SHYAMRAI ELECTRONICS

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TRANSFORMER – RECTIFIER UNIT

Designer & Manufacturer of TR Set, Thyristor Control Panel, TR Controller for ESP and Micro-Processor based Control System and Software Developer.

SHYAMRAI ELECTRONICS, KOLKATA

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TRANSFORMER-RECTIFIER SETS FOR ELECTROSTATIC PRECIPITATORS

General:

Transformer-Rectifier (T/R) sets supply specified DC Voltage and current to the field of electrostatic precipitators. Shyamrai makes both standard and custom T/R sets, and both set the very standard for quality and adaptability in retrofit and new applications for ESPs. Shyamrai make T/R sets and associated control panel and Micro-processor based controller meet all electrical requirements for all types of ESPs.

The T/R Set – Product Description

The T/R high-voltage supply consists of a transformer, an in built current-limiting reactor (CLR), rectifiers and switches - all contained in an oil- filled tank that is completely sealed and suitably painted for outdoor use. Standard semi-outdoor bushing are supplied on these units and are suitable for outdoor use when enclosed in a bus duct to protect them from the elements.

- **Transformer-Rectifier Tank:** T/R tanks are rectangular in shape. Lugs and supports are available to aid in lifting by crane or forklift. Powder coating or suitable outdoor paint is standard, but can meet other individual specifications on request.

- **Low Voltage Junction Box:** Located on the outside of the T/R tank, this box houses all low voltage input bushing and metering feedback bushing, as well as the terminal board for the temperature gauge alarm contacts and terminals for the optional primary voltage metering.

- **Main transformer:** This is a high-voltage, step-up transformer designed to convert low-voltage input into the high voltage required for ESP operation. The transformer is located on the bottom of the tank. Primary winding is designed to match the type of controller being used; secondary voltages and currents are set to meet load requirements. The transformers unique design helps prolong its life by distributing the electrical and mechanical stresses incurred in operating the ESP.

- **Rectifier:** To ensure the optimum reliability, our minimum rating for high-voltage rectifiers are 1.5 times the PIV of the T/R maximum peak KV. A full wave rectifier bridge is connected across the transformer secondary. The

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negative polarity i.e. DC output from the rectifiers is connected to a H.F Choke in such a way that the bridge is easily removable and replaceable from the top of the T/R set.

- **Current limiting reactor (CLR):** Because of sparking and consequent short circuiting during ESP operation, current must be limited to protect the T/R set & Thyristors. When a Silicon Controlled Rectifier (SCR) controller is used as the voltage regulating device, it must be protected for adverse short-circuit conditions. Besides improving waveform and waveform factor, the CLR protects both the T/R set and SCR controller as follows:

    1. By limiting current to SCR
    2. By limiting peak current to the T/R set during precipitator sparking.

The CLR is designed so that short-circuit current is limited to a value specified by the user or ESP manufacturer (usually a maximum of three times rated current). In the conventional T/R set the CLR is connected in series to the T/R set primary but in our case the Primary Impedance of the Transformer > 44% so it does not require any external transformer.

By using this inbuilt CLR, power loss is reduced more than 25% than the T/R set where the external CLR is used and thus allowing for greater reliability in transformer construction.

Use of this inbuilt CLR also allows more efficient utilization of SCR devices, without which higher current carrying SCR devices would have to be used, because of derating for lower conduction angles.

- **Air Core Inductor / RF Choke:** One Air Core inductor / R/F Choke is installed in series with each high voltage DC output bushing to limit high frequency capacitance discharge current surges generated during sparking in the load.

- **High voltage Bushings:** A suitable high voltage bushing is mounted on the side of the tank. This Bushing conduct the negative polarity of the high voltage.

- **T/R Oil Level Gauge:** There are two floats – top and bottom – provided with drain valves inside the tank. Any leakage of oil actuates a Buchholtz relay which in turn sends a signal to the Controller for warning and tripping. An Annunciator is provided in the TR Panel for this purpose.

- **Temperature Gauge:** A dial type Temperature Gauge with its own independent well (for easy replacement in the field) measures actual oil temperature. It has got two sets of adjustable contact for High temperature Warning and Trip.

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- **Surge Arrestor:** The GDT (Gas Discharge Tube) type Surge Arrestor is used to protect the electronic devices connected directly to the Transformer Rectifier Sets. The GDT surge arrestors are very simple but effective - switching elements that normally act as open circuits until a voltage surge reaches "Spark Over Voltage". At this point the gas becomes rapidly ionised and the arrestor changes state to a short circuit. As the surge passes, the voltage drops and the surge arrestor reverts to its isolating mode.

- **High Voltage Resistance (HVR):** A Resistance chain is connected directly to the Negative Bushing for feed back (400 microAmps for maximum peak KV) to the controller. This resistance chain is inserted into the oil of the T/R tank.

- **Shunt Resistance :** A suitable Shunt resistance is placed in the Low Voltage Junction Box for feedback to the controller, to measure the field current of the ESP.

SPECIFICATION:

1. Input Voltage: 415 ? 10%
2. Frequency: 50 Hz ? 5%
3. Primary Current: .... amps (max)
4. Secondary Current: ..... mA
5. Secondary kV: ..... kV(Peak)
6. Form Factor: 1.4 (Max)
7. Humidity: 90 – 100%
8. Ambient 50^0C
9. HT Bushing: Horizontal
10. Method of Cooling: Oil natural Convection Cooling
11. Duty Continuous
12. Installation Outdoor with HT Bushing enclosed in a metallic duct (Metallic duct is not in scope).

SCOPE OF SUPPLY:

1. Main Transformer (Single Phase step up core type, insulation class A, Cross Over type winding)
2. Single Phase Full Wave Bridge Rectifier
3. High Frequency Reactor for protection of Diode stack.
4. High Voltage Bushing (Porcelain)
5. Junction Box consisting of input and feedback terminals.
6. Feedback Circuit consisting of Current and Voltage feedback circuit with necessary protections.
7. Float switches
8. Dial Thermometer

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9. Pressure Release Valve
10. Drain Valve
11. Dielectric fluid (Mineral Oil)

HOW TO REACH US :

For ,

? Reliability
? Quality
? Technical Support,

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