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ISL Series SPECIFICATION

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ISL Series Regulating Transformer Specification

1.0 INTRODUCTION

This specification describes the requirements for an Industrial Grade Ferroresonant Voltage Regulating Transformer. The Isolimiter (ISL Series) Voltage Regulator, also known as Constant Voltage Transformer (CVT), regulates and conditions the AC output voltage to within pre-set limits, while accommodating wide variations of incoming line voltage. The ISL is capable of acting as a bypass source device in UPS/Inverter applications, or as a stand-alone voltage regulator.

2.0 APPLICABLE STANDARDS, CODES AND REGULATIONS

Unless noted otherwise, the design, fabrication, testing and performance of the Voltage Regulator shall be in accordance with the standards and codes, where applicable, of the following agencies:

National Electrical Manufacturers Association (NEMA)
American National Standards Institute (ANSI)
National Electric Code (ANSI/NFPA 70-2001)
Institute of Electrical and Electronic Engineers (IEEE)
International Electrotechnical Commission (IEC)

3.0 ENVIRONMENTAL CONDITIONS

3.1 Operating Temperature

The ISL shall operate at rated output continuously without any adverse affects, in an ambient temperature of 0°C to 40°C (32°F to 104°F).

3.2 Relative Humidity

The ISL shall operate at a relative humidity of 5% to 95%, non-condensing, over a temperature range of 10°C to 40°C (50°F to 104°F).

3.3 Operating Altitude

The ISL shall operate at any altitude from sea level up to 3000 meters (10,000 feet) without de-rating.

3.4 Audible Noise

Audible noise emanating from the unit shall be ≤ 75 dB (A) @ 1.5 meters.

4.0 SYSTEM DESCRIPTION

4.1 Basic Operation

The sineferro ISL shall provide both galvanic isolation and output voltage regulation over a wide line (input) voltage range. The ISL can be used either as a stand-alone regulation device, or installed on the bypass (or alternate) source of a UPS/Inverter system to provide emergency and maintenance power to critical AC loads.

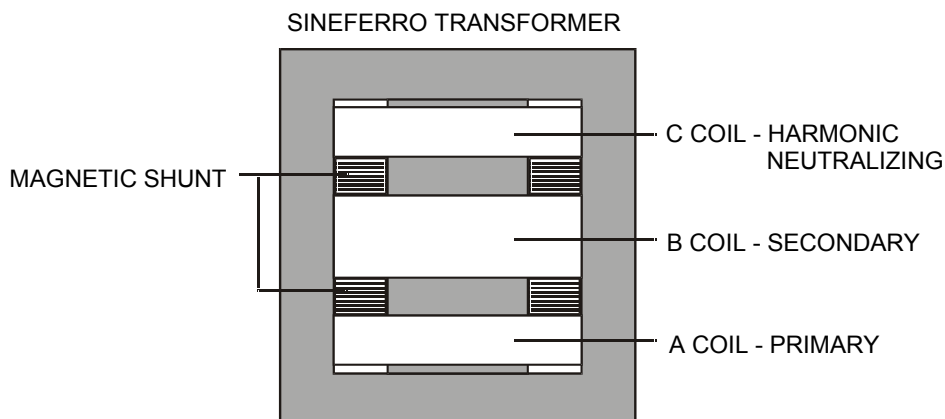
4.2 Basic Components

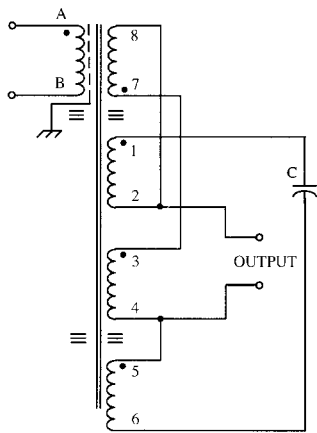
The ISL shall consist of the following “component” windings:

(Refer to Figures 1.0 & 2.0)

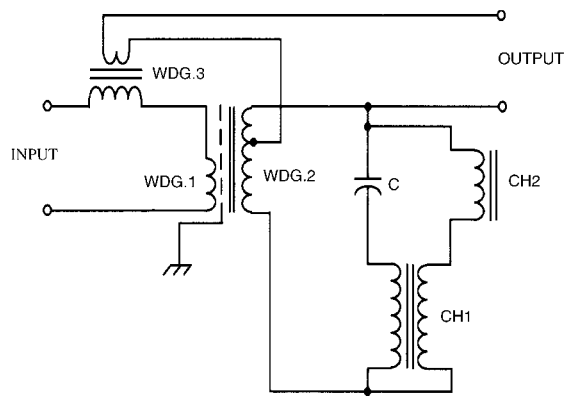
- Primary Winding: Provides input-to-output isolation
- Secondary Winding: Operates in magnetic saturation to provide output voltage regulation impervious to input line fluctuations
- Neutralizing Winding: Generates “neutralizing” harmonics that are out of phase with the secondary to insure that the resultant sine wave contains less than 5% harmonic distortion
- Primary Feedback or Compensation Winding: To improve output voltage regulation
- Electrostatic Shield: Reduces high frequency electrical noise
- Series Resonant Circuit: Consisting of an inductor and capacitor to control the saturation level of the magnetic core

Figure 1.0





7.5 – 50 kVA



75 – 100 kVA

Figure 2.0

4.3 Normal System Operation

When it is used in stand-alone applications, the Voltage Regulator shall provide clean, continuous, regulated AC power to its connected critical load(s).

When connected in the bypass (alternate) source leg of a UPS system application, the ISL will normally be unloaded, but turned 'ON', and be capable of assuming 100% of the UPS load with no disruption of power to the load. In addition to regulating the output voltage, the ISL shall provide energy to aid in clearing load faults.

4.4 Current Limit Feature

The regulator shall current limit at approximately 150 – 200% of its nameplate rating.

4.5 Energy Storage and Fault Clearing Capability

To aid in fault clearing, the regulator circuitry shall include a “tank” circuit that will enable the ISL to “store” energy for up to ½ cycle, while delivering up to 560% of its rated current.

5.0 PERFORMANCE SPECIFICATIONS

5.1 AC Input

5.1.1 AC input voltage shall be single-phase; 480 or 120 VAC, 60 Hz.; or 380 or 220 VAC, 50 Hz (Other voltages may also be specified)

5.1.2 AC input voltage range shall be + 10%; -15%

5.1.3 AC input frequency range shall be $\pm 0.5\text{Hz}$

5.2 AC Output

5.2.1 Capacity will be as specified on the project data sheet. Fuse and breaker clearing requirements shall be considered when sizing the ISL.

5.2.2 AC output voltage shall be single-phase; 120 VAC, 60 Hz; or 220 VAC, 50 Hz (Split-phase voltages and other single-phase voltages may also be specified).

5.2.3 AC output voltage regulation shall be $\pm 2\%$

5.2.4 Total harmonic distortion (THD) shall be $\leq 5\%$ with linear load; $\leq 7.5\%$ with non-linear load

5.2.5 Overload Rating shall be 125% continuous at full load; 150 – 200% for fault clearing.

5.2.6 Load power factor shall be 0.8 – 1.0

5.3 Noise Attenuation

5.3.1 Common Mode: 120 dB

5.3.2 Transverse Mode: 80 dB

5.4 Cooling

Forced-air cooling shall be provided when necessary to ensure that all components are operating below their specified operating temperature.

5.5 Efficiency

Full load efficiency shall be no less than 88%.

6.0 ACCESSORIES

6.1 Overload Protection

Overload devices shall not be activated when the system is started under normal operating conditions.

6.1.1 AC Input Circuit Breaker

A front access molded case circuit breaker shall be provided to manually disconnect the ISL for maintenance, as well as provide overload protection. The minimum A.I.C. rating of the breaker shall be 14KA minimum.

When specified, an **optional** AC **output** circuit breaker, with the same minimum A.I.C. ratings shall be provided.

6.2 Meters

When specified, the following 3.5 inch scale analog meters (2% accuracy) shall be provided on the front panel of the regulator:

- AC Input VM
- AC Output VM
- AC Input AM
- AC Output AM
- AC Output Frequency Meter

6.3 Indicator Lights and Alarms

Where applicable (units ≥ 50 kVA), an indicator (Red) and alarm contact (form 'C') shall be provided to indicate **Fan Failure**. The relay shall be normally de-energized. The contact shall be rated at 3 amps @120 VAC/28VDC.

When specified, the following **optional** indicating lights and alarms shall be provided: (The contacts shall be rated at 3 amps @120 VAC/28VDC.)

- **Over Temperature:** An indicator (Red) and alarm shall be provided when the ambient temperature is excessive (typically $> 65^{\circ}$ C). The relay shall be normally de-energized.

- **Low AC Output**

An indicator (Red) and alarm shall be provided when the AC output voltage is less than 90% of nominal. The relay shall be normally energized.

- **High AC Output**

An indicator (Red) and alarm shall be provided when the AC output voltage is greater than 110% of nominal. The relay shall be normally de-energized.

- **AC Output Overload**

An indicator (Red) and alarm shall be provided when the load exceeds the regulator's continuous rating. The relay shall be normally de-energized.

7.0 MECHANICAL SPECIFICATIONS

7.1 Wiring

Manufacturer shall utilize NEC, bulletin 70 (US National Electric Code) and NEMA wiring practices where applicable.

Control wire and Power wire shall be 18 AWG UL 3266 SIS.

Power wiring 10AWG through 4/0 AWG shall be SIS UL, CSA listed VW-1, 90°C, 600 V

Power wiring 262 MCM through 777 MCM shall be DLO 90°C, 600 Volt Ethylene Propylene Rubber (EPR) inner jacket, with a Hypalon outer jacket.

All wiring and bus-work shall be copper throughout the system.

7.2 Enclosure

The enclosure shall be a NEMA-1(IP-20), free standing, with minimum 12GA framework. Door panels shall be a minimum of 14GA steel and side panels shall be a minimum of 18GA.

The enclosure shall be mounted on channels with a 3 inch lifting base open at the front and back to facilitate moving with a forklift and to provide an entrance area for air movement through the enclosure.

The enclosure shall be designed with blank plates on the sides and rear for installation against a wall. The equipment shall be designed to allow replacement or maintenance of all components from the front.

One or more hinged doors shall be provided in the front with door locks on each. Hinged panels, 36" and larger, shall be provided with a 2 point latching system for holding the panels securely. Removable covers shall be attached with machine screws.

7.2.1 Drop and Drip Shields

When required, “drop” shields, which protect the enclosure from debris and foreign objects falling into the cabinet; or “drip” shields which protect the enclosure by preventing dripping water from entering the cabinet from above, shall be provided on the top of the enclosure.

7.2.2 Fungus and Moisture Proofing

When specified, a protective coating on components inside the UPS enclosure shall be provided when the unit is installed in environments where the ambient air is extremely humid, or is heavily laden with salt content or other contaminants.

7.2.3 Vermin Screens

When specified vermin Screens shall be provided to prevent the entry of small animals into the inverter cabinets.

7.3 Ventilation

When specified, air inlets and outlets shall be protected by screens or perforated metal guards to prevent the entrance of a rod having a diameter of 0.5 inches or larger.

7.4 Cable Entry

Cable entry shall be through the top or bottom of the cabinet.

7.5 Power Connections

The connections to the AC output or DC input shall be of the stud type and shall be sized for full load service.

Alarm connections shall be sized to allow connection of 12AWG Wire maximum. The alarm terminal boards shall be rated for 300 VAC.

7.6 Parts Placement

The system shall be designed to permit front access to modules, fuses, and assemblies. Parts, test points, and terminals shall be placed so they are accessible for circuit checking, adjustment, and maintenance without removal of any adjacent assembly or component or pose a shock hazard.

7.7 Wire Supports

Permanent wire supports shall be used, no adhesive backed wire supports shall be used.

7.8 Wire Marking

All point-to-point wires shall be marked with a permanent marking system on both ends of each wire.

7.9 Component Marking

All PCB's, indicator lights, meters, controls, semiconductors, and fuses shall be clearly marked with the component designation for ease of serviceability.

7.10 Personnel Safety

The cabinet shall be constructed so that all controls are operable with the doors closed, preventing exposure to high voltage terminals. High voltage warning labels shall be visible when any of the cabinet doors are opened.

7.11 Painted Surfaces

All external painted surfaces shall be ANSI 61 Gray enamel with a minimum of 1.0 mil thickness and shall be smooth with no runs, sags, or graininess. All internal mounting plates shall be galvanized steel.

8.0 Shop Testing

The system testing shall be in conformance with IEEE 944-1986 section 7.0, and IEC-146-4. Certified test data shall be supplied to verify test results when required. The manufacturer shall have either type-test or production test data available to demonstrate system performance.

9.0 Documentation

9.1 Cabinet outline and interconnect drawings shall be dimensioned and scaled, and include the following information:

- 9.1.1 Location of any removable plates for Owner's conduit entry.
- 9.1.2 Location and size of all terminal blocks for Owner's connections.
- 9.1.3 Location and size of ventilation openings.
- 9.1.4 Location of cabinet grounds.
- 9.1.5 Block diagram including currents for customer cable sizing, breaker locations and sizes, and meter locations.
- 9.1.6 Size and weight of equipment.
- 9.1.7 Front panel identification chart.

9.1.9 Nominal heat loss for the specified equipment.

9.2 Schematic type drawings shall include the following information:

9.2.1 System schematics shall include item designations for all electrical components.

9.2.2 Relay contacts diagrams shall be shown in the de-energized position.

9.2.3 Wire sizes and numbers shall have the same designations that appear in the equipment.

10.0 PREPARATION FOR SHIPMENT

10.1 Preparation for shipment shall be in accordance with the manufacturer's standard shipping procedure.

10.2 One complete set of instruction books and "as-built" drawings shall be included with the equipment when shipped.

10.3 To facilitate site access, shipment of individual cabinets, rather than complete lineups, may be necessary.