

Cast Resin 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

High Voltage Cast Resin Transformer Without Housing

- (1) Product Specification 2
- (2) Structure Sections Drawing 3
- (3) Product characteristic 4
- (4) Technical Data and Dimensions 6

Low Voltage Cast Resin Transformer 8

Low Voltage Dry type Transformer 10

Low Voltage Whole Cast Transformer 12

High Efficiency Cast Resin Transformer

- (1) Features 13
- (2) Specifications & Characteristics 14

Application Notes 16

Main Export Customers 17

Main Domestic Customers 17

(1) Product Specification

Shihlin molded transformers are made by resin vacuum casting for indoor application.

- Meet IEC 60076-11 Standard or the National Standards of each country
- Voltage level: 36kV/24kV/12kV or below
- Phase: Single phase or 3-phase
- Power Capacity: According to suggestion of each country's National standards.
- Tapping range: $\pm 2.5\%$, $\pm 5\%$
- Phase Vector: Dyn11 or Dyn11 (Other connection are available to meet requirements)

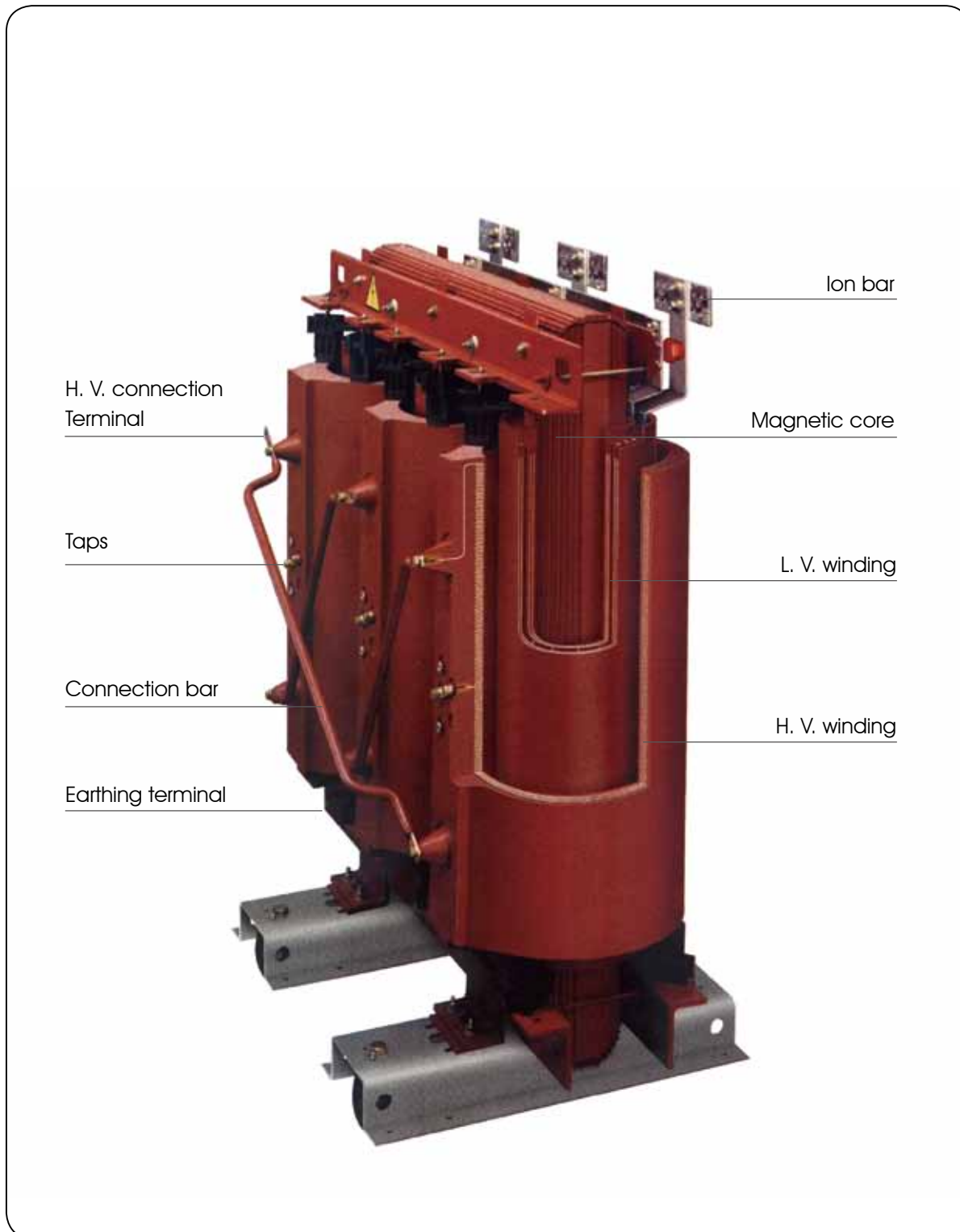
- Based on IEC 60076-11
- High Voltage Winding: F Class
- Low Voltage Winding: F Class
- Maximum Ambient Temperature: 40°C
- Temperature-Rise Limitation: 100 K
- Max permissible temperature: 155°C

- Based on IEC 60076-11
- Total Loss: + 10%
- No-Load Loss: + 15%
- Load Loss: + 15%
- Impedance: $\pm 10\%$
- Noise level(dB): + 3dB

- Max. Capacity: 10000 kVA
- Max. Voltage: 36kV

- Distribution transformer
- Tie transformer
- Rectify transformer
- Grounding transformer
- Furnace transformer

(2) Structure Drawing with Section



Standard Accessory

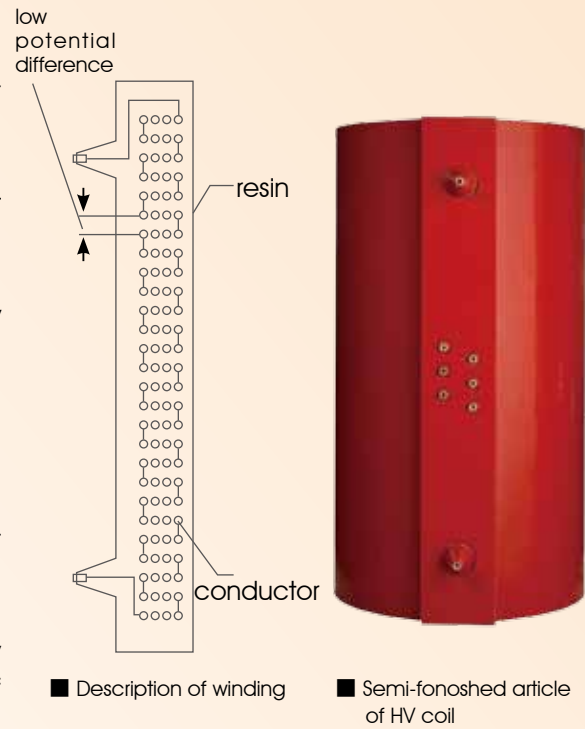
Name plate / Earthing terminal / Lifting lug / High and low voltage terminals / No load Tap changer / Wheel

Optional Accessory

Housing / Cooling Fan / Dial type thermal meter / Thermal relay

(3) Product Characteristic

- Conductor Material : Top quality copper (or aluminum) wire with high electrical conductivity.
- Winding : Lower unique technique by French FRANCE TRANSFO is applied. The voltage gradient and partial discharge (below 10pc) in the coil increases life and voltage stress capability.
- Resin : SiO_2 is added to the world top quality F graded resin to increase the resin thermal conductivity and reduce the thermal stress.
- Resin Reinforcement : Fiber glass mesh is used on the outermost and the innermost layers of the coil. Not only the resin thickness can be maintained but also to increase coil mechanism short circuit absorbing capability.
- Casting : The Italy-made fully automatic resin casting system is used. The whole process is closely monitored and controlled to ensure the quality of each vacuum casting.



■ Automatic Winding Machine for High Voltage Coils



■ Resin Vacuum Casting Equipment

Low Voltage Coils

- Conductor Material : Top quality aluminum(or copper) foil with high electrical conductivity is applied to reduce electromagnetic force.
- Winding : High performance winding machine is used.
- Insulation Materials : European high quality F class insulation materials are applied.



■ Sheet Winding Machine for Low Voltage Coils

Core

- Silicon Sheets : The sheets are made of Japan's or Europe's top class high permeability materials.
- Cutting : The German GEORG equipment is used for cutting the silicon sheets. V-NOTCH and STEP-LAP shearing methods are also used to greatly increase the iron core performance and reduce core noise.



■ CTQC Test Report



■ KEMA IEC60076-11



■ Step-Lap , V-notch

Quality Control

- Quality Recognition :
 - a.In 1994,BSI and ISO9001 certification were awarded.
 - b.In 1991 3 ϕ 2000kVA and 3 ϕ 5000kVA were approved by Taiwan Electric Research & Testing Center.
 - c.In 2006 3 ϕ 2000kVA was approved by KEMA according to IEC 60076-11 & CTQC(China National Transformer Quality Supervision Testing Center).
- Process Control : Each workstation sets up its own control standards and practically ensures the operation quality by Self-check.
- Final Product Quality Control : Every transformer must go through complete QC tests before shipping. A forming test will be made on all new design products to ensure the product quality.

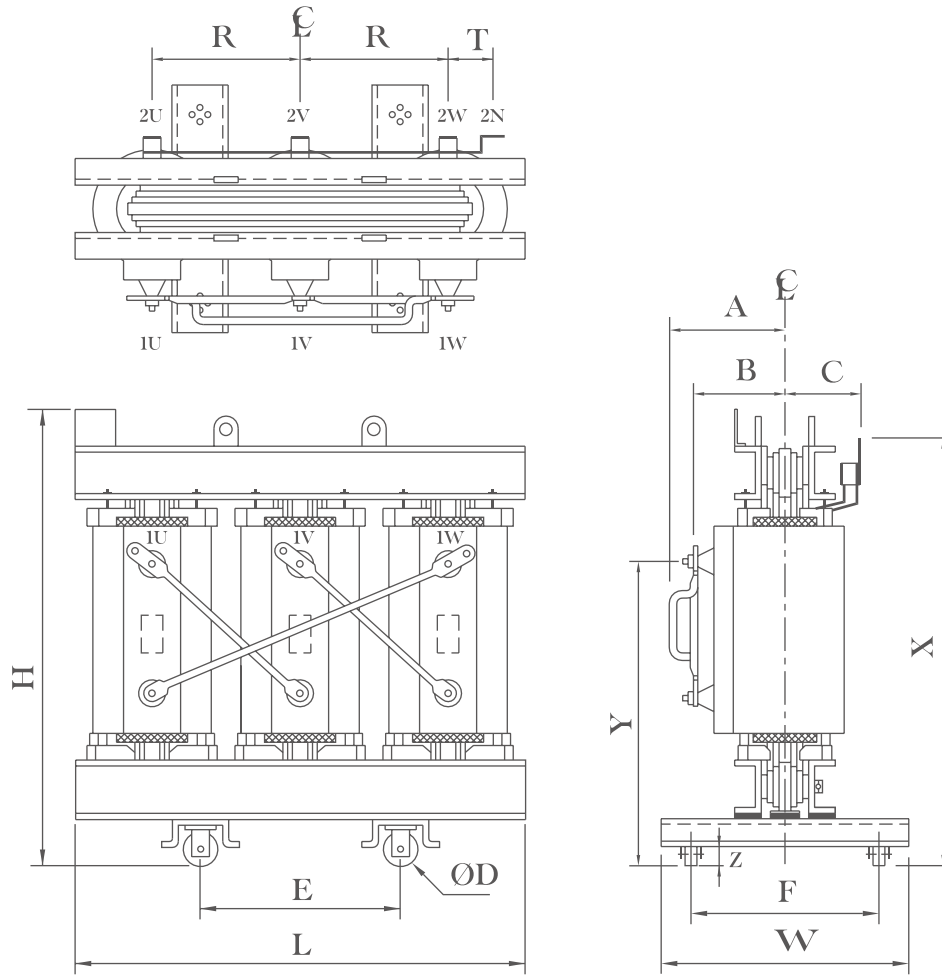
(4) Technical Data and Dimensions

3 Φ 60Hz		HV:22.8-11.4kV		IEC 60076-11																	
		LV:380(220)V		BIL:125kV AC:50kV (Temp. Rise 100K)																	
Type	Rated Power (kVA)	Impedance Voltage (%)	75°C Total (W)	75°C Efficiency (%)	Sound (dB)	Dimension (mm)												Weight (kg)	Terminal		
						H	L	W	E	F	R	T	A	B	C	X	Y	Z		LV	HV
SD0100-2	100	4	2560	97.5	56	1350	1250	860	700	700	415	135	410	280	215	1220	900	72	900	a	h
SD0150-2	150	4	3050	98.0	58	1400	1350	860	700	700	435	200	420	290	225	1185	810	72	1050	a	h
SD0200-2	200	4	3650	98.2	60	1400	1400	860	700	700	450	210	430	300	230	1195	820	72	1250	a	h
SD0250-2	250	4	4300	98.3	60	1550	1400	860	700	700	450	210	430	300	230	1345	970	72	1400	a	h
SD0300-2	300	6	5200	98.3	62	1400	1300	860	700	700	425	215	420	295	215	1310	935	75	1200	a	h
SD0400-2	400	6	6900	98.3	62	1400	1400	860	700	700	455	230	440	310	225	1330	960	97	1450	b	h
SD0500-2	500	6	8100	98.4	62	1550	1400	960	800	800	465	180	445	315	230	1420	1010	92	1600	b	h
SD0600-2	600	6	9100	98.5	64	1750	1550	960	800	800	510	210	455	325	250	1560	1140	85	2050	b	h
SD0750-2	750	6	10600	98.6	64	1750	1500	1060	900	900	495	200	480	350	250	1645	1270	94	2000	b	h
SD1000-2	1000	6	13200	98.7	64	1900	1550	1060	900	900	510	200	485	360	270	1795	1380	94	2350	c	h
SD1250-2	1250	6	16400	98.7	65	1950	1650	1160	1000	1000	550	210	505	380	270	1885	1435	112	2950	d	h
SD1500-2	1500	6	18200	98.8	65	2000	1700	1160	1000	1000	565	210	515	390	275	1795	1495	112	3350	e	h
SD2000-2	2000	6	22300	98.9	66	2150	1850	1160	1000	1000	615	225	540	410	305	2110	1545	102	4200	f	h
SD2500-2	2500	6	25300	99.0	68	2250	1900	1260	1100	1100	635	230	555	425	315	2240	1675	111	5050	f	i
SD3000-2	3000	6	27200	99.1	68	2400	2050	1260	1100	1100	670	260	570	440	330	2395	1745	111	6100	g	i

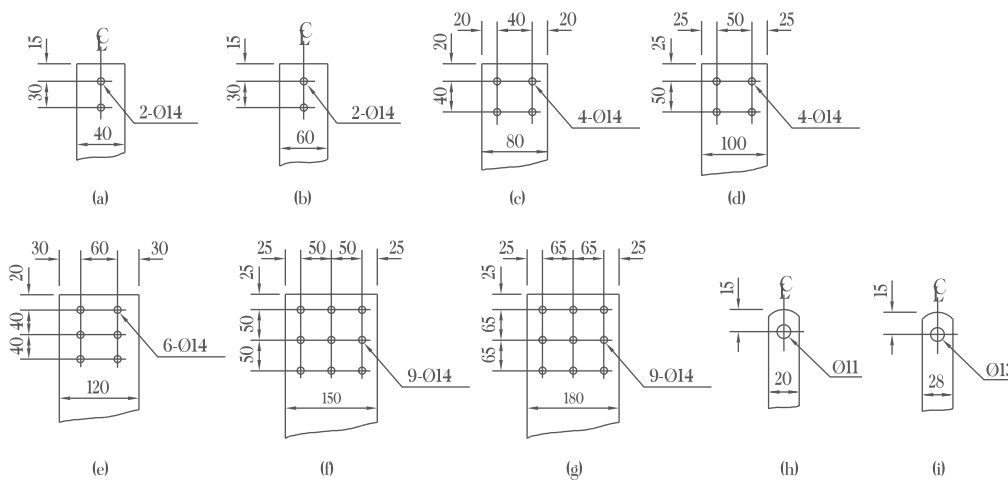
If dry-type transformer has been in storage over one month, the main body should be dried before operating.



Dimensions Diagram



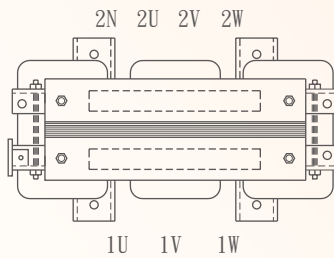
High/Low Voltage Terminal Diagram



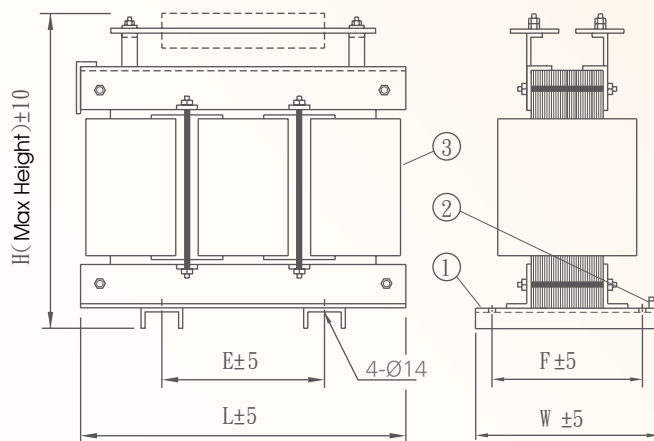
Low Voltage Cast Resin Transformer

3Ø 60HZ IP00 (Three Phase 60HZ Without Housing)

Power (kVA)	Rated		Guarantee Value(75°C)			Dimension(mm)					Total Weight (kg)
	High Voltage (V)	Low Voltage (V)	Total Loss (W)	Efficiency (%)	Impedance Voltage (%)	H	L	W	E	F	
3			220	93.17		290	330	260	200	190	40
5			280	94.70		330	330	260	200	190	50
7.5			375	95.24		390	330	260	200	190	60
10			440	95.79		390	390	300	250	230	75
15		220	560	96.40	≤4.5	450	390	300	250	230	95
20	480	110	720	96.53		450	410	340	300	270	125
25	460	380Y/220	890	96.56		450	510	340	300	270	140
30	440	220Y/127	1000	96.77		480	510	340	300	270	160
37.5	380	208Y/120	1100	97.15		540	510	340	300	270	185
50	220	200Y/115	1310	97.45		630	680	350	450	280	240
75		199Y/115	1820	97.63		760	830	370	550	300	390
100		190Y/110	2150	97.90	3.0	830	830	370	550	300	440
150			2920	98.09	5.5	1000	830	370	550	300	570
200			3800	98.14		1000	920	450	600	350	710
250			4600	98.19		1130	980	450	650	350	850



Rated Power	Noise Level
0-50 kVA	50 dBa
51-150 kVA	55 dBa
151-300 kVA	58 dBa



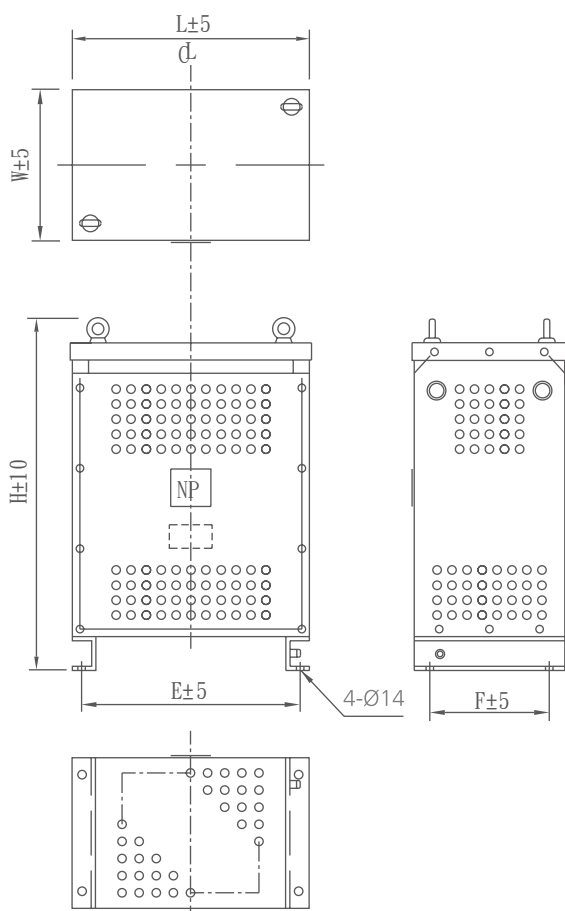
Product Specification

- Standard : IEC 60076-11 、 CNS13390
- Insulation thermal Class : F (155°C)
- Coil Temperature Rise : 100K
- AC Withstand Voltage : 3kV
- Noise Level : According to table 2.

According to different capacity and connection, terminal and structure would be changed. The overall dimension won't be changed, above transformer outline drawing is for reference only.

3Ø 60HZ IP20 (Three Phase 60HZ With Housing)

Power (kVA)	Rated		Guarantee Value(75°C)			Dimension(mm)					Total Weight (kg)
	High Voltage (V)	Low Voltage (V)	Total Loss (W)	Efficiency (%)	Impedance Voltage (%)	H	L	W	E	F	
3			220	93.17	≤4.5	500	380	250	330	150	50
5			280	94.70		500	380	250	330	150	60
7.5			375	95.24		500	380	250	330	150	70
10			440	95.79		570	440	300	390	200	90
15		220	560	96.40		570	440	300	390	200	120
20	480	110	720	96.53		630	560	350	510	250	145
25	460	380Y/220	890	96.56		630	560	350	510	250	160
30	440	220Y/127	1000	96.77		630	560	350	510	250	180
37.5	380	208Y/120	1100	97.15		700	560	350	510	250	210
50	220	200Y/115	1310	97.45		840	730	350	680	250	280
75		199Y/115	1820	97.63	3.0	1050	880	400	550	300	460
100		190Y/110	2150	97.90		5.5	1050	880	400	550	300
150			2920	98.09	1200		880	400	550	300	650
200			3800	98.14	1235		1000	450	600	350	830
250			4600	98.19	1365		1050	450	650	350	970



Rated Power	Noise Level
0-50 kVA	50 dBa
51-150 kVA	55 dBa
151-300 kVA	58 dBa

Product Specification

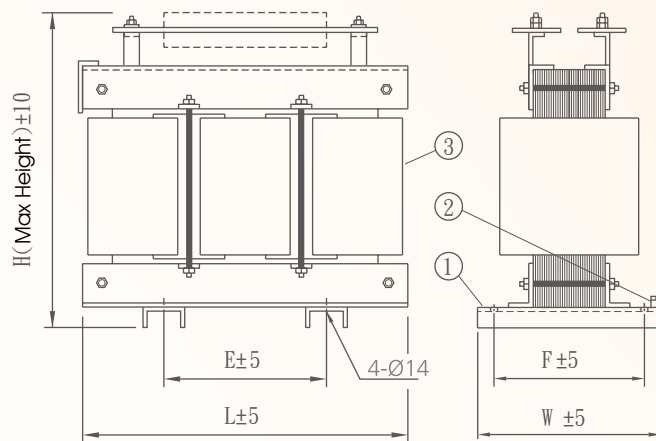
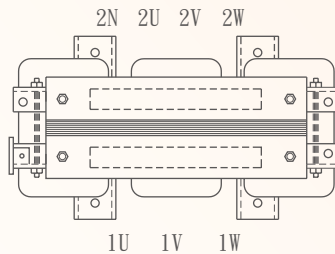
1. Standard : IEC 60076-11 、 CNS13390
2. Insulation thermal Class : F (155°C)
3. Coil Temperature Rise : 100K
4. AC. Withstand Voltage : 3kV
5. Noise Level : According to table 2.

According to different capacity and connection, terminal and structure would be changed. The overall dimension won't be changed, above transformer outline drawing is for reference only.

Low Voltage Dry Type Transformer

3Ø 60HZ IP00 (Three Phase 60HZ Without Housing)

Rated			Guarantee Value(75°C)			Dimension(mm)					Total Weight (kg)
Power (kVA)	High Voltage (V)	Low Voltage (V)	Total Loss (W)	Efficiency (%)	Impedance Voltage (%)	H	L	W	E	F	
3			190	94.04	≤4.5	310	300	260	200	190	40
5			260	95.06		350	300	260	200	190	45
7.5			350	95.54		400	300	260	200	190	50
10			420	95.97		370	340	300	250	230	70
15		220	530	96.59		420	340	300	250	230	85
20	480	110	680	96.71		460	340	300	250	230	100
25	460	380Y/220	820	96.82	3.0 ↓ 5.5	440	480	340	300	270	130
30	440	220Y/127	950	96.93		460	480	340	300	270	145
37.5	380	208Y/120	1170	96.97		490	480	340	300	270	165
50	220	200Y/115	1360	97.35		560	570	360	350	280	220
75		199Y/115	1790	96.67		680	570	360	350	280	260
100		190Y/110	2170	97.88		850	730	370	500	300	380
150			3000	98.04		1000	730	370	500	300	460
200			3800	98.14		1030	920	450	600	350	670
250			4600	98.19		1090	920	450	600	350	770



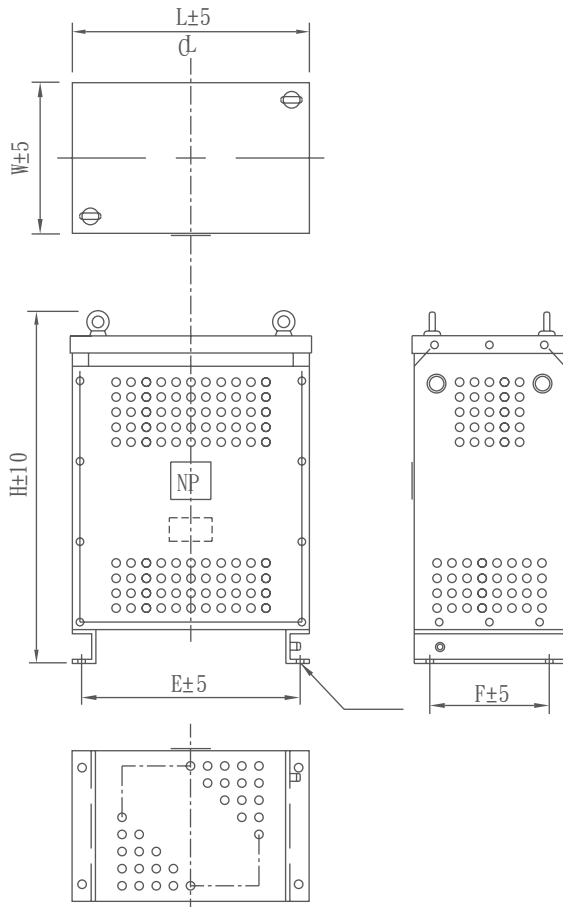
Rated Power	Noise Level
0-50 kVA	50 dBa
51-150 kVA	55 dBa
151-300 kVA	58 dBa

1. Standard : IEC 60076-11
2. Insulation thermal Class : H (180°C)
3. Coil Temperature Rise : 125K
4. AC. Withstand Voltage : 3kV
5. Noise Level : According to table 2.

According to different capacity and connection, terminal and structure would be changed. The overall dimension won't be changed, above transformer outline drawing is for reference only.

3Ø 60HZ IP20 (Three Phase 60HZ With Housing)

Power (kVA)	Rated		Guarantee Value(75°C)			Dimension(mm)					Total Weight (kg)		
	High Voltage (V)	Low Voltage (V)	Total Loss (W)	Efficiency (%)	Impedance Voltage (%)	H	L	W	E	F			
3	480 460 440 380 220	220	190	94.04	≤4.5	455	350	250	300	150	50		
5			260	95.06		455	350	250	300	150	60		
7.5			350	95.54		505	350	250	300	150	65		
10			420	95.97		500	390	300	340	200	85		
15			530	96.59		550	390	300	340	200	105		
20			680	96.71		590	390	300	340	200	120		
25			380Y/220	110	820	96.82	3.0 3.5 5.5	610	530	350	480	250	155
30			220Y/127		950	96.93		610	530	350	480	250	170
37.5			208Y/120		1170	96.97		610	530	350	480	250	190
50			200Y/115		1360	97.35		760	620	350	570	250	250
75			199Y/115		1790	96.67		900	620	400	570	300	290
100			190Y/110		2170	97.88		1050	780	400	500	300	450
150		3000	98.04		1200	780		400	500	300	530		
200		3800	98.14		1265	1000		450	600	350	750		
250		4600	98.19		1325	1000		450	600	350	850		



Rated Power	Noise Level
0-50 kVA	50 dBa
51-150 kVA	55 dBa
151-300 kVA	58 dBa

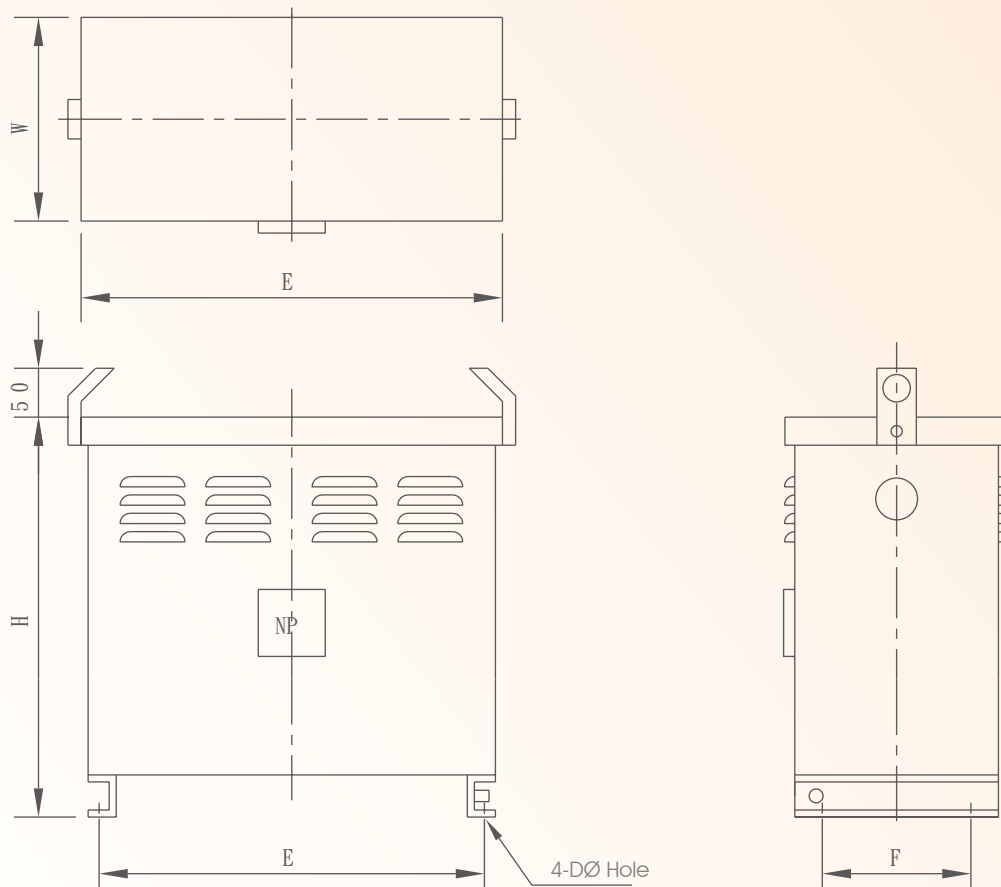
1. Standard : IEC 60076-11
2. Insulation thermal Class : H (180°C)
3. Coil Temperature Rise : 125K
4. AC. Withstand Voltage : 3kV
5. Noise Level : According to table 2.

According to different capacity and connection, terminal and structure would be changed. The overall dimension won't be changed, above transformer outline drawing is for reference only.

Low Voltage Whole Cast Transformer

3Ø 60HZ Below 600V (H Class Insulation)

Rated Power (kVA)	Total Loss 75°C (W)	Efficiency 75°C (%)	Impedance Voltage (%)	Dimension(mm)					Weight (kg)	Noise (dBa)
				H	L	W	E	F		
3	200	93.75	≤4.5	400	325	170	270	120	55	≤40
5	280	94.70		450	325	170	270	120	65	
7.5	380	95.18		500	325	170	270	120	75	
10	460	95.60		450	365	210	310	160	100	
15	600	96.15		500	365	210	310	160	115	
20	750	96.39		550	365	210	310	160	135	
25	860	96.67		600	365	210	310	160	160	
30	960	96.90		600	480	270	425	220	240	
37.5	1050	97.28		640	480	270	425	220	260	
50	1200	97.66		725	480	270	425	220	310	
75	1500	98.04	800	525	320	470	270	440		



Standard : IEC 60076-11
H class 3Ø60Hz IP20

Rating voltage:600V below
AC : 3KV Indoor type

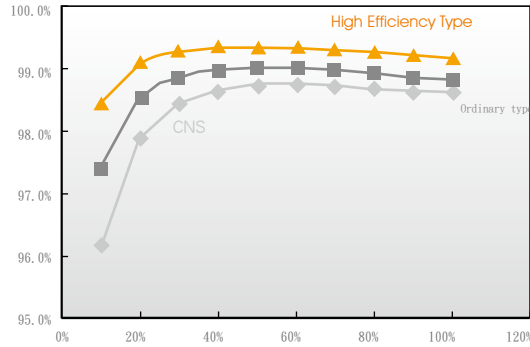
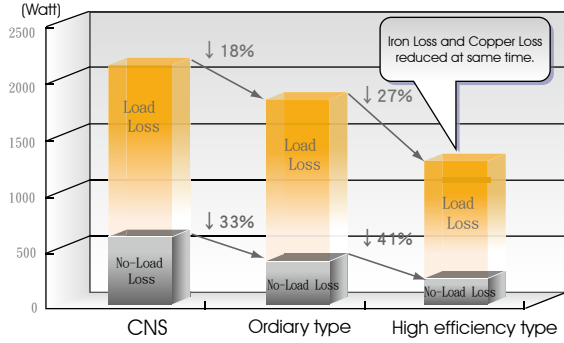
without TAP terminal
Temperature rising : 125K

High Efficiency Cast Resin Transformer

(1) Features

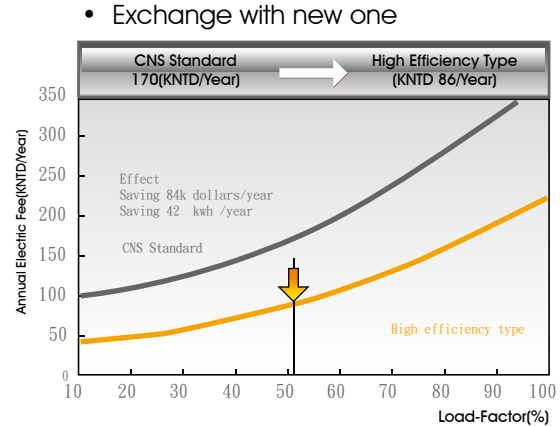
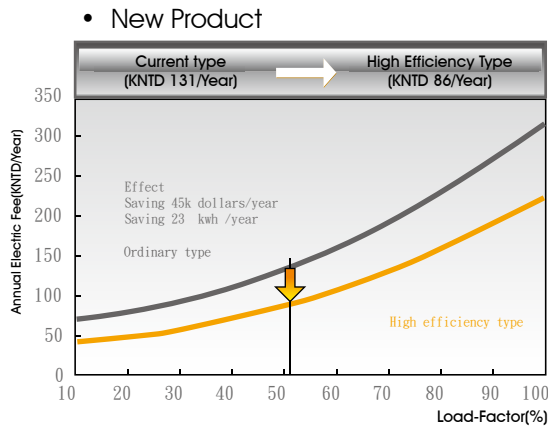
Power loss and Efficiency Comparisons
 Power loss - In the case of 3Ø 1500KVA

Efficiency (pf = 1.0) - In the case of 3Ø 1500KVA



Power Saving Facts

- (1) Electric Bill (K dollars/year) = $[(W_{fe} + W_{cu} \times L.F^2)] \times 365 \times 24 \times K / 1000$
- W_{fe} : Iron loss [No-load loss] (kW) · W_{cu} : Copper loss [Load loss] (kW)
 - L.F: Average loading rate
 - K: Average electricity cost per Kwh (calculated at NT\$2)
- (2) The transformer 3Ø 1500kVA 50% loading base on NT\$2.0/kWH.
 More Loading · More Saving!

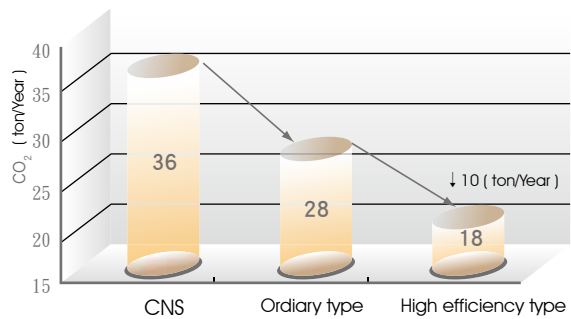
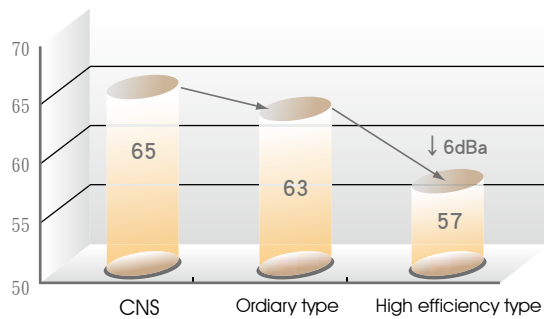


Emission of CO₂ (ton) = $[(W_{fe} + W_{cu} \times L.F^2)] \times 365 \times 24 \times 0.423 / 1000$

Effect of Low noise and low CO₂ Emission

• Noise (dBa) - In the case of 3Ø 1500kVA

• Emission (0.423kg / kWh) of CO₂ - in case of 3Ø 1500kVA 50% loading



(2) Specifications & Characteristics

Application

- Flame retardant suitable for indoor application : office building 、 hospitals 、 stations 、 schools 、 hotels 、 underground stores.
- High stability and reliability suitable for power equipment of public utilities, such as water resources, gas, telecom and transport organization.
- Pleasant appearance and low noise suitable for cafeteria and semiconductor industries.

Application provision

Insulation Class	Temp-Rise limitation	Standard insulation level			Installation
		Standard voltage	Ac test voltage	BIL	
F	100K	24KV	50 kV	125 kV	Foundation fixed model
		600V	3 kV	----	

Specification & Standard

Phase	Standard Power (kVA)	Rating Voltage (V)		Connecting	Standard
		Primary voltage (P.V)	Secondary Voltage (S.V)		
3	750,1000,1250 1500,2000,2500	F24000-F23400-R22800-F22200-F21600 F12000-F11700-R11400-F11100-F10800	380Y/220 220Δ	Dyn1 Dd0	CNS13390 IEC 60076-11

The Characteristics of Three Phase 750~2500kVA 22800-11400V/600V below

Model	Power (kVA)	Impedance (%)	Noise (dBa)	No-Load Current (%)	No-Load Loss (W)	load loss (W)	Full Loss (W)	Efficiency (%)	Remarks
EVD3-750-2	750	6.0	55.0	1.5	1,400	7,000	8,400	98.89%	<ul style="list-style-type: none"> • Tolerance refer to CNS13390 and IEC 60076-11 • Base Temperature 75°C
EVD3-1000-2	1000	6.0	56.0	1.5	1,700	8,600	10,300	98.98%	
EVD3-1250-2	1250	6.0	56.0	1.5	2,100	9,500	11,600	98.08%	
EVD3-1500-2	1500	6.0	57.0	1.0	2,300	10,500	12,800	99.15%	
EVD3-2000-2	2000	6.0	57.0	1.0	2,900	13,900	16,800	99.17%	
EVD3-2500-2	2500	6.0	57.0	1.0	3,500	17,000	20,500	99.19%	

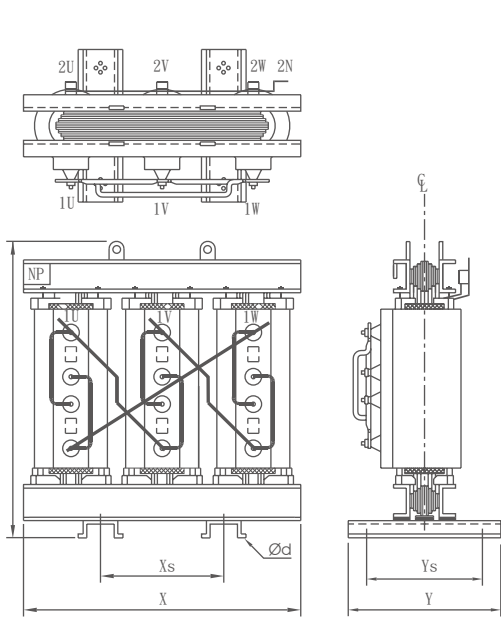
Standard and optional accessories

kVA	Name plate	Brand	Earth terminal	HV terminal	LV terminal	Lifting lug	Foundation	Cooling fan	Temp. controller	HV switch insulation cap	Wheels
750	●	●	●	●	●	●	●	○	○	○	△
1000	●	●	●	●	●	●	●	○	○	○	△
1250	●	●	●	●	●	●	●	○	○	○	△
1500	●	●	●	●	●	●	●	○	○	○	△
2000	●	●	●	●	●	●	●	○	○	○	△
2500	●	●	●	●	●	●	●	○	○	○	△

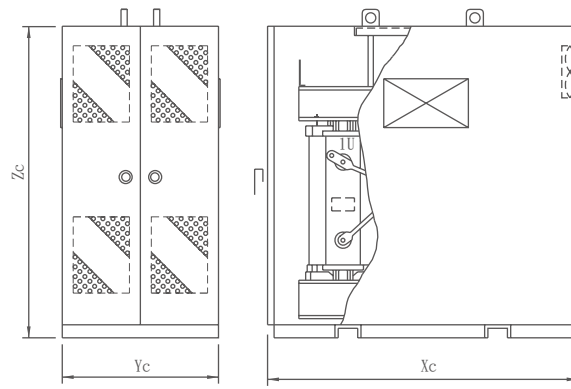
● Standard parts ○ Recommended parts △ Optional parts

Three Phase 750~2500 kVA 22800-11400V Δ / 380Y-220V Outline Dimension

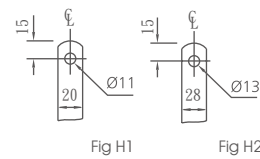
IP00 Dimension



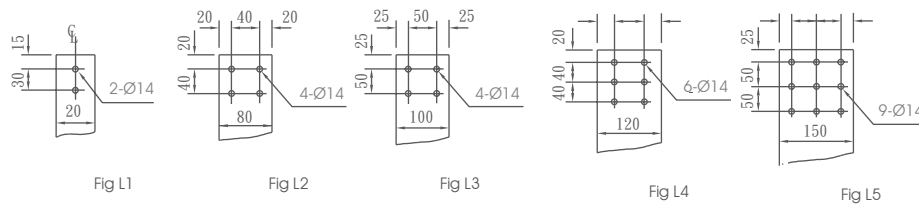
IP20 Dimension



H.V. terminal



L.V. terminal



Phase	Power (kVA)	Standard model(IP00)						Cahical Model(IP20)				Terminal Drawing (380Y/220V) (380Y/220V)		
		Outline Dimension (mm)			Foundation Dimension (mm)			Weight (kg)	Outline Dimension (mm)			weight (kg)	P.V	S.V
		X	Y	Z	Xs	Ys	d		Xc	Yc	Zc			
3	750	1500	1060	1780	900	900	19	2200	2000	1500	2200	2800		Fig.L1
	1000	1600	1060	1900	900	900	19	2700	2200	1600	2350	3350		Fig.L2
	1250	1700	1160	1820	1000	1000	19	3200	2200	1600	2350	3850	Fig.H1	Fig.L3
	1500	1750	1160	1880	1000	1000	19	3600	2400	1600	2350	4300		Fig.L4
	2000	1850	1160	2060	1000	1000	19	4650	2400	1700	2600	5400		Fig.L5
	2500	1950	1260	2180	1100	1100	19	5600	2600	1700	2700	6350	Fig.H1	Fig.L5

Application Notes

(1) Safety Distance

- The minimum safety distance between cable wire and transformer is shown as in Diagram 1.
- The minimum insulation distance from the transformer to the fully sealed case(plate) wall is shown as in Diagram 2 and Table 1.

Diagram 1

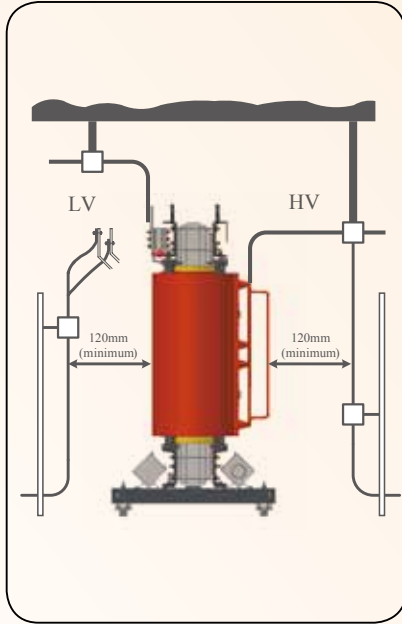
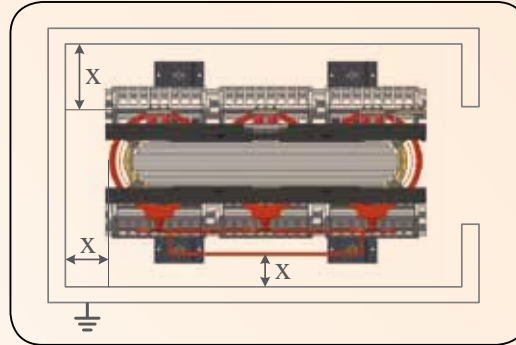


Diagram 2



System Voltage (kV)	BIL (kV)	Distance X (mm)
7.2	60	90
12	75	130
17.5	95	210
24	125	210
36	170	320

(2) Ventilation

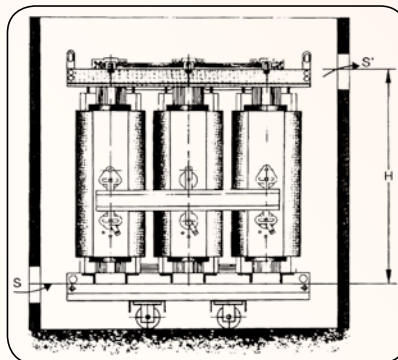
- Generally transformers are installed indoors or in a plate. to keep surrounding temperature not getting to high. It is recommended to have good ventilation facilities installed. Normally a loss of 1kW is equivalent to an air volume of more than 4m³/min,i.e.the minimum area required for ventilation openings at the installation site. The areas of indoor ventilation intake and outlet should meet the following requirements:

$$S=0.18P\sqrt{H} \quad S'=1.1 \times S$$

S : Intake Area(m²) S'=Outlet Area(m²)

p : Transformer Total Losses(kW)

H : Height Difference between intake and outlet level.



(3) Installation

- Elevation: The transformer is designed to be used under 1000m (3300ft) above the sea level.
- Ambient Temperature: Applied as in the table shown below.

Distinction	Air Temperature	Maximum Ambient Temperature	Permissible load
Maximum Temperature	40°C	40°C	P (full capacity)
Daily Average Temperature	30°C	45°C	0.97 × P
Yearly Average Temperature	20°C	50°C	0.94 × P
		55°C	0.90 × P

When the ambient temperature exceeds 40°C, load capacity will be limited as shown below.

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Indonesia	PT Nikomas
	PT Cosmo Tech
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	MITSUBISHI ELECTRIC CORPORATION
	TAKENAKA CORPORATION
	JFE STEEL CORPORATION
	ISHIKAWAJIMA TRANSPORT MACHINERY CO., LTD.
China	CHENG SHIN RUBBER (CHINA) CO., LTD.
	FAR EASTERN INDUSTRIES (SHANGHAI) LTD.
	E POWER INTERNATIONAL CO., LTD.
Thailand	MAXXIX INTERNATIONAL THAILAND CO., LTD
VIETNAM	POU YUEN VIETNAM ENTERPRISE LTD.

Main Domestic Customers

Taiwan Power Company	TPO Displays Corp.
Taipei Rapid Transit Corp.	HannStar Display Corp.
Taiwan High Speed Rail	Corning Incorporated.
Hsuehshan Tunnel	RITEK Corp.
Chunghwa Telecom	DragonSteel Corp.
ChinaSteel Corp.	Feng Hsin Iron & Steel Co., Ltd.
CPC Corporation, Taiwan	Veterans General Hospital
CSBC Corp., Taiwan	Chi Mei Medical Center
Taiwan Semiconductor Manufacturing Company Limited	Lee Chang Yung Chemical Industry Corp.
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Vanguard International Semiconductor Corporation	China Man-made Fiber Corp.
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Winbond Electronics Corp.	Yuen Foong Yupaper Mfg. Co. Ltd
Advanced Semiconductor Engineering Inc.	Uni-President Enterprises Corp.
Siliconware Precision Industries Co., Ltd.	Tainan Spin Corp.
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