBER IND. CO., LTD.
AUO ptronics Corp. (Quanta Display Inc.)	Yuen Foong Yupaper Mfg. Co. Ltd
Innolux Display Corp.	Uni-President Enterprises Corp.
TPO Displays Corp.	Vedan Enterprises Corp.
HannStar Display Corp.	Tainan Spin Corp.
Corning Incorporated.	Dream-Mall Co., Ltd.

Over 50 Year Experience

Shihline Electric Transformers are in service worldwide



China

FAR EASTERN IND. LTD.
TSMC(SHANGHAI) CO., LTD.
CHICONY CO. LTD.
JUN HUI IND. CO. LTD
ASIA OPTICAL INT'L LTD.
DYNAMIC ELECTRIC CO. LTD.
CHENG SHIN-TOYO TIRE & RUBBER CO. LTD.
LIANZHONG STAINLESS STEEL CORP.
UNIMICRON TECHNOLOGY CORP.
CENSION SEMICONDUCTOR CO. LTD.
QIMONDA TECHNOLOGIES CO. LTD
HAINAM JINHAI PULP & PAPER CO. LTD

South-East Asia

MAXXIX INT'L THAILAND CO. LTD.
PT INDAH KIAT P&P CORP.
PT GUNUNG GARUDA
JSW STEEL LTD.
FORMA PLYWOOD IND. CORP.
RING SHINE TEXTILES
HELIOS TERMINAL CORP.
BANG SAPHAN BAR MILL CO. LTD.
HIEP PHUOC POWER CO. LTD.
POU YUEN VIETNAM ENTERPRISE CORP.
SANYO ELECTRIC VIETNAM WORKS
VEDAN VIETNAM ENTERPRISE CORP.
HUALON CORP.

Philippines

ABOITIZ POWER GROUP CO.
NATIONAL POWER CORP. PHILIPPINES
SIEMENS, INC.
SUMISETSU PHILIPPINES, INC.
TSUNEISHI HEAVY IND.
CATHAY PACIFIC STEEL
SKK STEEL CORP.
YAMAHA INC.
TRUST INT'L PAPER CORP.

Japan

TOKYO ELECTRIC POWER CO.
KANSAI ELECTRIC POWER CO. INC
KYUSHU ELECTRIC POWER CO. INC
OKINAWA ELECTRIC POWER CO. LTD
CHUGOKU ELECTRIC POWER CO. LTD.
MITSUBISHI ELECTRIC CORP.
NIPPON STEEL CORP.
JFE GROUP
TMEIC
TAKENAKA CROP.
MHI, KHI, IHI, SHI
KINDEN CORP.

Mid-East

DEWA
SCECO (EASTERN)
SWCC
MARAFIQ YANBU/JUBAIL
MINISTRY OF ENERGY IN KUWAIT

Australia

POWERCOR
SP-AUSNET
ALINTA ENERGY

Africa

GOVERNMENT OF BENIN
MITSUBISHI ELECTRIC CORP.
SOTCO

Americas

DEPT. OF WATER & POWER LA
PASADENA WATER & POWER
FORMOSA PLASTIC TEXAS
M3 ENGINEERING
DELTA POWER INC.
EMPRESA ELECTRICA GUACOLDA S. A.
INDUSTRIAS JOVIDA C.V. DE S. A.



INTEGRATION OF POWER SYSTEM



www.seec.com.tw / www.seecusa.com

Head Office 16F, No.88, Sec.6, Chung Shan N. Rd., Taipei, 111 Taiwan
T. +886-2-2834-2662 F. +886-2-2836-6187

Export Sales Dept. 13F, No.90, Sec.6, Chung Shan N. Rd., Taipei, 111 Taiwan
T. +886-2-2832-1556 F. +886-2-2832-1003 e-mail: export@seec.com.tw

Heavy Electric Factory No. 23, Chung Hwa Rd., Hsin Chu Industrial Park, HsinChu, 303 Taiwan
T. +886-3-598-1921 F. +886-3-598-1480

Overseas Office
Shihlin Electric U.S.A. 80 South Lake Avenue, Suite 780, Pasadena, CA 91101
T. +1-626-535-0132 F. +1-626-535-0134 e-mail: sales@seecusa.com

Area Representative

2009, 2,000

Copyright reserved