TRYSTAR®

100V to 1000V DC 100A to 5000A DC

SERIES 50 MODELS 506 & 5012

6 Pulse and 12 Pulse DC Power Supplies for Electrocoating and Industrial DC Powered Systems

Applications:

- Electrocoating
- Ion Nitriding
- Magnet Charging (Including Superconducting)
- Anodizing

15765 Acorn Trail / Faribault, MN 55021 / 507.333.3990

TRYSTAR.com

THE UNIQUE AND PROVEN SOLUTION

Experience, Quality, And Field Reliability

Controlled Power Company engineers and manufactures the industry's highest quality **industrial DC power supplies (rectifiers),** capitalizing on over 50 years of expertise. This quality is reflected in the design, material, workmanship, and operating performance of each rectifier we build. The result is a rugged, reliable rectifier system that will stand up to the rigors of 24x7 operation, even in harsh industrial environments.

Our rectifiers' durability and performance maximize end-user productivity and minimize downtime. If / when field service is necessary, Controlled Power Company will provide available parts and service for the life of each rectifier we manufacture, which is often 20+ years!

Controlled Power Company is ISO 9001:2015 certified, assuring quality and customer satisfaction from order entry to system start up, and beyond.

OEM's And System Integrators

As a leading manufacturer of **industrial DC power supplies (rectifiers),** Controlled Power Company understands and strictly adheres to each OEM's and system integrator's rectifier specifications. A custom rectifier design reflects job-specific requirements including voltage and current levels, NEMA ratings, monitoring and controls, dimensions / footprint, and product weight. OEM specific features often include air filters, 24VDC control circuitry, color coded wires, custom paint color, top or bottom entry of AC and DC power cables, and PLC control.

Each rectifier is designed and manufactured for simple installation, startup, and service. Input and output terminations, component placement, and wiring connectivity are all configured to keep installation costs to a minimum, and to eliminate the need for any field customization during the installation process.

Many design methods are available to help the engineer integrate the high voltage rectifier into the production line, with proper personnel safety. This includes fail-safe emergency power off logic to DC disconnect switches for safe, quick, and convenient isolation of power from production areas.

Controlled Power Company's staff of design and application engineers work together to make sure job requirements are satisfied. In addition, expertise is always on-hand to assist with future expansions, and help implement control improvements or monitoring enhancements.

Customer Support And Field Service

All Controlled Power Company **industrial DC power supplies (rectifiers)** are designed and manufactured to have a low MTTR (mean time to repair). Components and sub-assemblies can be easily field-tested, removed, and serviced without excessive and costly hours of maintenance and downtime.

Each Controlled Power Company rectifier is backed by 24x7 customer support and service. Experienced, knowledgeable staff and technicians are familiar with e-coating and other metal finishing applications, and are ready to assist with service contracts, rectifier startup, training, and phone support. Replacement parts and components can be quickly and easily shipped

to a customer's site. When requested, a factory technician is dispatched and can most-often be onsite within 24 hours.

SERIES 50 RECTIFIERS

Controlled Power Company's **"Series 50" Rectifier** reflects a single transformer, secondary thyristor design, and is the preferred choice for electrocoating and other metal finishing applications which require 100VDC or higher. The **"Series 50" Rectifier** is available in both 6- and 12-pulse standard models. Compatible with current advanced manufacturing processes, this rectifier is designed for optimum, reliable performance in harsh industrial environments.

Input Breaker Protection

Standard main input AC circuit breaker, complete with a door-interlocked safety mechanism.

Cabinet Design

Available in NEMA 1 and NEMA 2 rated enclosures. Other NEMA ratings available for indoor and outdoor enclosures. The **"Series 50" Rectifier** is designed and constructed to endure the harsh industrial environments associated with e-coating and metal finishing processes. All enclosure designs are industrial-grade, welded steel construction, with a durable scratch-resistant powder coat finish. High-grade stainless steel enclosure designs are available as an option, with or without a powder coat finish.

Transformers

Designed for high efficiency, low inrush current, durability, and dynamic loading, the **"Series 50" Rectifier** transformers are constructed from high-grade steel and copper to ensure maximum conductivity and minimal loss. These transformers have a low temperature rise, and are mechanically and electrically designed to withstand the stress that occurs under fault conditions.

Thyristor (SCR's)

In the **"Series 50" Rectifier,** fully synchronized, phase lock loop gating circuitry is used to control the thyristors, eliminate gate misfiring, and insure that all phases are present before gating commences. Thyristors in each phase are surge protected using MOV suppression and an RC snubber circuit. For maximum efficiency and reliability, thyristors are conservatively rated to operate at a current level much lower than their device rating. Additionally, each thyristor is cooled to minimize the junction temperature and increase component life.

Controls And Monitoring

Standard digital metering and local controls on every **"Series 50" Rectifier** include:

- Output Voltage and Current Meters
- AC Power On and DC On Lights
- Output Voltage and Current Control Potentiometers

- Voltage or Current Regulation Mode Switch
- Voltage or Current Limit Control Potentiometer
- Automatic DC Overload Shut Off

Optional local or remote controls are available to suit almost every application. See Page 4 for e-coat specific options.

Cooling

"Series 50" Rectifiers offer a choice of cooling methods to help minimize cost or increase longevity in harsh environments.

Air Cooled

Outside ambient air is drawn into the rectifier using a long-life fan, and directed over the semiconductor devices. The power transformer is convection cooled, but rectifiers with high power ratings also incorporate a fan in the transformer section to assist with heat removal from the enclosure. Replaceable air filters are available for all air inlets. With proper maintenance, long rectifier life will result in typical painting environments or protected electrical closets. Low power rectifiers are available with all-convection cooling to minimize dust/debris entry.

Water Cooled

Heated air from power semiconductors is drawn into an air-to-water heat exchanger. Thermal transfer effectively reduces the air temperature, and then circulates the cooled air back into the semiconductor area. This air circulation also removes heat from the power transformer. An internal thermostat is adjustable to maintain the water cycle for proper cooling, while minimizing internal condensation. Direct water-cooled semiconductor designs are also available and can help lower the component ratings to reduce costs. This method of cooling insures long rectifier life for extreme operating environments.

Water cooled Model 506, shown with optional DC isolation switch.

E-COAT RECTIFIER FEATURES AND BENEFITS

Having manufactured and installed thousands of e-coat rectifiers since the late 1960's, Controlled Power Company remains the leader into the 21st century. Automobile and truck cabs, tractors, major appliances, small metal parts and components ... all have been e-coated using a Controlled Power rectifier. In addition to a quality product, our staff of experienced design and application engineers is one of the very best reasons to choose a Controlled Power e-coat rectifier. Our expertise extends into software and PLC programming, which offers a significant benefit to the OEM and end user.

The **"Series 50" Rectifier's" e-coat specific** optional features and benefits are as follows:

DC Transfer Switch

Available either directly attached to the rectifier or in a separate enclosure, this transfer switch is used in applications which have both a primary and a backup rectifier. The 2-pole, double-throw design allows the user to easily transfer the DC power from one rectifier to another, without disconnecting any wires or modifying the system; thus saving downtime. When the transfer switch is in the "Off" position, the rectifier can be locked-out for safety

purposes. An optional Kirk key can be integrated to interlock the switch with the e-coat tank doors to ensure that DC power never reaches the e-coat tank when the doors are open. owntime. When the transfer switch is in the “Off” position, the rectifier can be locked-out for safety purposes. An optional Kirk key can be integrated to interlock the switch with the e-coat tank doors to ensure that DC power never reaches the e-coat tank when the doors are open.

Adjustable Voltage / Current Ramping

Ramping or “Sloping” the DC output at a user-adjustable time rate to control the application of paint and prevent imperfections. In addition, this option relieves surge current stresses on the rectifier and prevents premature current limits from being reached.

Command Two-Level Control / Holding Voltage

Provides two (2) standard voltage levels at which the rectifier will operate. When a customer-provided contact closes, the DC will fall to a low holding voltage. When the contact returns to its open state, the DC will rise to the maximum voltage setting. This feature is beneficial for continuous conveyor and batch type systems to prevent / reduce rework in the event of an unplanned line stop.

Automatic Average Current Density (AACD)

In both continuous conveyor and batch e-coat processes, larger parts require more voltage to achieve proper paint thickness and smaller parts require less voltage. The AACD is a PLC-based, rectifier controller that automatically adjusts the output voltage of the rectifier, based on the size of the parts that are in the e-coat tank. Whether integrated into the “Series 50” Rectifier or installed externally, the AACD reduces paint film deviations, reduces part rejections, and achieves paint cost savings.

Ripple Meter

An integral or remote digital meter which measures and displays the percentage of AC output ripple. This meter can be programmed to sound an alarm when the ripple voltage exceeds 5%, and also includes a DC voltage meter. DC voltage levels above or below the prescribed voltage can be monitored. The main benefit is to determine the “rectifier health” and annunciate an alarm that the e-coat process may be compromised.

Amp-Hour Meter

Digital meter that counts the number of DC amp-hours pertaining to energy management and/or paint consumption.

Amp-Hour Meter With 2-Pump Control And Optional Stroke Feedback Counter

Digital amp-hour meter with 2-pump control for ecoat systems with a 2-part paint feed. Automatically turns on paste and resin pumps, based upon the number of amp-hours or amp-minutes elapsed. Also programmable to turn on the pumps for a set number of strokes, per pre-programmed parameters as well as mixing ratios. Optional ability to receive confirming pump signals to verify that the stroke took place.

AnodeMON™ — Anode Cell Current Monitoring And Distribution

PLC-based, anode cell current monitoring and power distribution system. Anode current and anode life data can be monitored and recorded from an HMI screen, and/or downloaded to a USB flash drive for further analysis. Certain AnodeMON configurations feature anode power distribution with fusing, fuseblown indication, and blocking diodes for protection. Consult factory for additional product information.

Enhanced Monitoring Package

The enhanced monitoring package includes LED lamp indicators for Overload and SCR Fuse Blown, which are mounted to the front door of the rectifier. If a PLC is integrated into the rectifier, the indication will be displayed on the HMI screen as well. Both of these indicators can greatly assist maintenance personnel in operational, troubleshooting, or maintenance issues with the rectifier.

Job Design Specific Options

Controlled Power has a variety of cabinet, controls, wiring, and safety options available to suit specific customer requirements. Contact factory for details.

Model 506 6-pulse system for automotive e-coat.

SPECIFICATIONS

Controlled Power Company **"Series 50" Rectifiers"** include two (2) distinct product models: **Model 506** and **Model 5012**.

Model 506

The **Model 506** is a 6-pulse, secondary thyristor rectifier used in e-coating and other metal finishing applications that require DC power > 100VDC.

Available in output voltages ranging from 100VDC to 1000VDC, and in current ratings ranging from 100A to 5000A, the **Model 506** incorporates a single transformer design, with thyristor semiconductors for rectification and regulation of DC power. In e-coating and other metal finishing applications where low ripple is required, the **Model 506** incorporates an L/C ripple filter to smooth the pulsating DC and to effectively reduce the AC RMS voltage ripple.

Model 5012

The **Model 5012** is a 12-pulse, secondary thyristor rectifier used in "low ripple, high current" e-coating and other metal finishing applications. Available with or without ripple filtering, the **Model 5012** brings the output percent ripple to < 1% with filtering. The **Model 5012** offers a significant advantage over the **Model 506**, in that it reduces input current harmonics, and delivers a smoother DC output. In large e-coating applications where the voltage is > 300V and the current is >1500A, the **Model 5012** is often the best solution.

Performance Specifications

- Input Voltage: Standard 208 V, 480V, or 600V; 3 phase. (Other voltages available. Consult factory.)
- Input Line Variation: ± 5% from nominal. (Optional wider ranges available. Consult factory.)

- Frequency: 60 Hz. Optional 50 Hz.
- Efficiency: 95% typical, size dependent.
- Power Factor: 90% typical at full output.
- % AC Output Ripple: **Model 506** — 5% (full voltage and current).

  Optional filter provides 5% when operating within 25% to 100% of full voltage and current.

  Model 5012 — 3% (full voltage and current). Optional filter provides 1% when operating within 25% to 100% of full voltage and current.
- Reliability: 65,000+ hours MTBF
- Voltage Regulation: ± 0.5%
- Current Regulation: ± 0.5%
- Ambient Temperature: 0º C (32º F) to 40º C (104º F) maximum, 50º C optional.
- Humidity: 95% non-condensing.
- Elevation: Maximum elevation 1524 meters (5000 feet) without de-rating.
- Storage: -20º C (-4º F) to 50º C (122º F).

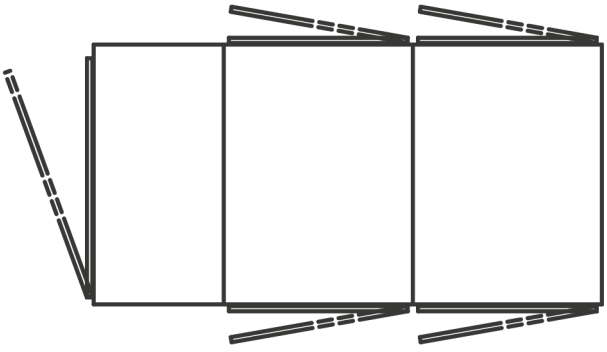
MODEL 506 CABINET DIMENSIONS

Consult factory for the dimensions and cabinet outlines of the higher-current Model 506, water cooled models, the 12-pulse Model 5012, and 1000 VDC power supplies.

MODEL 506 CABINET DIMENSIONS (400V air cooled models shown below)			
Standard DC Voltages: 100 – 600			
DC Output Current	Cabinet Number	Weights	Dimensions In Inches And Centimeters ––– W x D x H
100A	4W	1750 lbs (794 kg)	39" x 48" x 60" (99 cm x 122 cm x 153 cm)
200A	4W	1850 lbs (839 kg)	39" x 48" x 60" (99 cm x 122 cm x 153 cm)
300A	4W	2000 lbs (907 kg)	39" x 48" x 60" (99 cm x 122 cm x 153 cm)
400A	8W	2800 lbs (1270 kg)	39" x 78" x 60" (99 cm x 198 cm x 153 cm)
500A	8W	3100 lbs (1406 kg)	39" x 78" x 60" (99 cm x 198 cm x 153 cm)
600A	8W	3400 lbs (1542 kg)	39" x 78" x 60" (99 cm x 198 cm x 153 cm)
700A	8W	3800 lbs (1723 kg)	39" x 78" x 60" (99 cm x 198 cm x 153 cm)
800A	8W	4400 lbs (1996 kg)	39" x 78" x 60" (99 cm x 198 cm x 153 cm)
900A	8W	4600 lbs (2087 kg)	39" x 78" x 60" (99 cm x 198 cm x 153 cm)
1000A	8W	4800 lbs (2177 kg)	39" x 78" x 60" (99 cm x 198 cm x 153 cm)
1100A	8W	5000 lbs (2268 kg)	39" x 78" x 60" (99 cm x 198 cm x 153 cm)

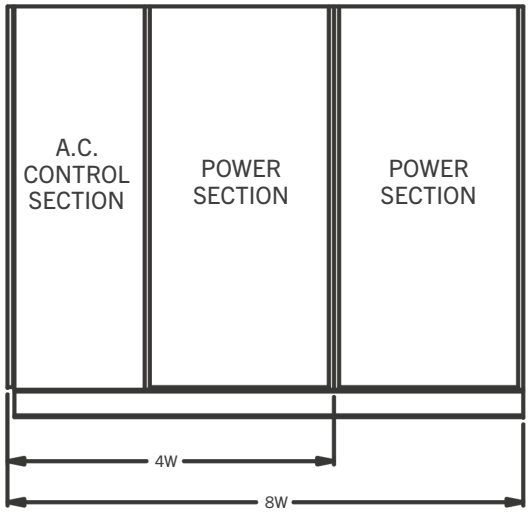
Note: Consult factory for dimensions and weights of sizes not listed above.

CABINET OUTLINES



Top View

Front View



Warranty: Controlled Power Company guarantees the unit to be free from defects in material and workmanship for a period of (1) year following shipment from the factory. Consult factory for details.

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