

PETRO ATS DIVISION





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ABOUT

Petroleum ATS Division, known as Petro ATS is a world leading manufacturer of engineered products, systems and services for the optimization of industrial process. Our solutions include turnkey engineering, control systems, measurement products, life cycle services, and industry specific products such as electric propulsion for ships, mine hoists, turbo-chargers and pulp testing equipment.

The cutting edge technology and the most dedicated engineering team has taken Petro ATS to be a leader company in the world wide oil industry market.

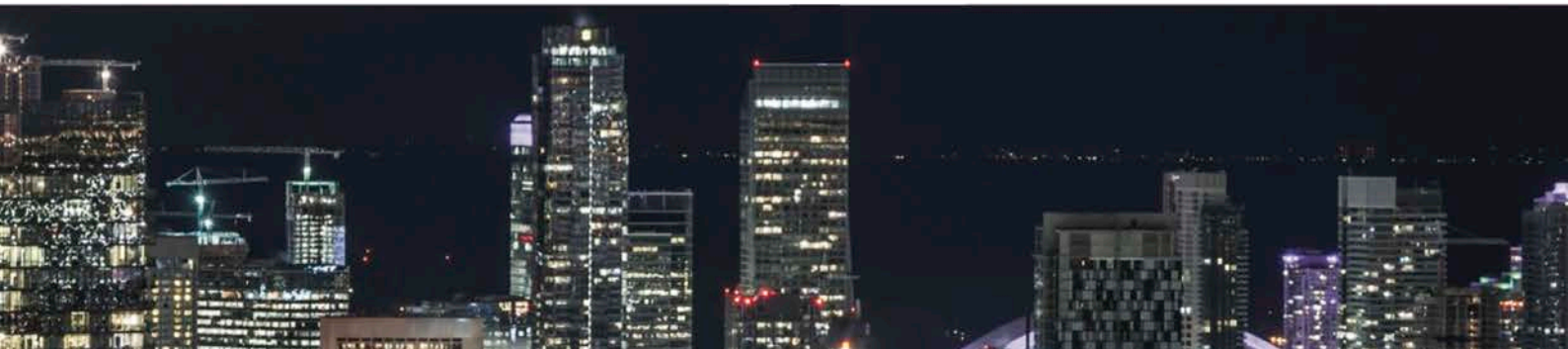
Our vision is to impulse the growing process industries such as oil and gas, petrochemicals, mining, metal production, and marine application, in order to optimize the results for improving the productivity on the field.

Petro ATS is taking responsibility on building the future of the process industry, having the most prepared team leading the growth of the company along the most advanced technologies and energy solutions for the next generations. Our biggest commitment is working on the safest, most reliable and cost-efficient innovations in the industrial process market.





INTEGRATED VFD SYSTEM



PRODUCT OVERVIEW

ORION200

A variable-frequency drive (VFD) is a type of adjustable-speed drive used in electro-mechanical drive systems to control AC motor speed and torque by varying motor input frequency and voltage.

ORION200 has successfully solved many of critical extraction and production situations and optimized well performance.

The ORION200 is an adjustable frequency AC drive that achieves the ultimate in AC motor control performance. The second generation of AC drives to utilize ABB's Direct Torque Control (DTC) motor control algorithm, the ORION200 performs accurate speed and torque control without the use of a pulse encoder or other speed measurement device on standard squirrel cage induction AC motors.

The ORION200 can be used from the simplest to the most advanced applications without complicated configuration changes. Three integral option slots support additional analog and digital I/O, encoder feedback, and various fieldbus communication option modules. An integral brake chopper is standard in all R2 and R3 frame drives and is available as an option in frames R4 through R8.

The ORION200 with PCP&ESP software can work without any external inputs or with down-hole, surface and pump sensors. It will protect the Pump by accurately controlling the rod speed and torque at all times.

It includes several process control functions for the protection of the pump equipment and the optimization of production rates. Protection is provided by monitoring selectable input signals and automatically shutting down the pump during conditions that could harm the equipment. Optimization is realized through automatic pump speed adjustments based upon control set points and limits. Speed reference for the pump by motor or pump rotation speed. Can be used both engineering units- English and Metric.



ORION200 Control Panel

The ORION200 Control Panel gives access to the user to control the drive from the exterior without opening the cabinet.

Features:

Temperature Control Solutions for Electrical Enclosures

Cooling Capacities of 1000 to 20,000 BTUH
Indoor/Outdoor, NEMA Types 12, 4 & 4X.

Engineered & manufactured to endure the most difficult of environments and applications. Thermal Edge air conditioners will exceed environmental requirements in applications like Steel, Food Processing, Petro-Chemical, Cement, Paper & Pulp and Plastics.

Digital Temperature Controller

Active Condensate Management System

Complete elimination of condensate
Eradicates condensate without corrosive contact with coils

Unit Efficiency

Pressure operated blower control reduces power inrush and saves energy
Highly efficient rotary compressor
Fully insulated & sealed cabinet
Temperature Control Valve to provide a broad temperature range while maintaining cooling capacity.



PRODUCT OVERVIEW

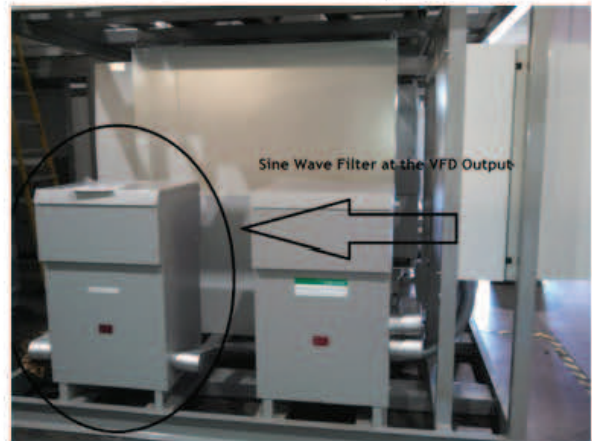
Control Panel



Compressor Protection System



Harmonic Filter at the VFD Input and Sine Wave Filter at the VFD Output



Suppress



MANUFACTURING EXECUTION SYSTEMS

MES

A Business Intelligence **Manufacturing Execution Systems** (MES by Petroleum ATS Division) solution comprises of a computerized system and software modules used in manufacturing and production environments that can provide the right information at the right time. An MES solution will provide real-time visualization of performance metrics to ensure maximum productivity, quality and up-time.

Visualization: Present and Future

Data visualization is a way to see your process in real-time. This includes how people, systems, assets and inventories travel through the supply chain. The ability to view this overview or "Dashboard" on your web enabled device makes it much easier to manage multiple factories/locations and increase overall efficiency. The visualization layer provides the following features and benefits:

The system allows to monitor process critical information which can be accessed via any smartphones or tablets, Wi-Fi access will allow control of the system through credential identification.

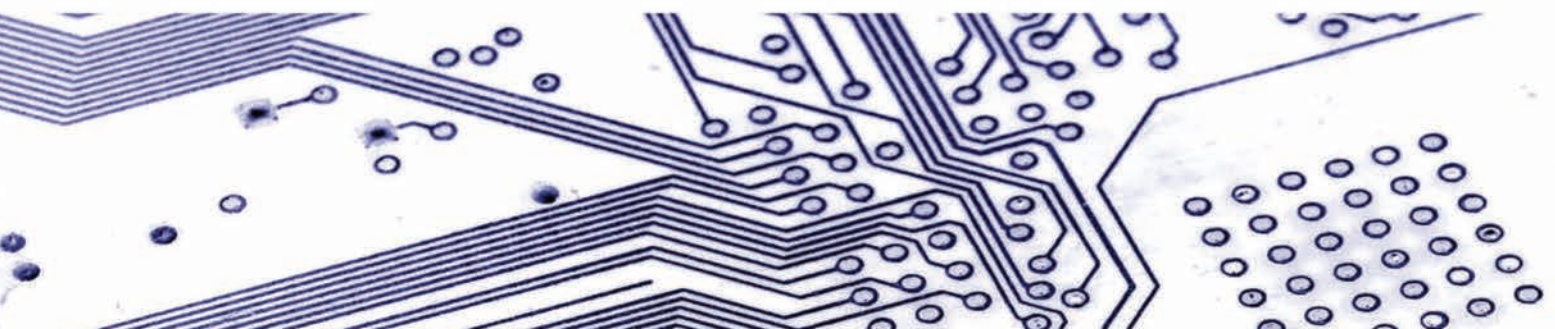
Reporting functions can be easily developed for future project stages. These can be created in PDF format, exported to Excel, or just viewed on a screen.

Connected and credentialed computers on the network can be allowed to view the system(s). No additional licenses are required.

No special software needs to be installed on any client computer. A modern browser is pointed at the server, and the screens download and run automatically. This reduces the burden on the IT department!

Notification Services can notify selected personnel immediately when any critical business processes are approaching a configured set-point. At this time, actions can be made before problems emerge, thus avoiding risk events.

The following are examples of Dashboard screens. The Dashboards are 100% customizable and expandable for future functionality.



WHY TO USE ORION200?

OUR ADVANTAGES

- Manufacturing Execution Systems (MES), allow the ORION200 VFD to be able to be connected to the network and provide real-time values anywhere with simple access to the application on your phone or laptop.
- ORION200 VFD has higher performance (up to 316 HP if required) giving greater reliability and efficiency in critical moments of production.
- Sinusoidal output filter with application to PCP and electric submersible. It was found that the output signal by oscilloscope is clean without noise, prolonging engine life and prevents future damages.
- Input and output control panel, for input and output power of the VFD and motor. This achieves avoid direct contact with the signals and controls the VFD by external agents at the time of connection and disconnection.
- External control panel that allows the operation of the VFD externally without access to external enclosure which exposes service personnel to high voltage parts and electrification risk or shut down of the well.
- Maple Systems Data logger for display of the data externally and keep track of the data on a portable memory to be later revised by production.
- 20,000 BTUH cooling system to maintain and prolong the life of electronic equipment of the main cabinet (VFD suppressors, ...)
- Digital temperature controller. Allows to program a set point for cooling the system and indicates the VFD until, when it can be operated as in cases of failure to prevent the loss of the well completely.
- Prevention System condensates. Avoid creating condensates which can create corrosion on internal teams.
- Unit efficiency reduces airflow and reduces energy consumption
- The cabinet is mounted on a reinforced skid with both filters and connection boxes, to provide an easier time handling and maneuverability for transportation..
- Intruder detection system in the cabinet and junction boxes. This system triggers an alarm when unauthorized personnel to open the doors of the cabinet or junction box or out of power cables. This alarm can be triggered in the control room or in the same job site adding a siren in it.







COMPLETE PRODUCT OVERVIEW

DRY TYPE TRANSFORMER

Table of Contents

Dry-type Transformer

1. General
2. Technical Feature
3. Structure Feature
4. Component
5. Quality Management, Product Certificate, After-sales Service
6. Customer-oriented Support System
7. Main Technical Data
 - Epoxy Resin Cast Dry-type Transformer
 - SC(B)9-30~2500/10
 - SC(B)9-50~2500/20
 - SC(B)9-50~2500/35
 - SC(B)9-800~20000/35
 - H-class Impregnated Insulated Dry-type Transformer
 - SG(B)10-100~2500/10
 - Amorphous Alloy Core Dry-type Transformer
 -
8. Overall and Installation Dimension
9. Ordering Information

DRY-TYPE TRANSFORMER

1. General

1.1 Main Feature

- Dry-type transformer mainly consists of core and windings, it doesn't immerse in insulating liquid. Our dry-type transformer designs according to IEC.
- With no leakage of oil and gas, security, environmental protection, and low-noise performances.

1.2 Application

- Mainly used for locations having special fire safety requirements such as commercial buildings, high-rise buildings, airports, industrial and mining enterprises, power plants, oil platforms, subways and tunnels.
- Applicable for 50/60Hz system.

1.3 Working Condition

- Max. ambient temperature: +40°C
- Max. daily average ambient temperature: +30°C
- Max. annual average ambient temperature: +20°C
- Min. temperature: -5°C (indoor installation)
- Min. temperature: -30°C (outdoor installation)
- Altitude: ≤1000m
- Relative humidity: ≤93%, no dew on the winding surface.
- Customized products are available.

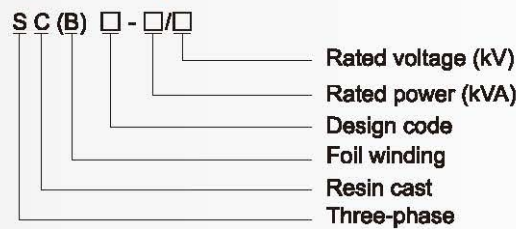
1.4 Standard

- IEC 60076-11:2004; ANSI, etc.



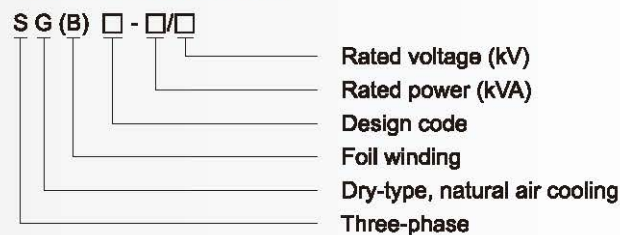
SC(B) Epoxy Resin Cast Dry-type Transformer

Type Designation



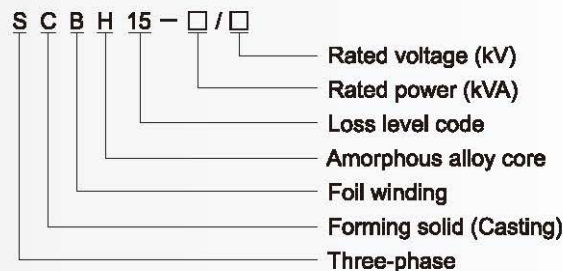
SG(B) H-class Impregnated Insulated Dry-type Transformer

Type Designation



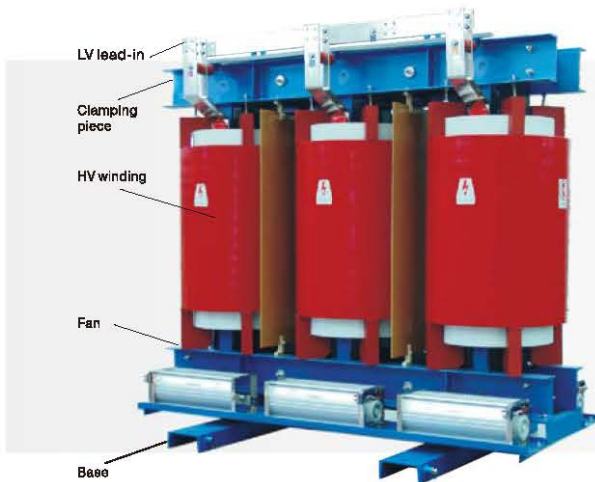
SCBH15 Amorphous Alloy Core Dry-type Transformer

Type Designation



2. Technical Feature

- 2.1 Transformer technology is based on model experiments, self-developed calculation software of leakage flux, short circuit mechanical strength, on load losses etc, to realize overall optimization of electrical performance of transformer, therefore low-cost and high-performed solutions could be provided to the customers.
- 2.2 The structure design is based on three-dimension finite element analysis software ,to do analysis on transformer iron core and clamping pieces,which provides a guarantee to enhance mechanical strength,anti-short-circuit capacity and reduce noise.

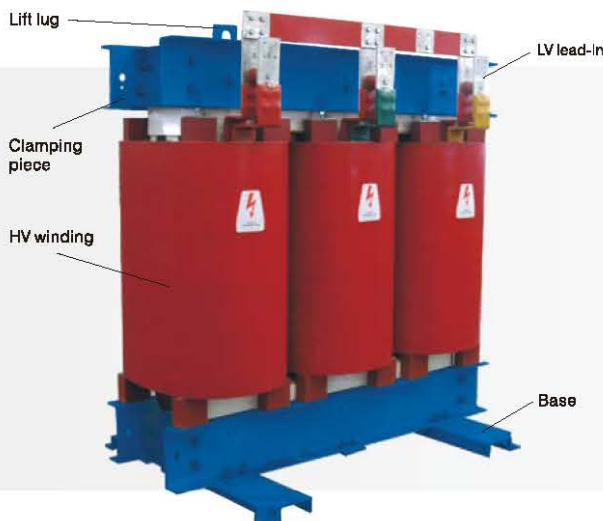
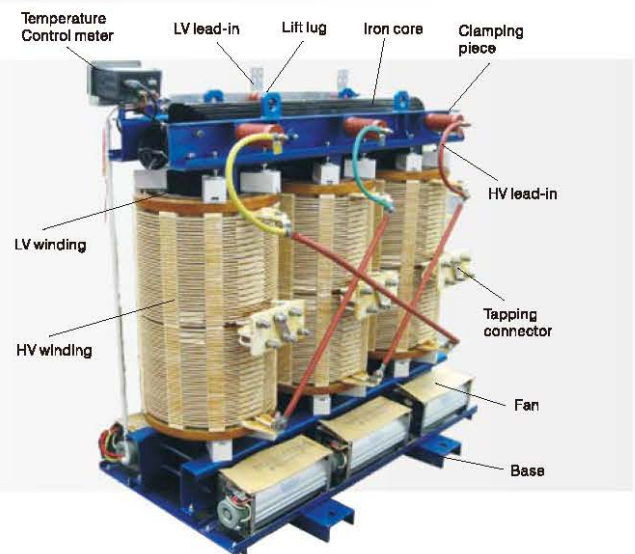


Performance Feature

- Safety, fireproofing, non-polluting, direct operation on the load center.
- Strong mechanical strength, excellent insulation capacity, low partial discharge ,strong radiation capability, high reliability and long life.
- Low loss, low noise, energy-saving.
- High heat dispersion and strong serviceability , forced air cooling can improve the operation of capacity.
- High humidity-resistant, environmental protection, fire-retardant, explosion-proof, less maintenance compact design and light weight.

Performance Feature

- Lower temperature rise, long thermal life.
- Fire-retardant, long time burning under 800°C high temperature without smoke generation.
- Strong thermal shock resistance ,at -50°C can immediately increase full load.
- High humidity-resistant performance.
- Low loss, a significant energy saving effect.
- Easy recycling on insulating material and copper at life end for environmental protection.
- Temperature control meter.



Performance Feature

- Safe, reliable, no pollution, can operate directly in the load center;
- High mechanical strength, strong ability to withstand short circuit, low partial discharge, good thermal stability, high reliability, long use life;
- Low no-load loss, high performance, low noise, efficient energy conservation;
- High thermal performance, high operation capacity, when forced air cooling the capacity can be improved to run;
- Good moisture resistant ability, can operate in high humidity and other harsh environments;
- With features of environmental protection, flame retardant, explosion-proof and free of maintenance;
- Small size, light weight;

DRY-TYPE TRANSFORMER

3. Structure Feature

3.1 Iron Core

The iron core is made of high quality, cold-rolled, granule-oriented silicon-steel sheets and machined with completely automatic cutting line, superposed with 45 ° six-level bias seams. Core column adopts special banding technique, the surface of iron core is painted with the special rustproof coating to resist humidity and rust, which can effectively reduce the no-load losses, no-load current and iron-core noise. Facilitated with six sets of cutting lines for iron core such as, Soenen from Belgium.



◀ Silicon steel sheet
▼ Core cutting line (transverse)



▲ Cutting line (Slitting)



▲ ③ Automatically stacked silicon steel sheets



▲ ② Silicon steel sheet cutting



▲ ① Sending materials



▲ The silicon steel sheet folded



▲ Iron core overlapping



▲ Core joints



▲ Core molding



▲ Amorphous alloy core shearing line
 ◀ Conveyor feed
 Automatic cutting & stack ▶



Iron core rolling machine



▲ Pack up iron core



▲ Roll up iron core



▲ Amorphous alloy core cross section



▲ Fixation



DRY-TYPE TRANSFORMER

3.2 Winding

F-class insulation HV winding: it is made of lacquered wire. With hardness ranges from 120 to 210 Mpa. The insulation material is a composite of silicon micro-powder and epoxy resin, featuring high performances of good thermal shock resistance, fire resistance, no emission of hazardous gases, good heat dispersion and low winding temperature rise.



▲ F-class insulation HV winding

▶ Epoxy resin composite material



▲ Vacuum casting, drying workshop



▲ HV F-class insulation windings before casting



▲ Vacuum casting equipment from Germany HÜBERS adopts patented technology such as film defoaming and static mixer, ensure the transformer low partial discharge.



▲ Vacuum dry oven

- H-class insulation HV winding: it adopts NOMEX paper wrapped flat copper wire and continuous winding process. The winding made after dry treatment by VPI vacuum pressure device, several times impregnated in special H class insulating paint, and baking features high mechanical strength, good heat dispersion.



▲ Vacuum Impregnation device



▲ HV H-class Insulation winding

- LV winding: LV winding is mainly made of foils. It adopts interior argon gas protection welding, with high precision and reliability as no external welding joint. It solves the winding turns imbalance, effectively improves thermal performance and enhance short circuit withstanding capability.



▲ LV foil winding



▲ TUBOLY LV foil winding machine from Switzerland which with constant tension, deburring, automatic bypass system and the corrective function

DRY-TYPE TRANSFORMER

4. Component

4.1 Protection Enclosure

Protection enclosure can be made of general steel plate, stainless steel plate or aluminum alloy materials. For example, protection enclosure of IP20 can prevent solid object which is 12mm from entering, and this type is suitable for indoor installation. Protection enclosure of IP23 inherits the characters of IP20 enclosure and can prevent water dropping at an angle within 60° to the vertical line from inflooding, as well which is adapted to outdoor installation.



Enclosure of steel plate



Enclosure of stainless steel plate



Enclosure of aluminum alloy plate

4.2 Temperature Control Device

Transformer temperature control protection device adopts double-sensor principle of PTC non-linearly resistance and PT100 linearly resistance. It has functions of LED temperature display, temperature setting. It can keep highest temperature data, automatically alarm and trip signal and start / stop the fan either automatically or manually. Various special temperature devices can be equipped according to the demand of the customer.

4.3 Air Cooling System

Usually, the cooling system of transformer is natural air cooling(AN), then the transformer can continuously operate at rated power. Cooling system can be provided according to customers' requirements. The fan is controlled automatically by the temperature controller to ensure the normal temperature rise when the load exceeds the rated load.



Cross-flow cooling fan

5. Quality Management, Product Certificate, After-sales Service

5.1 Quality Management

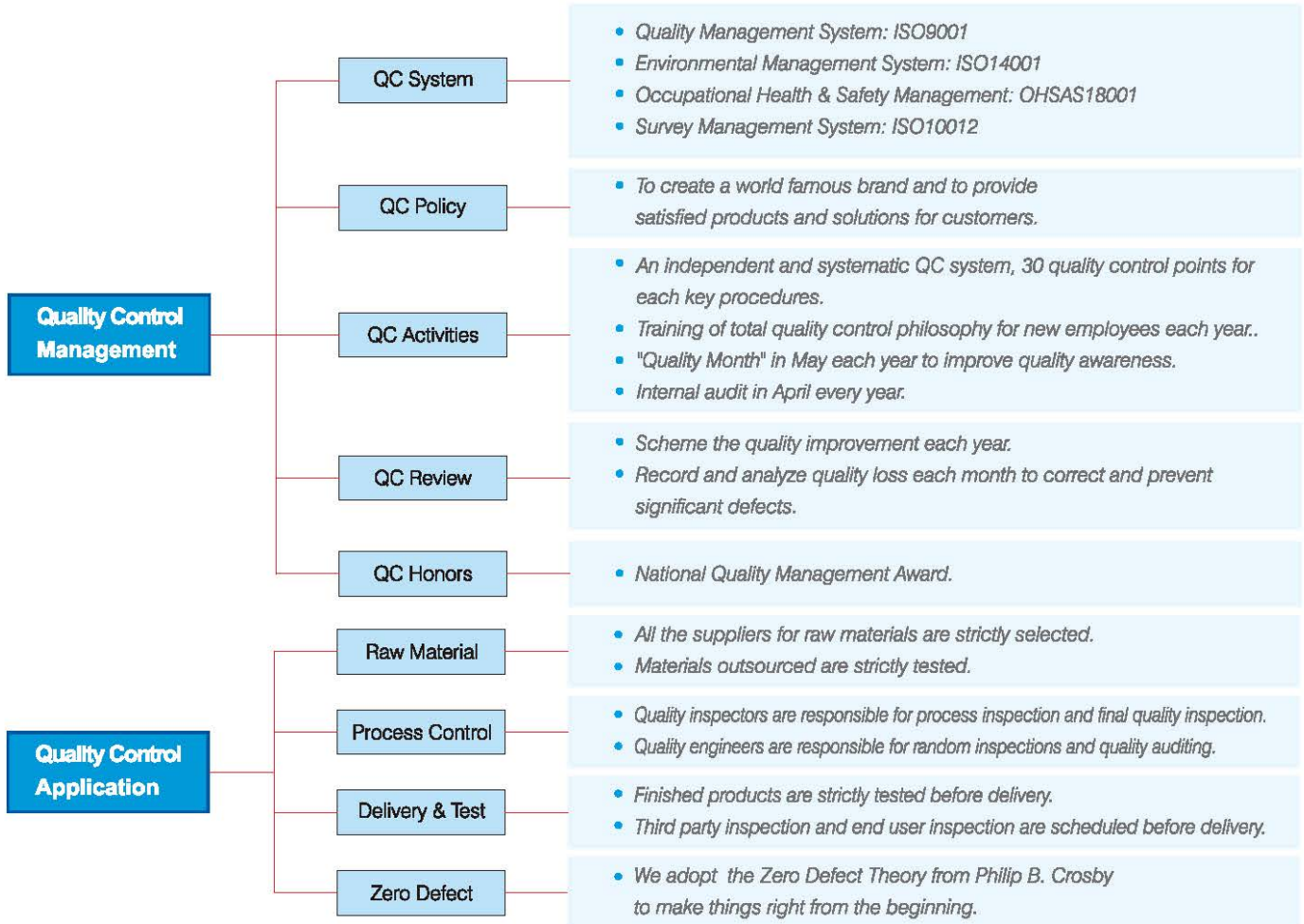


▲ Testing control room

▲ Lightning impulse generator

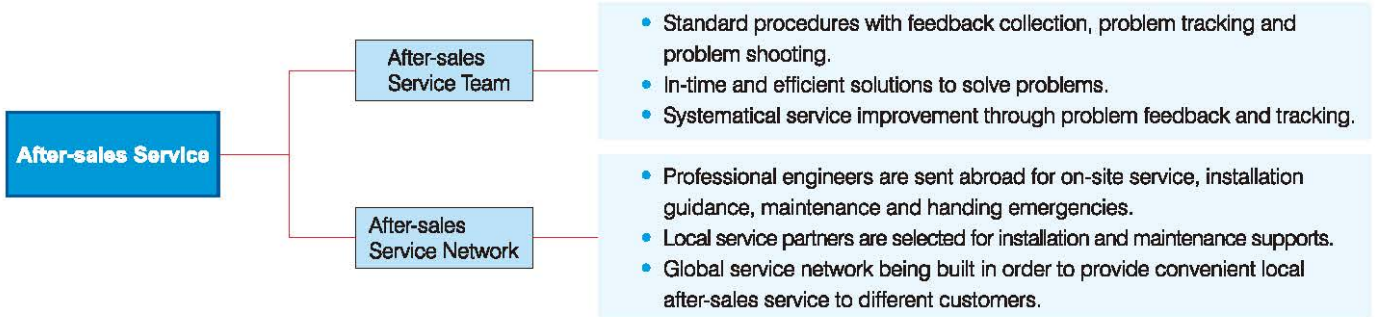
▲ Partial discharge test

▲ Power frequency voltage test



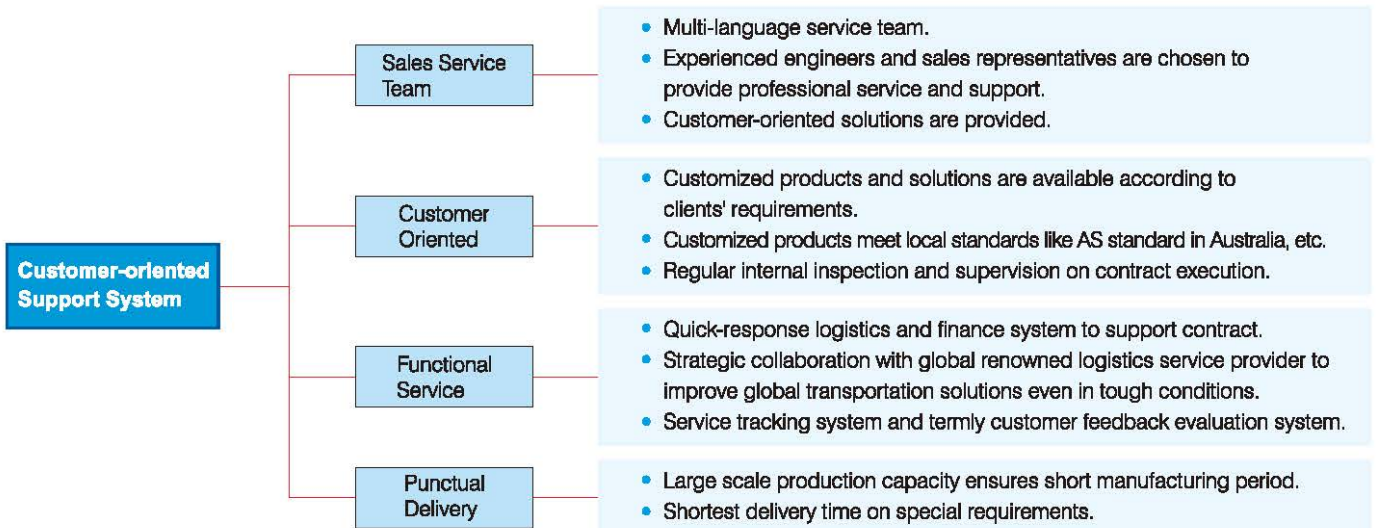
DRY-TYPE TRANSFORMER

5.2 After-sales Service



6. Customer-oriented Support System

Professional & Fast customer support system was set up to ensure customer satisfaction.



7. Main Technical Parameter

7.1 Epoxy Resin Cast Dry-type Transformer

※Note: Customized and more-efficient dry-type transformer is available on your requirements.

7.1.1 9 Series 10kV Free Excitation Voltage Regulation Distribution Transformer

Sheet 1

Model	Voltage combination			Connection symbol	No-load loss (W)	Load loss under F class (W) (120°C)	No-load current (%)	Short circuit impedance (%)
	HV (kV)	HV tap range	LV (kV)					
SC9-30					220	750	2.4	
SC9-50					310	1060	2.4	
SC9-80					420	1460	1.8	
SC9-100					450	1670	1.8	
SC9-125					530	1960	1.6	
SC9-160					610	2250	1.6	
SC(B)9-200	6;				700	2680	1.4	4
SC(B)9-250	6.3;				810	2920	1.4	
SC(B)9-315	6.3;				990	3670	1.2	
SC(B)9-400	6.6;	±5		Dyn11	1100	4220	1.2	
SC(B)9-500	6.6;	or	0.4	or	1310	5170	1.2	
SC(B)9-630	10;				1510	6220	1.0	
SC(B)9-630					1460	6310	1.0	
SC(B)9-800	10.5;	±2×2.5		Yyn0	1710	7360	1.0	
SC(B)9-1000					1990	8610	1.0	
SC(B)9-1250	11				2350	10260	1.0	6
SC(B)9-1600					2760	12400	1.0	
SC(B)9-2000					3400	15300	0.8	
SC(B)9-2500					4000	18180	0.8	
SC(B)9-1600					2760	13700	1.0	
SC(B)9-2000					3400	16900	0.8	8
SC(B)9-2500					4000	20000	0.8	

7.1.2 10 Series 10kV Free Excitation Voltage Regulation Distribution Transformer

Sheet 2

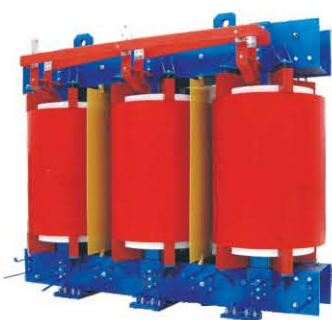
Model	Voltage combination			Connection symbol	No-load loss (W)	Load loss under F class (W) (120°C)	No-load current (%)	Short circuit impedance (%)
	HV (kV)	HV tap range	LV (kV)					
SC10-30					190	710	2.4	
SC10-50					270	1000	2.4	
SC10-80					370	1380	1.8	
SC10-100					400	1570	1.8	
SC10-125					470	1850	1.6	
SC10-160					540	2130	1.6	
SC(B)10-200	6;				620	2530	1.4	4
SC(B)10-250	6.3;				720	2760	1.4	
SC(B)10-315	6.3;				880	3470	1.2	
SC(B)10-400	6.6;	±5		Dyn11	980	3990	1.2	
SC(B)10-500	6.6;	or	0.4	or	1160	4880	1.2	
SC(B)10-630	10;				1340	5880	1.0	
SC(B)10-630					1300	5960	1.0	
SC(B)10-800	10.5;	±2×2.5		Yyn0	1520	6960	1.0	
SC(B)10-1000					1770	8130	1.0	
SC(B)10-1250	11				2090	9690	1.0	6
SC(B)10-1600					2450	11730	1.0	
SC(B)10-2000					3050	14450	0.8	
SC(B)10-2500					3600	17170	0.8	
SC(B)10-1600					2450	12960	1.0	
SC(B)10-2000					3050	15960	0.8	8
SC(B)10-2500					3600	18890	0.8	



10kV Dry-type Transformer



20kV Dry-type Transformer



35kV Dry-type Transformer

DRY-TYPE TRANSFORMER

7.1.3 9 Series 20kV Free Excitation Voltage Regulation Distribution Transformer

Sheet 3

Model	Voltage combination			Connection symbol	No-load loss (W)	Load loss under F class (W) (120°C)	No-load current (%)	Short circuit impedance (%)
	HV (kV)	HV tap range	LV (kV)					
SC9-50					380	1300	2.4	
SC9-100					600	2100	2.2	
SC9-160					750	2600	1.8	
SC(B)9-200					820	3100	1.8	
SC(B)9-250					940	3600	1.6	
SC(B)9-315					1080	4300	1.6	
SC(B)9-400	20;	±5		Dyn11	1280	5100	1.4	
SC(B)9-500					1500	6100	1.4	6
SC(B)9-630	22;	or	0.4	or	1700	7200	1.2	
SC(B)9-800						1950	8700	1.2
SC(B)9-1000	24	±2×2.5		Yyn0	2300	10300	1.0	
SC(B)9-1250					2650	12150	1.0	
SC(B)9-1600					3100	14600	1.0	
SC(B)9-2000					3600	17250	0.8	
SC(B)9-2500					4300	20400	0.8	
SC(B)9-2000					3600	18800	0.8	8
SC(B)9-2500					4300	22400	0.8	

7.1.4 10 Series 20kV Free Excitation Voltage Regulation Distribution Transformer

Sheet 4

Model	Voltage combination			Connection symbol	No-load loss (W)	Load loss under F class (W) (120°C)	No-load current (%)	Short circuit impedance (%)
	HV (kV)	HV tap range	LV (kV)					
SC10-50					345	1235	2.4	
SC10-100					540	1995	2.2	
SC10-160					675	2470	1.8	
SC(B)10-200					740	2945	1.8	
SC(B)10-250					845	3420	1.6	
SC(B)10-315					975	4085	1.6	
SC(B)10-400	20;	±5		Dyn11	1155	4845	1.4	
SC(B)10-500					1350	5795	1.4	6
SC(B)10-630	22;	or	0.4	or	1530	6840	1.2	
SC(B)10-800						1755	8265	1.2
SC(B)10-1000	24	±2×2.5		Yyn0	2070	9785	1.0	
SC(B)10-1250					2385	11545	1.0	
SC(B)10-1600					2790	13870	1.0	
SC(B)10-2000					3240	16390	0.8	
SC(B)10-2500					3870	19380	0.8	
SC(B)10-2000					3240	17860	0.8	8
SC(B)10-2500					3870	21280	0.8	



7.1.5 9 Series 35kV Free Excitation Voltage Regulation Distribution Transformer

Sheet 5

Model	Voltage combination			Connection symbol	No-load loss (W)	Load loss under F class (W) (120°C)	No-load current (%)	Short circuit impedance (%)
	HV (kV)	HV tap range	LV (kV)					
SC9-50					500	1500	2.8	
SC9-100					700	2200	2.4	
SC9-160					880	2960	1.8	
SC(B)9-200					980	3500	1.8	
SC(B)9-250					1100	4000	1.6	
SC(B)9-315		±5		Dyn11	1310	4750	1.6	
SC(B)9-400					1530	5700	1.4	
SC(B)9-500	35~38.5 or		0.4	or	1800	7000	1.4	6
SC(B)9-630					2070	8100	1.2	
SC(B)9-800		±2×2.5		Yyn0	2400	9600	1.2	
SC(B)9-1000					2700	11000	1.0	
SC(B)9-1250					3150	13400	0.9	
SC(B)9-1600					3600	16300	0.9	
SC(B)9-2000					4250	19200	0.9	
SC(B)9-2500					4950	23000	0.9	

7.1.6 9 Series 35kV Free Excitation Voltage Regulation Power Transformer

Sheet 6

Model	Voltage combination			Connection symbol	No-load loss (W)	Load loss under F class (W) (120°C)	No-load current (%)	Short circuit impedance (%)
	HV (kV)	HV tap range	LV (kV)					
SC(B)9-800					2500	9900	1.1	
SC(B)9-1000					2970	11500	1.1	
SC(B)9-1250					3480	13600	1.0	6
SC(B)9-1600			3.15	Dyn11	4100	16300	1.0	
SC(B)9-2000			6		4700	19200	0.9	
SC(B)9-2500		±5	6.3	Yd11	5400	23000	0.9	7
SC(B)9-3150			10	Yyn0	6700	25800	0.8	
SC(B)9-4000	35~38.5 or		10.5		7800	31000	0.8	8
SC(B)9-5000					9300	36800	0.7	
SC(B)9-6300		±2×2.5	11		11000	43000	0.7	
SC(B)9-8000				Dyn11	12600	48500	0.6	
SC(B)9-10000				Yd11,YNd11	14400	58500	0.6	9



DRY-TYPE TRANSFORMER



7.2 H-Class Impregnated Insulated Dry-type Transformer

7.2.1 9 Series 10kV Free Excitation Voltage Regulation Distribution Transformer

Sheet 7

Model	Voltage combination			Connection symbol	No-load loss (W)	Load loss under H class (W) (145°C)	No-load current (%)	Short circuit impedance (%)
	HV (kV)	HV tap range	LV (kV)					
SG9-100					450	1780	1.8	
SG9-125					530	2100	1.6	
SG9-160					610	2410	1.6	
SG9-200					700	2870	1.4	
SG9-250					810	3120	1.4	4
SG(B)9-315	6;				990	3930	1.2	
SG(B)9-400	6.3;				1100	4520	1.2	
SG(B)9-500		±5		Dyn11	1310	5530	1.2	
SG(B)9-630	6.6;				1510	6660	1.0	
SG(B)9-630		or	0.4	or	1460	6750	1.0	
SG(B)9-800	10;				1710	7880	1.0	
SG(B)9-1000		±2×2.5		Yyn0	1990	9210	1.0	
SG(B)9-1250	10.5;				2350	10980	1.0	6
SG(B)9-1600					2760	13270	1.0	
SG(B)9-2000	11				3400	16370	0.8	
SG(B)9-2500					4000	19460	0.8	
SG(B)9-1600					2760	14660	1.0	
SG(B)9-2000					3400	18000	0.8	8
SG(B)9-2500					4000	21400	0.8	

7.2.2 10 Series 10kV Free Excitation Voltage Regulation Distribution Transformer

Sheet 8

Model	Voltage combination			Connection symbol	No-load loss (W)	Load loss under H class (W) (145°C)	No-load current (%)	Short circuit impedance (%)
	HV (kV)	HV tap range	LV (kV)					
SG10-100					400	1690	1.8	
SG10-125					470	1980	1.6	
SG10-160					540	2280	1.6	
SG10-200					620	2710	1.4	4
SG10-250					720	2960	1.4	
SG(B)10-315	6;				880	3730	1.2	
SG(B)10-400					980	4280	1.2	
SG(B)10-500	6.3;				1160	5230	1.2	
SG(B)10-630		±5		Dyn11	1340	6290	1.0	
SG(B)10-630	6.6;				1300	6400	1.0	
SG(B)10-800		or	0.4	or	1520	7460	1.0	
SG(B)10-1000	10;				1770	8760	1.0	
SG(B)10-1250		±2×2.5		Yyn0	2090	10370	1.0	6
SG(B)10-1600	10.5;				2450	12580	1.0	
SG(B)10-2000					3050	15560	0.8	
SG(B)10-2500	11				3600	18450	0.8	
SG(B)10-1600					2450	13900	1.0	
SG(B)10-2000					3050	17110	0.8	8
SG(B)10-2500					3600	20290	0.8	



7.3 Amorphous Alloy Core Dry-type Transformer

7.3.1 General

Application: applicable for all places where common dry-type transformers are used, such as high-rise buildings, commercial centers, airports, oil platforms, subways, tunnels, airports, railway stations, industrial and mining enterprises and power plants. It is especially suitable for places which are flammable and explosive.

7.3.2 Standard

IEC 60076-11:2004 Dry type power transformer

7.3.3 Main Technical Parameter

Sheet 9

Model	Voltage combination			Connection symbol	No-load loss (W)	Load loss (W)			No-load current (%)	Short circuit impedance (%)
	HV (kV)	HV tap range	LV (kV)			100°C (B)	125°C (F)	145°C (H)		
SCBH15-30					70	670	710	760	1.6	
SCBH15-50					90	940	1000	1070	1.4	
SCBH15-80					120	1290	1380	1480	1.3	
SCBH15-100					130	1480	1570	1690	1.2	
SCBH15-125					150	1740	1850	1980	1.1	
SCBH15-160	6				170	2000	2130	2280	1.1	4
SCBH15-200	6				200	2370	2530	2710	1.0	
SCBH15-250	6.3				230	2590	2760	2960	1.0	
SCBH15-315		±5			280	3270	3470	3730	0.9	
SCBH15-400	6.6				310	3750	3990	4280	0.8	
SCBH15-500		or	0.4	Dyn11	360	4590	4880	5230	0.8	
SCBH15-630	10				420	5530	5880	6290	0.7	
SCBH15-630			±2×2.5		410	5610	5960	6400	0.7	
SCBH15-800	10.5				480	6550	6960	7460	0.7	
SCBH15-1000					550	7650	8130	8760	0.6	
SCBH15-1250	11				650	9100	9690	10370	0.6	6
SCBH15-1600					760	11050	11730	12580	0.6	
SCBH15-2000					1000	13600	14450	15560	0.5	
SCBH15-2500					1200	16150	17170	18450	0.5	
SCBH15-1600					760	12280	12960	13900	0.6	
SCBH15-2000					1000	15020	15960	17110	0.5	8
SCBH15-2500					1200	17760	18890	20290	0.5	

Note: (1) The values of load loss (W) listed in the sheet 9 are under particular temperature levels corresponding with specific insulated heat-resistant levels listed in the parentheses.

(2) If user adopts other connection symbols, the specific technical requirements are negotiable between the manufacturer and the user.

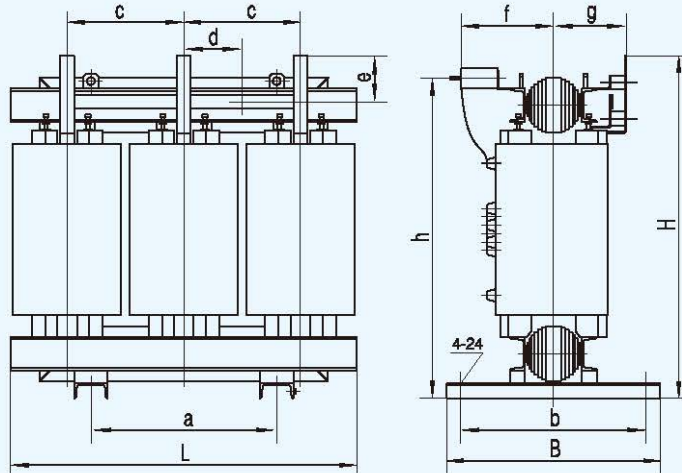
DRY-TYPE TRANSFORMER

8. Overall and Installation Dimension

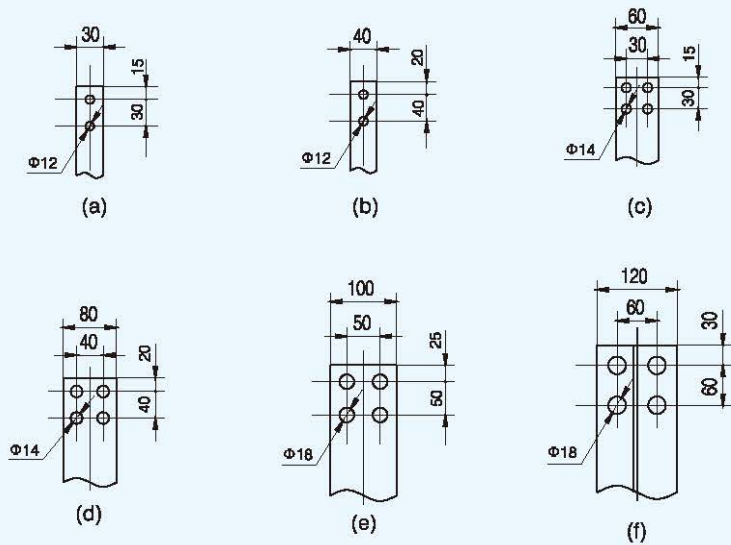
8.1 Epoxy Resin Cast Dry-type Transformer



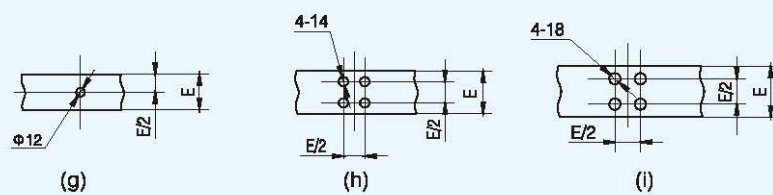
SC(B)9/10 Series, 10kV



a/b/c Phase Connection Terminal, LV



Neutral Point Connection Terminal, LV



Note: The width (dimension E) of the bus bar of the connection terminals in the LV neutral point is equivalent to the width of the bus bar of the connection terminals in LV a/b/c phase.

8.1.1 Dimension of Transformer Body of SC(B)9 Series,10kV (unit: mm)

Sheet 10

Model	Short circuit impedance(%)	Overall dimension			Installation dimension		c	d	e	f	g	h	LV Terminal	
		L	B	H	a	b							a/b/c Phase	Neutral Point
SC9-30/10	4	870	500	935	400	400	290	145	175	275	185	850	(a)	(g)
SC9-50/10		900	500	955	400	400	305	150	175	280	190	875	(a)	(g)
SC9-80/10		960	500	995	400	400	325	160	175	285	195	915	(a)	(g)
SC9-100/10		990	650	1045	550	550	335	165	175	295	205	960	(a)	(g)
SC9-125/10		1030	650	1060	550	550	350	175	175	300	210	980	(a)	(g)
SC9-160/10		1080	650	1110	550	550	365	180	175	305	215	1030	(a)	(g)
SC9-200/10		1180	760	1160	660	660	395	197.5	150	315	245	1070	(a)	(g)
SC9-250/10		1200	760	1200	660	660	405	202.5	120	320	245	1110	(a)	(g)
SC9-315/10		1230	760	1240	660	660	415	210	180	325	250	1145	(b)	(g)
SC9-400/10		1300	760	1280	660	660	440	200	180	335	270	1200	(c)	(h)
SC9-500/10		1350	920	1405	660	820	455	225	200	345	280	1305	(d)	(h)
SC9-630/10		1500	920	1398	660	820	480	240	200	337	300	1298	(d)	(h)
SC9-630/10		1525	920	1333	660	820	485	242.5	195	333	321	1233	(d)	(h)
SC9-800/10	1670	920	1393	660	820	530	265	195	342	334	1293	(d)	(h)	
SC9-1000/10	1650	920	1458	660	820	535	267.5	220	349	321	1358	(d)	(h)	
SC9-1250/10	6	1780	920	1628	820	820	560	280	225	360	347.5	1538	(e)	(i)
SC9-1600/10		1850	1170	1658	1070	1070	600	300	240	369	360.2	1558	(e)	(i)
SC9-2000/10		2070	1170	1766	1070	1070	650	325	265	387.5	382.5	1655.5	(f)	(i)
SC9-2500/10		2100	1170	2160	1070	1070	695	347.5	275	497	438	2009.5	(f)	(i)

Note: (1) H is the height from temperature controller to the base if rated capacity is ≥ 630 kVA.
(2) Customized products are available.

8.1.2 Dimension of Transformer Body of SC(B)10 Series,10kV (unit: mm)

Sheet 11

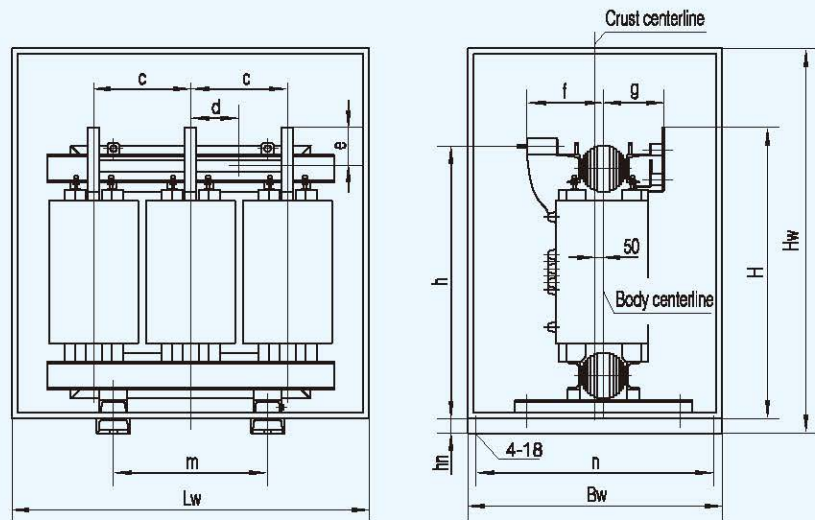
Model	Short circuit impedance(%)	Overall dimension			Installation dimension		c	d	e	f	g	h	LV Terminal	
		L	B	H	a	b							a/b/c Phase	Neutral Point
SC10-30/10	4	870	500	935	400	400	290	145	175	275	185	850	(a)	(g)
SC10-50/10		900	500	955	400	400	305	150	175	280	190	875	(a)	(g)
SC10-80/10		960	500	995	400	400	325	160	175	285	195	915	(a)	(g)
SC10-100/10		990	650	1045	550	550	335	165	175	295	205	960	(a)	(g)
SC10-125/10		1030	650	1060	550	550	350	175	175	300	210	980	(a)	(g)
SC10-160/10		1080	650	1110	550	550	365	180	175	305	215	1030	(a)	(g)
SC10-200/10		1180	760	1160	660	660	395	197.5	150	315	245	1070	(a)	(g)
SC10-250/10		1200	760	1200	660	660	405	202.5	120	320	245	1110	(a)	(g)
SC10-315/10		1230	760	1240	660	660	415	210	180	325	250	1145	(b)	(g)
SC10-400/10		1300	760	1280	660	660	440	200	180	335	270	1200	(c)	(h)
SC10-500/10		1350	920	1405	660	820	455	225	200	345	280	1305	(d)	(h)
SC10-630/10		1500	920	1398	660	820	480	240	200	337	300	1298	(d)	(h)
SC10-630/10		1525	920	1333	660	820	485	242.5	195	333	321	1233	(d)	(h)
SC10-800/10	1640	920	1453	660	820	510	255	195	337	320	1353	(d)	(h)	
SC10-1000/10	1640	920	1520.5	660	820	530	265	220	342	340	1420.5	(d)	(h)	
SC10-1250/10	6	1780	920	1628	820	820	560	280	225	360	347.5	1538	(e)	(i)
SC10-1600/10		1910	1170	1728	1070	1070	610	305	240	374	365	1638	(e)	(i)
SC10-2000/10		2070	1170	1815.5	1070	1070	625	312.5	265	383	382.5	1705.5	(f)	(i)
SC10-2500/10		2100	1170	2159.5	1070	1070	695	347.5	275	497	438	2009.5	(f)	(i)

Note: (1) H is the height from temperature controller to the base if rated capacity is ≥ 630 kVA.
(2) Customized products are available.

DRY-TYPE TRANSFORMER



Dimension of the enclosure of SC(B) series, 10kV



8.1.3 Dimension of the enclosure of SC(B)9/10 Series, 10kV (unit: mm)

Sheet 12

Model	Short circuit impedance(%)	Overall dimension			Installation dimension		c	d	e	f	g	h	H	hn
		Lw	Bw	Hw	m	n								
SC9, 10-125/10	4	1550	1150	1700	550	1090	350	175	175	300	210	980	1060	140
SC9, 10-160/10		1550	1150	1700	550	1090	365	180	175	305	215	1030	1110	140
SC(B)9, 10-200/10		1550	1150	1700	660	1090	395	197.5	150	315	245	1070	1160	140
SC(B)9, 10-250/10		1550	1150	1700	660	1090	405	202.5	120	320	245	1110	1200	140
SC(B)9, 10-315/10		1550	1150	1700	660	1090	415	210	180	325	250	1145	1240	140
SC(B)9, 10-400/10		1700	1200	1750	660	1140	440	200	180	335	270	1200	1280	140
SC(B)9, 10-500/10		1700	1200	1750	660	1140	455	225	200	345	280	1305	1405	140
SC(B)9, 10-630/10		1700	1200	1750	660	1140	455	210	200	345	290	1305	1405	140
SC(B)9, 10-630/10	6	1800	1300	1900	660	1240	485	225	195	340	280	1315	1415	140
SC(B)9, 10-800/10		1800	1300	1900	660	1240	500	250	195	345	280	1380	1480	140
SC(B)9, 10-1000/10		1900	1300	2000	660	1240	520	260	220	350	290	1445	1575	140
SC(B)9, 10-1250/10		1950	1400	2100	820	1340	540	270	225	350	290	1625	1740	140
SC(B)9, 10-1600/10		2100	1500	2200	1070	1440	570	285	240	365	305	1660	1790	140
SC(B)9, 10-2000/10		2250	1500	2300	1070	1440	605	300	265	380	320	1760	1910	140
SC(B)9, 10-2500/10		2400	1600	2500	1070	1540	645	300	275	430	337	1855	2005	140

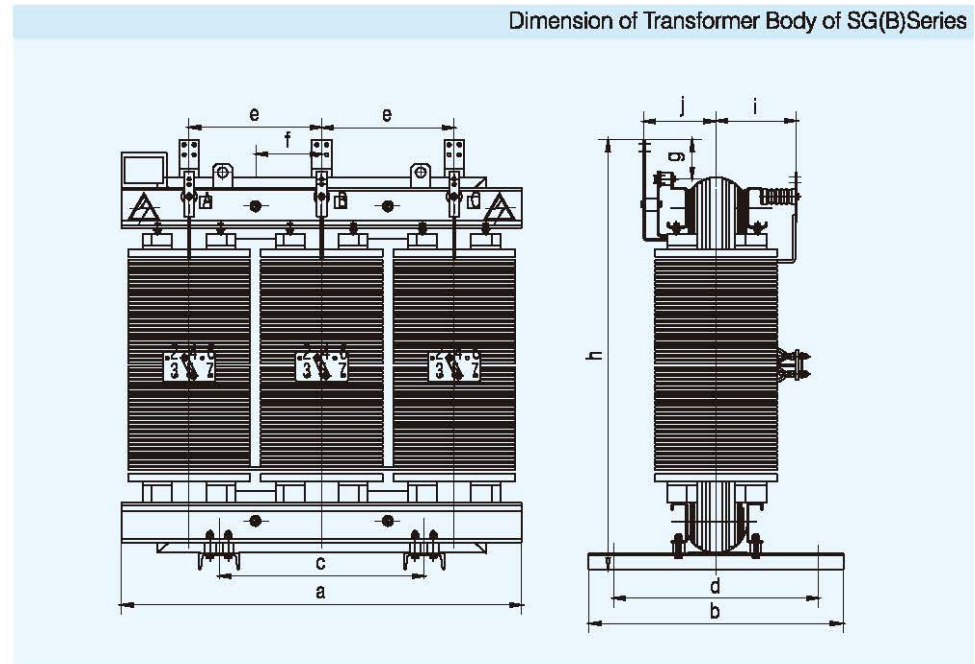
Note: (1) Customized products are available.



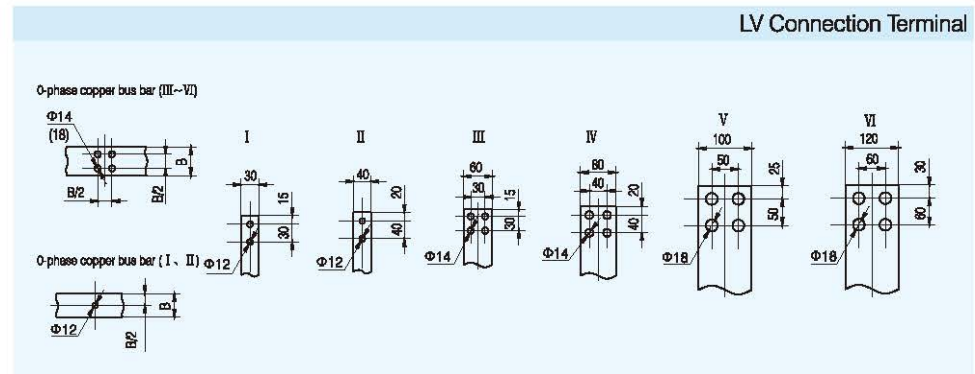


8.2 H-Class Impregnated Insulated Dry-type Transformer

Dimension of Transformer Body of SG(B)Series



LV Connection Terminal

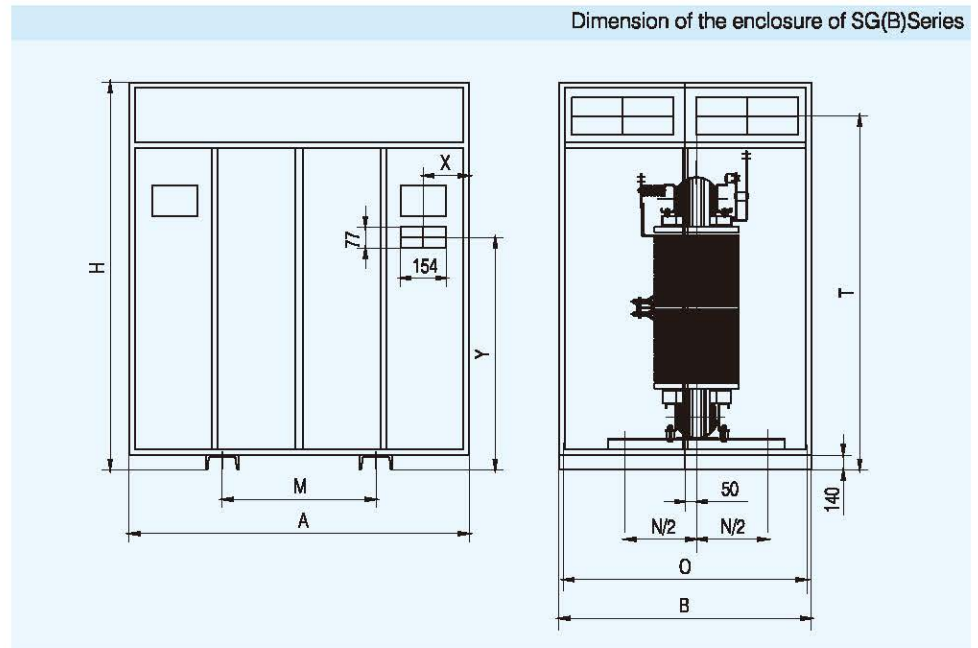


8.2.1 Dimension of Transformer Body of SG(B) Series (unit: mm)

Model	a	b	c	d	e	f	g	h	i	j	Copper Bus Bar	Overall dimension
SG10-100/10	1060	650	550	550	335	168	100	1150	285	225	I	1550×1200×1800
SG10-160/10	1100	650	550	550	360	180	105	1200	290	230	I	1550×1200×1800
SG10-200/10	1160	650	660	550	390	195	100	1280	290	240	I	1550×1200×1800
SG10-250/10	1180	760	660	660	400	200	115	1300	290	250	I	1550×1200×1800
SG(B)10-315/10	1180	760	660	660	400	200	110	1360	300	250	II	1700×1200×1900
SG(B)10-400/10	1200	780	660	660	410	205	100	1430	300	260	III	1750×1400×1900
SG(B)10-500/10	1270	780	660	660	430	215	118	1500	305	265	III	1750×1400×1950
SG(B)10-630/10	1400	780	660	660	475	238	115	1435	315	270	III	1850×1400×1950
SG(B)10-800/10	1480	940	660	660	490	245	212	1590	325	300	IV	1950×1400×2100
SG(B)10-1000/10	1550	940	820	820	525	263	215	1570	340	310	IV	2000×1500×2100
SG(B)10-1250/10	1600	940	820	820	530	265	240	1695	340	305	V	2050×1500×2200
SG(B)10-1600/10	1740	1200	820	1070	585	293	173	1705	355	345	V	2200×1500×2200
SG(B)10-2000/10	1780	1270	1070	1070	595	298	181	1790	365	350	V	2250×1500×2400
SG(B)10-2500/10	1920	1270	1070	1070	625	313	205	2070	430	350	VI	2400×1500×2600

Note: (1) The above data is just for reference.
 (2) Customized products are available.

DRY-TYPE TRANSFORMER



8.2.2 Dimension of the enclosure of SG(B)Series (unit: mm)

Sheet 14

Model	A	B	H	M	N	O	T	X	Y	Enclosure Dimension
SG10-100/10	1550	1200	1800	550	550	1140				1550×1200×1800
SG10-160/10	1550	1200	1800	550	550	1140				1550×1200×1800
SG10-200/10	1550	1200	1800	660	550	1140				1550×1200×1800
SG10-250/10	1550	1200	1800	660	660	1140				1550×1200×1800
SG(B)10-315/10	1700	1200	1900	660	660	1140				1700×1200×1900
SG(B)10-400/10	1750	1400	1900	660	660	1340				1750×1400×1900
SG(B)10-500/10	1750	1400	1950	660	660	1340				1750×1400×1950
SG(B)10-630/10	1850	1400	1950	660	660	1340				1850×1400×1950
SG(B)10-800/10	1950	1400	2100	660	660	1340				1950×1400×2100
SG(B)10-1000/10	2000	1500	2100	820	820	1440				2000×1500×2100
SG(B)10-1250/10	2050	1500	2200	820	820	1440				2050×1500×2200
SG(B)10-1600/10	2200	1500	2200	820	1070	1440				2200×1500×2200
SG(B)10-2000/10	2250	1500	2400	1070	1070	1440				2250×1500×2400
SG(B)10-2500/10	2400	1500	2600	1070	1070	1440				2400×1500×2600

Note: (1) Customized products are available.

8.3 Amorphous Alloy Core Dry-type Transformer

Customized products are available.

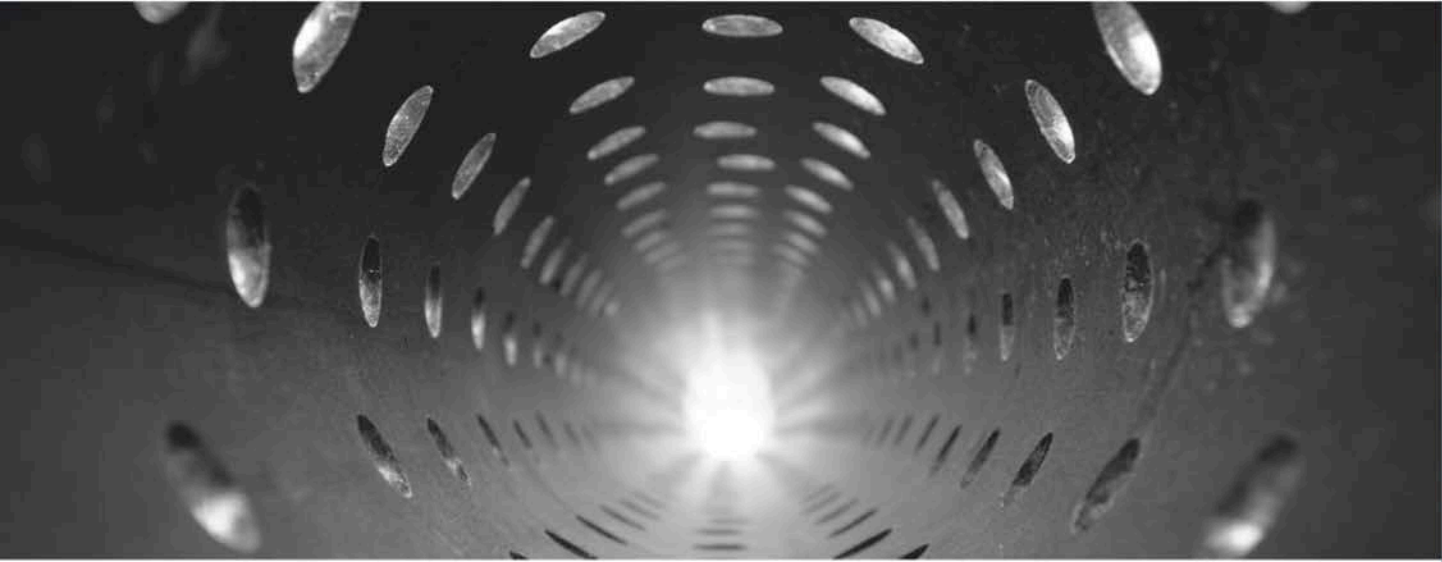
9. Ordering Information

Please indicate the following technical parameters when ordering:

Product type, rated capacity, voltage ratio and tap, connection way, impedance voltage, no-load loss, on-load loss, insulation class, rated frequency, insulation level, environment temperature, altitude, standard, air cooling system, temperature control system, protection degree of the enclosure, color of the enclosure and other particular requirements.*



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