# AACD

## Automatic Average Current Density

Automatic rectifier voltage controller and paint usage optimization device for e-coat systems.

Benefits:

- Narrows paint film deviation between various sized parts
- Reduces / eliminates undercoating
- If overcoating — reduces paint and energy consumption


**Shown with optional 7″ display.**

TRYSTAR®

## Experience, Quality, And Field Reliability

Trystar engineers and manufactures the industry's highest quality **industrial DC power supplies (rectifiers)** and complementary rectifier monitoring and control products, capitalizing on many years of expertise. This quality is reflected in the design, material, workmanship, and operating performance of each product we build. The result is a rugged, reliable rectifier and/or control system that will stand up to the rigors of 24x7 operation, even in harsh industrial environments.

The durability and performance of each of our rectifiers and control products, maximize end-user productivity and minimize downtime. If / when field service is necessary, Trystar will provide available parts and service for the life of each product we manufacture, which is often 20+ years!

Trystar is ISO 9001:2008 certified, assuring quality and customer satisfaction — from quoting, throughout the design, manufacturing, delivery, system startup, and beyond!

## What Is Automatic Voltage Control ... And Why Is It Important?

All electro-deposition processes have a current density profile established as a guideline for power requirements, in order to achieve the level of deposit (coverage) on a metal substrate. The current density value for the electrocoating process is generally **2.5 amperes per square foot (ASF**), based on such variable factors as paint chemistry, bath temperature, and immersion time. The goal is to consistently meet the current density value of 2.5 ASF, regardless of the variables mentioned above. However, the greatest dynamic that alters the "ASF rule-of-thumb" is the difference in the size of the parts being coated. Naturally, the larger parts have a higher ASF, and the smaller parts have a lower ASF. Since the electrocoating process is driven by constant voltage control, the only way to average the ASF value is to automatically increase the voltage when coating the larger parts, and decrease the voltage when coating the smaller parts. Thus the term **"Automatic Average Current Density" (AACD).**

In an e-coat process, it's essential to keep the film thickness within specifications, while optimizing paint and energy usage. E-coat operations running parts which are very close in physical size, can rely on consistent paint film coverage with a single voltage setting at all times. However, many e-coat operations involve a wide variety of part sizes and shapes, which typically require voltage changes to meet customers' coating requirements. Irregularly shaped parts tend to be the most difficult challenge in obtaining uniform coating thickness. Different sized parts are easier to manage — simply requiring lower voltage on smaller parts, and higher voltage on larger parts in order to meet the 2.5 ASF current density "rule of thumb". Having an automatic system to provide dynamic voltage adjustments to match the dynamic part sizes, results in tighter film tolerances.

## Common E-Coat Problems

### Due To Lack Of Automatic Voltage Control

In many e-coat systems, quality issues and paint waste become major problems which lead to unnecessary operating costs and lost profit. Failure to control the rectifier voltage leads to less-than-optimal current density values ... consequently causing:

- **Insufficient Coating** (poor quality)
- **Rework Costs** (paint / labor waste)
- **Overcoating** (paint waste)
- **Unnecessary Labor Costs** (labor waste — manually adjusting voltage for different parts)
- **Unnecessary Energy Consumption** (energy waste — higher voltage results in greater power consumption)
- **Scrapping Parts** (materials waste)

### Inherent To Conveyor And Batch Processes

Both conveyor and batch e-coat processes often have paint waste and film build inconsistencies.

In a continuous conveyor process, the rectifier voltage is often set to a fixed level to ensure proper film thickness on the largest group of parts. When smaller parts enter the tank, they are often painted at the same voltage level thus receiving too much paint.

Similarly, in a batch process, the rectifer voltage is set to a fixed level to ensure the target film thickness on the parts with the largest surface area. Sometimes the hoist operator manually adjusts the voltage or increases the dwell time for the smaller parts.

Both processes can result in wasted energy, paint, materials, and labor (additional costs to manually adjust the voltage). In addition, automatic voltage control eliminates the possibility of human error.

In all of these situations, these common e-coat problems can be easily corrected by installing a rectifier with **AACD** ... or by retrofitting the **AACD** to an existing rectifier.

## AACD (Automatic Average Current Density)

The **AACD** is an automatic rectifier voltage controller, which adjusts the rectifier voltage (based upon tank current) in order to maintain optimal current density levels of the substrates' various surface areas. Since different sized parts require different power levels to ensure proper paint film thickness, **the AACD automatically adjusts the output voltage to ensure that the larger parts receive more power and the smaller parts receive less power.** By bringing uniform paint thickness to e-coat processes in which groups of various sized parts enter the tank at different times, the **AACD** eliminates or greatly reduces inconsistent paint film thickness, part rejection, excess paint and energy usage, as well as the potential for human error in the e-coat process. **In most applications, a properly calibrated AACD system can bring parts to within .1 mil (.0001) of targeted film thickness.**

### AACD Product Snapshot

- Multiple recipe control (see Page 4)
- Reduces paint consumption *
- Reduces / eliminates undercoating
- Narrows paint film deviation between various sized parts
- Compatible with both conveyor and batch processes
- Reduces energy consumption *
- Compatible with almost any e-coat rectifier
- Fast ROI
- Digital monitoring of rectifier
- Optional bath temperature voltage compensation
- Voltage and current trending
- Multi-zone compatible
- Multiple PLC platforms available
- Optional multi-coating thickness capability
- Compatible with various substrates.

* For existing e-coat operations that are overcoating.

### AACD Product Design & Flexibility

A user-configurable front panel display allows the paint line operator to set the minimum and maximum voltage values for the parts, the voltage rate of change, and the bath temperature adjustments. Because the **AACD's** processes are all automatic, once the settings have been made, operator intervention is not required to make an adjustment every time different sized parts enter the tank. Such automated processes save the plant money in terms of time and resources ... greatly increasing ROI. Many of Trystar's **AACD** installations have paid for themselves within 1 - 6 months (process dependent).

The **AACD** has been designed with the flexibility of being implemented with and controlled by different manufacturers' PLC's, in order to complement the local standard.

### Retrofit To Any Rectifier:

The **AACD** can be retrofitted to any rectifier, as long as there is a method of electronic voltage adjustment. A standard **AACD** unit is contained in a NEMA2 cabinet, which can be wall-mounted near the rectifier, or attached to the rectifier cabinet itself. The **AACD** requires an external single phase power source, as well as signal wiring internal to the rectifier. The "HMI" (human-machine interface) for programming the **AACD** and monitoring the rectifier is a 4" (standard) or 7" color touchscreen (larger sizes also available).

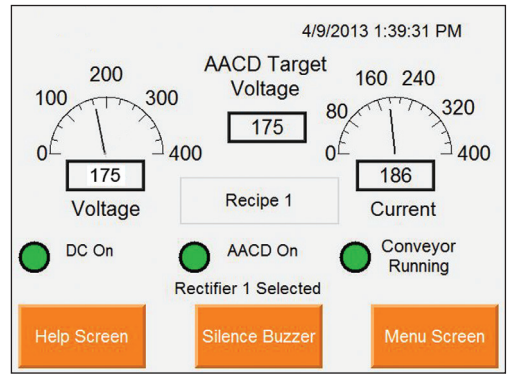
**Note:** The "HMI" might also be referred to as the "operator interface terminal" (OIT).

### Ordered With A New Trystar Rectifier:

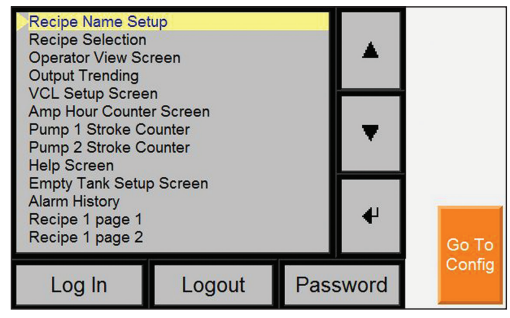
The **AACD** electronics and the "HMI" are physically integrated into the rectifier, thus eliminating the need for an external enclosure, external single phase power, and running external signal wires.

### Ease Of Programming And Operation

All programming of the **AACD** and monitoring of the rectifier is performed through the touchscreen "HMI". Below are (2) sample screens.




"Monitoring & Status" screen includes output voltage and current measurements, as well as verification that the target voltage is met.




"Main Menu" screen includes access to all operational data, programming, status, and alarm logs.

## AACD Features, Benefits, & Options

### Manual Override Capability

The **AACD's** controls can be activated / deactivated by a switch. If deactivated, the rectifier control is then set to manual mode using potentiometers.

### Optional Multiple Recipe Control

In facilities where different film thicknesses are required for various part runs, the **AACD** has an optional programmable "recipe control" feature. For example, in a continuous conveyor or batch process, 10 racks of parts need to be painted with a 1 mil film thickness ... immediately followed by 5 racks of parts which need to be painted with a .8 mil film thickness. Either by digital or analog input, or through the "HMI", the **AACD** automatically adjusts the voltage to accommodate the different mil requirements. The result is a seamless production run without any downtime or quality issues related to e-coating and/or paint film thickness! The **AACD** can be programmed with as many different recipes as required.

### Various Substrates

In many e-coat systems, parts of various substrates such as steel, galvanized, or aluminum may need to be painted on the same line. Since each substrate has different conductive properties, the voltage required to apply the target film build varies. By using the multiple recipe option on the **AACD**, the user can program the **AACD** to apply paint to different metals and maintain their required film thickness with little or no human intervention.

### Optional Multiple Zone Control

In a multiple zone system, the **AACD** can be configured to control two or more rectifiers with true multiple zone control or single zone treatment.

### Optional Amp-Hour / Coulomb Counter

The **AACD** can be programmed with an optional, resettable amp-hour or coulomb (amp-second) counter.

### Optional Amp-Hour / Coulomb Counter with Pump Control For Up To (2) Pumps

The **AACD** features an optional, programmable amp-hour or coulomb (amp-second) counter with controls for up to two (2) pumps with stroke feedback for controlling the mixing ratio of resins and solids.

### Optional Standby Rectifier Control

The **AACD** can be easily configured to seamlessly control a standby rectifier when it is brought online.

### Optional Automatic Override

As part of its failsafe design, the **AACD** can be configured to automatically relinquish control of the rectifier, and switch to manuals controls in the event of malfunction or output out-of-tolerance error.

### Optional Under- / Over-Voltage Monitor

If the output DC voltage of the rectifier falls below or exceeds a preset voltage setting, the rectifier can be shutdown to prevent any potential problems in the paint process.

### Optional Bath Temperature Compensation

With an end-user supplied temperature sensor located in the tank, the AACD adjusts the output voltage of the rectifier to compensate for the bath being either too cold or too hot. This option negates the need for a "bath warmup".

## Case Study

A wheel manufacturer contacted Trystar about their paint film variances. The necessary loading patterns of two different wheel diameters prevented the paint line operators from making manual voltage adjustments to help minimize the fluctuation. The manufacturer wanted their film thickness to be at 1.0 mil. Trystar consulted with the wheel manufacturer, and we proposed retrofitting our **AACD** to their rectifier.

Before the installation of the **AACD**, this manufacturer was experiencing paint film deviations from 1.05 - 1.345 mils, which was eating into their bottom-line with the unnecessary cost of wasted paint. After the **AACD** was installed, their paint film variations were reduced to 1.0 - 1.13 mils.

By reducing the wheel manufacturer's paint film thickness by over 0.215 mils, their annual cost savings in paint usage alone has been about $150,000 — resulting in a very satisfied customer!

## ROI

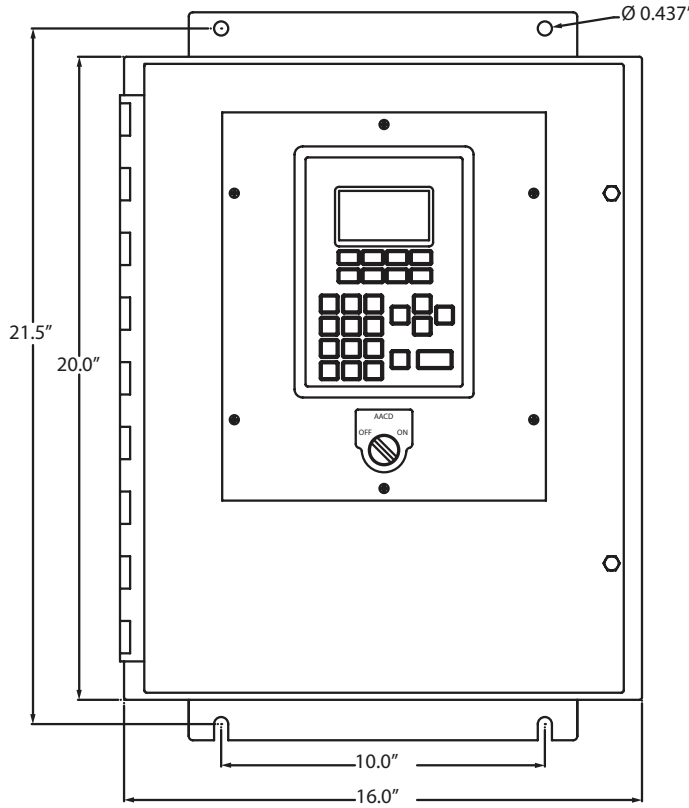
Historically, e-coat facilities that have used the **AACD** usually begin to see a return on investment (ROI) within 1 - 6 months (part type, part size, and loading pattern dependent). The ROI typially takes the form of cost savings as a result of:

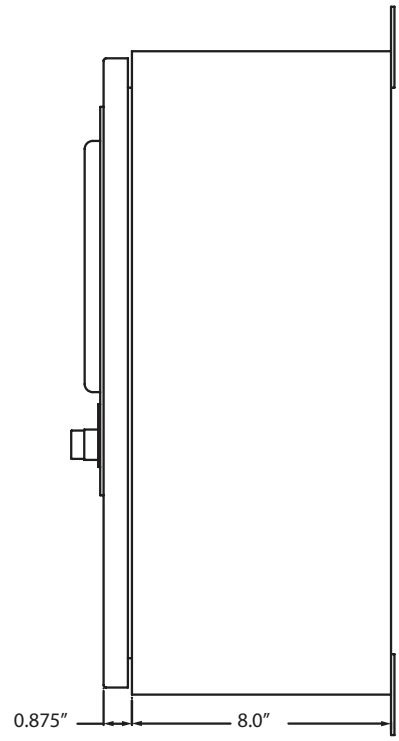
- less paint waste
- fewer rework costs
- reduced energy usage
- reduced labor costs

The "unspent money" from these cost savings, significantly increases profitability of the e-coat process and enhances the company's bottom line.

# CABINET DIMENSIONS

## Product Dimensions & Basic Installation Drawings



# ADDITIONAL E-COAT PRODUCTS

Having manufactured and installed thousands of e-coat rectifiers since the late 1960's, Trystar 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.

## Series 50 Rectifier

The **"Series 50" Rectifier** reflects a single transformer, secondary thyristor design, and is the preferred choice for electrocoating and other metal finishing applications which require a single rectifier rated at or above 100V and 500A DC.

The **"Series 50" Rectifier** is available in both 6- and 12-pulse standard models: the **Model 506** and the **Model 5012**, respectively. With either model, the rectifier controls are customized to fit various applications. A selection of manual controls are available to fit specific e-coat and other metal finishing processes. In addition, digital control and monitoring options are available via an internal or external PLC.

Offered in air-cooled models up to 1100A and water-cooled models up to 5000A, the **"Series 50" Rectifier** is designed to provide optimum, reliable performance in harsh industrial environments.

## Series 70 AutoCoat Modular Anode Control Rectifier

The **"Series 70 AutoCoat" Modular Anode Control Rectifier** is rated at 400V - 450V and 200A or 400A DC, and is specifically designed for automotive and general e-coat systems which require greater control of the painting process.

Historically, 90-95% of e-coat lines have used a "zone system" (typically 2-3 zones), in which parts being coated are exposed to 2 or more voltage levels in the tank ... and each zone requires a separate rectifier.

In comparison, the **MAC** system brings the multi-zone concept to a new level. Now instead of having 2 - 3 zones, there are 10 or more zones. This approach provides the flexibility to control the voltage at every 2 - 4 anodes, which provides greater control over the application of paint.

The **"Series 70 AutoCoat"** is available in both 6- and 12-pulse standard models: the **Model 706** and the **Model 7012**, respectively.

Contact us and/or consult our website for additional details about these and other Trystar **industrial DC power supplies (rectifiers)**.

**Warranty:** Trystar guarantees the unit to be free from defects in material and workmanship for a period of (1) year following shipment from the factory.

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