Spang Power Electronics

DIGI-COAT™ SERIES
Electrocoating Rectifiers

Spang Power Electronics offers the best electrocoating rectifier technology. The Digi-Coat™ rectifier is the latest in a line of microprocessor based power control systems introduced by Spang. This technology offers the flexibility of larger scale PLC based units with the economy and reliability of standard off-the-shelf rectifier designs.

The Digi-Coat™ Rectifier is a stand alone, factory assembled and tested power conversion package engineered to delivery precisely regulated, low ripple DC power to meet the demands of industrial electrocoating paint processes.

TECHNOLOGY FEATURES:

- **Network Connectivity**
- **Customer Configurable – Easy to Modify**
- **Fuseless Rectifier Protection**
- **Easily Accessible Process Data**

PRECISE PROCESS CONTROL

INFINITELY ADJUSTABLE OUTPUT

DC voltage is steplessly adjustable from zero to the maximum output. For continuous operation at voltages below rated output, full current transformer taps are provided as standard equipment to allow selection of the range for maximum efficiency, optimal power factor and minimum ripple.

PRECISE VOLTAGE REGULATION

The Digi-Coat™ maintains constant output voltage to insure uniform coating thickness and prevent blow-through or rupture of the paint film. The digital microprocessor control instantly stabilizes the voltage output to within 1% accuracy of the setpoint against variations in the load or AC input power fluctuations.

DUAL VOLTAGE SETPOINT

Contacts provided with the rectifier for interlocks prevents paint from washing off workpieces left suspended in the tank in the event a conveyor or hoist shuts down during production. This interlock automatically reduces output voltage to a programmable “hold” level that retains deposited film without increasing the thickness during a halt in production. A programmable ramp rate between “hold” and “paint” voltages smoothes this transition during these starts and halts in production.

RELIABLE DESIGN

ELECTRONIC OVERCURRENT PROTECTION

As workpieces enter the tank, resistance is extremely low and current draw can exceed the capacity of the rectifier interconnecting wiring, power bus and parts connectors. Electronic current limit prevents peak currents from rising above a programmable level, protecting these components from normal overlaod conditions without the need for costly oversizing.

FUSELESS SHORT CIRCUIT PROTECTION

The Digi-Coat™ microprocessor based overcurrent shutdown feature provides protection from load faults without the needless downtime required to replace expensive blown fuses. The circuit interrupts power within 8.33 milliseconds of an accidental momentary contact of the workpiece and the tank. The control automatically resets for continued operation. If the fault remains after a programmable number of retrys, the input circuit breaker automatically trips.

COMPLETE LINE ISOLATION

The Digi-Coat™ design places SCR regulation on the transformer secondary. This helps impede the passage of harmonics and RFI from the SCR switching directly back to the plant line. This also dampens the effect of AC line transients on power supply regulation.

APPLICATION FLEXIBILITY

EXPANDABILITY

As electrocoat needs change, the Digi-Coat™ rectifier system can be expanded to meet this increased capacity requirement. The modular design simplifies paralleling additional units. The optional dual-loop regulator assures current sharing between rectifiers while maintaining tank voltage regulation.

ADAPTABILITY

Isolated outputs allow the Digi-Coat™to be used in either anodic or cathodic systems by simply changing connections.

LOCAL DIGITAL CONTROL INTERFACE

The Digi-Coat™ is shipped standard with a local digital control (LDC). The LDC provides for local operator input of control setpoints and a display of critical rectifier parameters during setup and operation.

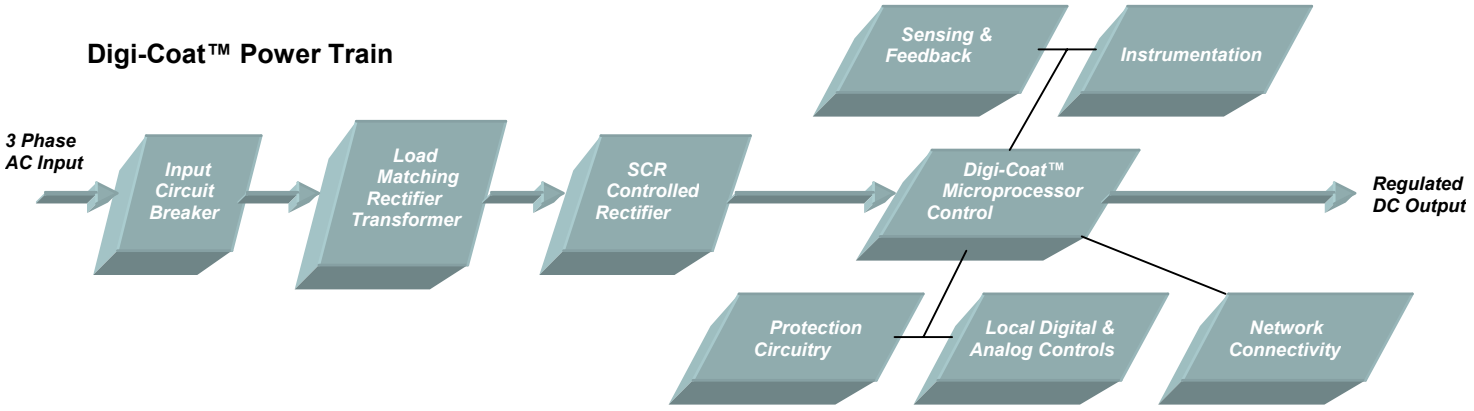
PERFORMANCE SPECIFICATIONS

VOLTAGE REGULATION ACCURACY: **1% FS**

POWER FACTOR * (@ 75-100% Output)	**75-95%**
RIPPLE *	
With L-C Filter	2.5 - 4%
Without L-C Filter	4.5 – 27%

*** Over Entire Operating Range**

Digi-Coat™ Power Train

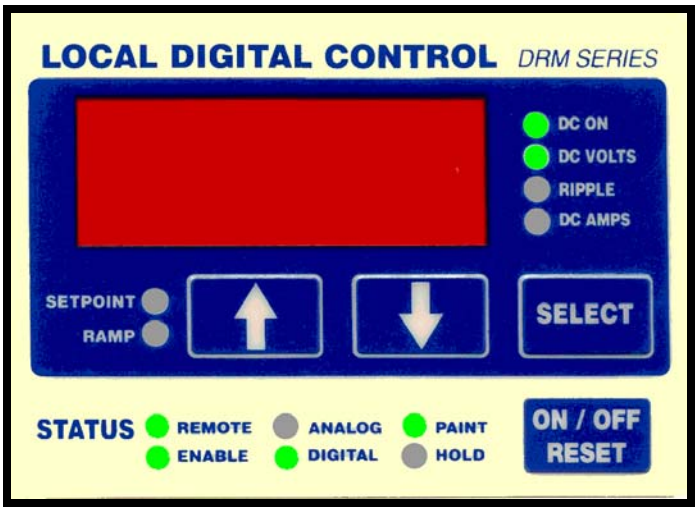


STANDARD EQUIPMENT FEATURES

Each Digi-Coat™ is a complete power supply, factory assembled and tested to provide easy installation and flawless start-up. Spang Power Electronics designs all critical components which have been tested through years of in-use service. This reliability in transformers, chokes, regulators and controls assures quality, compatibility as well as years of trouble free operation. Critical control components are housed in a side mounted NEMA 12 compartment for added protection and reliability.

Digi-Coat™ POWERTRAIN

- **Input molded circuit breaker** with thermal and magnetic trips and a shunt trip coil for emergency shutdown control strategy
- **Spang rectifier designed transformer** with isolated primary and secondary windings and load matching taps. Furnished with a conservative 130°C rise, 220°C Class H insulation. Robust, dry-type design manufactured from high quality materials for long service life and high efficiency.
- **Digi-Coat™ six SCR controlled rectifier** uses digital microprocessor control to provide voltage, power or current regulation with a full compliment of system configuration settings, programmable by the User. Programmable current limit and microprocessor controlled over current shutdown eliminate semi-conductor fusing while protecting the rectifier and the tank. High PRV SCRs are equipped with voltage surge and transient suppression for optimum reliability.
- **Instrumentation and controls** on the Digi-Coat™ include a full compliment of standard functions described in the specifications section of this brochure. The integrally mounted Local Digital Control (LDC) is used to display critical parameters, illustrated below. The microprocessor architecture makes over 70 parameters available for network viewing, in addition to the control of voltage, current and power. Paint voltage, hold voltage, ramps, limits, alarms, faults and system configurations are easily viewed using the free Windows™ based configuration tool connected to the Digi-Coat™ through a convenient serial communications port. Optional components can be added to enhance the functionality and reliability of the entire system.
- **Dual voltage setpoints** provide settings for PAINT voltage levels during regular operation and a HOLD voltage level upon conveyor or hoist shutdown. Either network, local digital or analog inputs can be used to control the setpoints and operation. Programmable ramps can be inserted between voltage setpoints to smooth the transitions during operation.
- **Adjustable ramps** between PAINT and HOLD voltages, and start-up are programmable from 0-360 seconds to optimize parts introduction to the tank to insure paint quality.
- **Input power** for the Digi-Coat™ series rectifiers is three phase, AC input and standard at 480 volts. Other voltage inputs from 120 volt to 23 kV can be specified.
- **Output voltages** from the Digi-Coat™ rectifier series are available standard at 400VDC. All input transformers are designed to include full current rated taps at 80%, 64% and 50% of rated voltage. These taps allow selection of the operating range which best optimizes efficiency, power factor and ripple.
- **Output currents** are standard at 150A through 1200A in stepped increments detailed in the specification section of this brochure



Digi-Coat™ LOCAL DIGITAL CONTROL

Parameter Display:

Selectable – One on display

- DC ON
- DC Voltage
- RMS Ripple Voltage
- DC Current
- Paint Voltage Set Point (Pxxx on display)
- Hold Voltage Set Point (Hxxx on display)
- Current Set Point
- Ramp Set Point
- Fault & Alarm Codes

O = Status Lights

☐ = Push Button

Digi-Coat™ Control Functions

Control Functions

Selectable DC Regulation Modes:	Voltage (Digi-Coat™ standard) Current Open Loop
Configurable PID loops:	Voltage Current
Selectable DC limits:	Voltage Current
Adjustable Set point Ramps:	Ramp up to "Paint" voltage 0-360 seconds settable Immediate drop to "Hold" voltage
Imbedded Amp-hour Indication: (Accessed w/configuration tool or network)	Amp-hour Preset setting (Read/Write) Resettable Amp-hour setting (Read) Total Amp-hour setting (Read) Amp-hour Preset bit output (Momentary for one second when Resettable Amp-hour reaches Amp-hour preset setting)

Analog/Digital Interface

Hardware:	*Analog Inputs: 0-5VDC 4-20mADC Potentiometer	Hold voltage Paint voltage
	*Transducer Outputs: 0-5VDC 4-20mADC	Two (2) configurable for DC voltage, current of other User specified parameters
	*Common (-) and GND reference	
	External Digital Fault Inputs: (Dry-contact type)	Transformer over temperature Inductor over temperature Power Control Unit over temperature Fault Reset One (1) input for Customer use
	External Dry Contact Inputs:	DC ON = Closed / OFF = Open Holding Voltage Enable Open= painting voltage Closed= hold voltage (Overrides Paint Voltage Set point)
	Local/Remote Control:	Local=analog In or Local DigitalControl Remote=Network
	Dry Contact Status Indications: - 1NO/1NC - Rated Resitive: 125VAC/ 0.3AAC 30VDC/ 1 ADC - Rated Inductive: 125VAC/ 0.2AAC 30VDC/ 0.5ADC	DC ON/OFF (w/External Relay) Rectifier Alarm/Fault

Monitoring Functions

Parameters Monitored:	Transformer secondary: Phase-to phase line voltage Phase current AC Frequency Power (kVA, kW, power factor) DC voltage & current RMS ripple voltage (at output capacitor)
Faults Monitored: (Shutdowns requiring reset) Logged in fault buffer	Transformer secondary: Current input high(OC shutdown) Voltage input (HI and LO) Phase loss Over Temperature: Transformer Inductor Power Control Unit Customer defined external fault inputs (1) Configuration Fault Watchdog Fault Network Fault (Communication loss)
Alarms: (Indicate only–no shutdown) Logged in fault buffer	Frequency Charged capacitor bank (above 50 VDC) High RMS Ripple voltage Transformer secondary voltage low DC Voltage limit DC Current limit AC current limit Network alarm Transformer voltage imbalance (Ph to Ph) Failure to reach set point: Ramp complete Actual DC 15 VDC below set point

Network Connectivity

Local Serial Connection:	RS232 Port w/ Windows based Configuration Tool included
Networking Options:	DeviceNet™ Slave Profibus DP Modbus Ethernet TCP Protocol

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