



AM SGB Sdn Bhd

Cast Resin Transformer



So why Cast Resin Transformers?

The advantages speak for themselves

Minimal fire risk:

Cast resin molding material is not very flammable and can be self-extinguishing. There are no special fire prevention coatings, with associated fire conditions, the calorific potential of the cast resin transformer is minimal and there are no dangerous fire gases capable of long-term damage.

No coolants:

Cast resin transformers only need air for cooling. Liquid coolants – of whichever chemical type – cannot be released into the environment. There is therefore no requirement for building a cast resin transformer, which would be required for a liquid cooled type.

High short time overload capability:

The current density in the winding with cast resin transformers is considerably lower than with oil transformers. Short time load peaks, such as with wind power installations, can be

easily overcome without there being a need to plan the relevant over sizing.

Advantage capabilities of the enclosure:

Instead of transformer bays or cable housings, a simple enclosure can be used for access prevention. Enclosures can be complemented with the provision of high voltage flanges and low voltage cabinets to provide focal stations.

Simple increased performance:

Through optimized forced ventilation there is an increase in performance of about 40%.

Unrestricted installation possibilities:

The transformer is a key component in the electrical supply network, and speed of installation can be valuable. A cast resin transformer is easily accommodated, for example, no blast walls are necessary. Consequently, the planning of the installation is simplified and installation costs are at the minimum.

Why Cast Resin Transformers from AM SGB?

SGB are able to deliver Cast Resin Transformers with capacities up to 25 MVA and series voltages up to 36 kV. Our manufacturing range includes converter transformers, distribution transformers and special transformers. With more than 30 years experience in the construction of cast resin transformers, SGB has worldwide expertise, and this is expressed in remarkably high quality coefficients such as mean time between failure (MTBF) of over 1,700 years. Thanks to their unique design, SGB Cast Resin Transformers offer a range of features which set them apart

technically from other cast resin transformers and make them a very dependable and very reliable solution. For you the customer this means the following operational advantages:

- High impulse voltages are controlled safely.
- Thermal withstand capability makes overload possible.
- Expansion and contraction of coils in service is tolerated, even for short circuits.
- Long service life is guaranteed.



High voltage winding

The high voltage winding is the centerpiece of the cast resin transformer. Herein lies SGB's great technical know-how. Core and low voltage winding are also important for the overall design, as all components are naturally interdependent.



One of the characteristics of cast resin transformers is that the conductors of the high voltage winding are completely encapsulated in a cast resin body with a smooth surface. This can only be carried out in moulded formers under vacuum. SGB's production technology and materials used can also be distinguished through important unique features which set them apart technically from other cast resin transformers and make them a very dependable and very reliable solution.

R-eserves-equipped

Thermal Loads Make Overload Possible

SGB Cast Resin Transformers not only have an advantage over oil transformers but also cast resin transformers incorporating established alternative designs. These transformers use a high voltage winding design where the conductor consists of copper foil strip and the coil/layer insulation is plastic. The insulation level of this type of system can only be considered as class F, when considering the insulation system as a whole. It is quite different with SGB Cast Resin Transformers as SGB uses insulated profile wires for a double layer winding where the primary insulation either consists of a high heat resistant polyesterimide coating with a temperature index of 200°C or Nomex thread winding of the temperature class C (220°C).

R-eserves-equipped

Overloads are permissible due to the thermal reserves provided by specific primary insulation.

E-ndurance-enhanced

Cooling ducts guarantee long service life.

S-urge-proof

The double layer winding technology enables the control of high impulse voltages.

Q-uantum-leap

Glass fiber reinforcement of windings ensures that during operation, when the winding heats and expands, the design has the flexibility to react without damage to the winding even under short circuit conditions.

For our customers these specific features mean a high level of safety – both in relation to operation and their investment decision.

“Resin Quality by SGB”

These exceptional factors of quality are subsequently explained in detail below.



As the operating temperature of SGB Cast Resin Transformers rarely reaches the limit of the temperature class F (155°C), the primary insulation has sizeable temperature reserves.



E-ndurance-enhanced

Guaranteed high service life

Cast resin transformers must emit the resulting heat in the windings over the surface area of the coils to the cooler air surrounding the transformer. This has to be achieved with respect to the winding insulation class and without exceeding the average winding temperature, or the Hot-Spot temperature. The necessary cooling requirements can be calculated by considering the heat transfer coefficient, the ambient temperature, the surface temperature of the coil, and the size of the surface area. With cast resin transformers of alternative designs, only the inner and outer surface areas of the high voltage cylindrical coil are available for cooling. To provide the necessary surface areas for cooling, the coils must be larger. SGB's design of a double layer winding in comparison simply allows for the introduction of additional cooling ducts inside the coil. In this way very efficient cooling is achieved. SGB Cast Resin Coils can therefore be equipped with several cooling ducts. SGB Cast Resin Transformers use appropriate materials and design to guarantee a consistent distribution of temperature inside the coil. The optimized cooling enables a reduction in temperature for the high voltage winding and furthermore a consistently distributed temperature for the entire transformer.

S-urge-proof

High impulse voltages are controlled safely

Only SGB Cast Resin Transformers mould their high voltage coils in vacuum combined with a double layer winding.

This ensures safety in the control of impulse voltages brought about by, for example, lightning strikes or vacuum switches.

- Regular coil winding of other transformers leads to much greater voltage stress, especially on the input coils, because 70% of the shock impact does not apply on the first 30% of the coils. The risk of winding short circuits therefore increases significantly.
- The SGB double layer winding by contrast guarantees linear fault distribution for all windings.

Q-uantum-leap

Overcome temperature shocks reliably

Cast resin transformers are subject to great mechanical and thermal shocks and strains in their transport and in particular when operated. Therefore of great importance is the ability of the transformer to safely control spasmodic temperature increases. A decisive factor in this feature is the construction of the cast resin composite material, into which the conductors are moulded. This depends especially upon the tensile stress and the thermal coefficients of expansion of the composite material in relation to the winding material. With many cast resin transformers this composite material is comprised of epoxy resin which is mixed to over 70% with a mineral bulking agent, mainly quartz powder. Such a composite material can reach the tensile strength of the epoxy resin, about 50 N/mm. With the thermal coefficients of expansion the value of aluminium can roughly be met with maximum mineral filling but remains clearly above that of copper. This is the reason why cast resin transformers of usual technology were only available for decades with aluminium conductors. Recently there has been an improvement through an additional concentration of glass fiber on the surface. It is quite different with SGB. Here the composite system is comprised of a glass fiber concentrated epoxy resin between the layers and on the surface with high tensile strength in the area of 120 N/mm and a coefficient of expansion which is equally close to that of copper and aluminium. SGB Cast Resin Transformers are produced with copper winding materials. Casting has always occurred under vacuum and is therefore free of voids. The advantage of the SGB composite system has frequently been recognized in tests. With an exit temperature of -50°C , SGB Cast Resin Coils have also safely passed the required temperature shock tests in accordance with IEC 60076-11 for climate class C2 based on a temperature of -25°C .



Low voltage winding

SGB Cast Resin Transformers' low voltage winding is almost always used as a full length foil winding. The advantages of this form of winding are evident:

- Reduction of additional losses.
- Even temperature distribution in the coil.
- High short circuit consistency.

Exceptions exist if the LV winding is rated as less than 160 kVA or has a voltage rating of over 3 kV. For more than 40 years SGB has been producing foil windings for distribution transformers and cast resin transformers. This long expertise is the reason for high quality features such as:

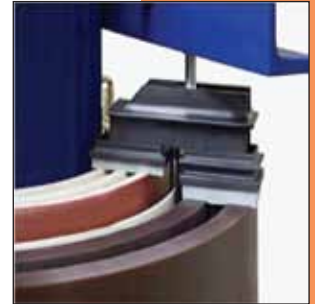
- SGB uses treated material exclusively from foil manufacturers in special cylinders to guarantee that the edges are burr-free. This is an important requirement for electrical dependability.

Low voltage winding

To connect the outbound connection edges with the tapes, there are two common practices, welding under inert gas or cold welding under high pressure (400 kN). Cold welding has been used for more than 20 years at SGB.

Benefits:

- No metallurgic changes of the winding material by means of a temperature process.
- No foreign bodies which can occur with molding.
- By using multi-layer prepregs, there is a high-strength, thick-walled cylinder, which can accommodate the radial short circuit force unsupported-compared with the otherwise standard solutions.



Quality

Guaranteed high service life

The manufacture of cast resin transformers is of course certified within SGB in accordance with ISO 9001 and ISO 14001. As a provider to OEM customers with high quality standards, we are familiar with challenging quality systems such as, Six-Sigma. Classification societies such as Germanischer Lloyd, RINA or Bureau Veritas have approved SGB Cast Resin Transformers. SGB has been producing cast resin transformers for over 30 years and therefore has the greatest wealth of experience in this field worldwide. This remarkable know-how is reflected in exceptionally high quality coefficients, such as MTBF of over 1,700 years. SGB Cast Resin Transformers naturally comply with all the usual quality standards such as:

- Fire class F1.
- Environmental class E2.
- Climatic class C2.

Tests

SGB Cast Resin Transformers are designed and produced as standard in accordance with IEC 60076-11. SGB Cast Resin Transformers comply with all the tests required in IEC 60076-11 All detailed inspections and type tests, e.g. short

circuit tests or temperature rise tests as well as many special tests have been completed in the course of our supply. In this way the specific properties stipulated in the customer specification can also be checked, and met. In conjunction with external institutes, we have also completed detailed measurements for the following areas:

- EMV Electromagnetic tolerance in conjunction with Systron EMV Ltd, Rednitzhembach.
- Fire gas analysis or low temperature carbonization gas analysis of components of cast resin transformers in conjunction with the Allianz Centre for Technology, Munich.
- Vibration test in conjunction with IABG, Munich.
- Short circuit strength in conjunction with FGH, Mannheim and Zkusebnictvi High Power Laboratory, Prague.
- Certification for -50° C in conjunction with Standard Elektro, Moscow.
- E2 and C2 tests in conjunction with KEMA.
- Full Routine, Type & Special Test as per IEC 60076-11 with KEMA.



Technical Data / Specifications

11/0.433 kV Dyn 11 50Hz (Um12/1.1kV)

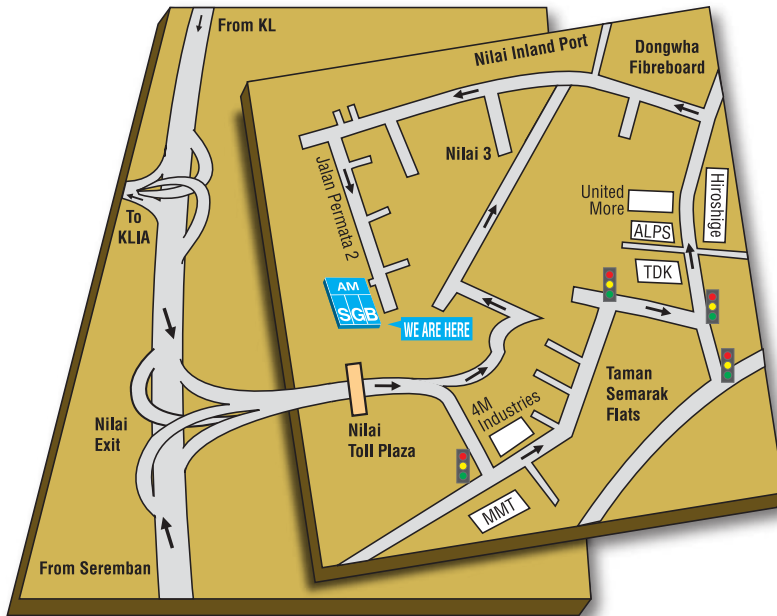
| Rated Power | Type | No - Load Loss | Load Loss | Impedance | Noise Level | Weight (kg) | Dimension Transformer | | |
|-------------|--------|----------------|--------------|-----------|-------------|-------------|-----------------------|------------|-------------|
| | | Po (W) | Pk 120°C (W) | Uk (%) | LPA (dB) | | Lenght (mm) | Width (mm) | Height (mm) |
| 500kVA | DTTHYL | 820 | 5300 | 6.0 | 66 | 1800 | 1460 | 820 | 1300 |
| 630kVA | DTTH | 1400 | 7350 | 4.0 | 60 | 2100 | 1600 | 820 | 1400 |
| 800kVA | DTTH | 1750 | 8700 | 6.0 | 58 | 2250 | 1560 | 820 | 1400 |
| | DTTHIL | 1350 | 5000 | 6.0 | 47 | 2600 | 1640 | 820 | 1340 |
| 1000kVA | DTTH | 2000 | 10100 | 6.0 | 60 | 2250 | 1600 | 820 | 1400 |
| | DTTHIL | 1550 | 6100 | 6.0 | 51 | 3100 | 1660 | 1000 | 1600 |
| 1250kVA | DTTH | 2400 | 11700 | 6.0 | 60 | 2800 | 1600 | 820 | 1400 |
| | DTTHIL | 1850 | 7500 | 6.0 | 52 | 3650 | 1680 | 1000 | 1700 |
| 1600kVA | DTTH | 2800 | 14400 | 6.0 | 61 | 3410 | 1800 | 1000 | 1800 |
| | DTTHIL | 2250 | 8800 | 6.0 | 53 | 4260 | 1860 | 1000 | 1770 |
| 2000kVA | DTTH | 3500 | 18400 | 6.0 | 61 | 4200 | 1800 | 1270 | 1000 |
| | DTTHIL | 2800 | 12000 | 6.0 | 53 | 5300 | 1940 | 1300 | 1950 |
| 2500kVA | DTTH | 4300 | 21200 | 6.0 | 64 | 5600 | 2200 | 1300 | 2000 |
| | DTTHIL | 3150 | 13900 | 6.0 | 56 | 5950 | 1029 | 1280 | 2000 |

22/0.433 kV Dyn 11 50Hz (Um24/1.1kV)

| Rated Power | Type | No - Load Loss | Load Loss | Impedance | Noise Level | Weight (kg) | Dimension Transformer | | |
|-------------|------|----------------|--------------|-----------|-------------|-------------|-----------------------|------------|-------------|
| | | Po (W) | Pk 120°C (W) | Uk (%) | LPA (dB) | | Lenght (mm) | Width (mm) | Height (mm) |
| 1000kVA | DTTH | 2300 | 11110 | 6.0 | 59 | 2643 | 1700 | 1000 | 1700 |
| 1250kVA | DTTH | 2750 | 13400 | 6.0 | 52 | 3650 | 1760 | 1000 | 1720 |
| 1600kVA | DTTH | 3100 | 16100 | 6.0 | 63 | 3650 | 2050 | 1000 | 1720 |
| 2000kVA | DTTH | 4100 | 19500 | 6.0 | 64 | 4750 | 2060 | 1280 | 2200 |
| 2500kVA | DTTH | 5000 | 23000 | 6.0 | 66 | 5604 | 2220 | 1000 | 2000 |

Table Key : Low Loss
 Standard Loss

NOTE: In the interest of technical progress the above specifications are subject to change without prior notice. The above ratings are a selection from our wide range of transformer designs. Difference ratings are available upon request.



The AM SGB Sdn Bhd and SGB Cast Resin Sdn Bhd factory is strategically located in Nilai, the heart of Negeri Sembilan's fast booming industrial district. Its proximity to the North-South highway, the Nilai Inland Port and the Kuala Lumpur International Airport (KLIA) offers excellent and strong infrastructural support to platform the company's progress.



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