

Application Note

DECS-150 Offers Simple Upgrade Solution to SRA Voltage Regulator

Basler Electric’s SR4A and SR8A voltage regulators were manufactured for many years and are in service in thousands of facilities around the world. For nearly 50 years, SRA voltage regulators have provided reliable voltage regulation for generators in many applications.

SRA regulators (Figure 1) are single-function devices that regulate generator output voltage with 0.5% accuracy. Other functions such as excitation limiting, remote control, and constant var or power factor regulation were provided by separate products. Examples of these products include the Basler EL 200 for underexcitation and overexcitation limiting, SCP 250 for constant var or power factor regulation, UFOV 260 for volts per hertz limiting, and MOC motor-operated potentiometer for remote control.



Figure 1. Basler SR4A Voltage Regulator

Significant performance and functionality benefits can be realized by upgrading from an aging SRA voltage regulator and its accessory modules to an integrated DECS-150 Digital Excitation Control System.

DECS-150 Full-Function Excitation System

Basler Electric offers a new digitally-controlled voltage regulator system designed to provide years of reliable service in these applications. The DECS-150 (Figure 2) can replace the SRA voltage regulator while upgrading generator performance.

The DECS-150 replaces the multiple black box approach to building a control system with a single device that regulates voltage, provides V/Hz limiting, excitation limiters, and generator protection. The DECS-150 integrates complete flexibility with programmable elements and logic to adapt to any system need.



Figure 2. Basler DECS-150 Digital Excitation Control System

For brushless machines, the DECS-150 detects failed power semiconductors in the diode ring and provides an alarm. Oscillography and sequence-of-events recording logs the behavior of the generator and excitation system during abnormal system events. Table 1 compares the features of the digital DECS-150 with the features of the analog SRA voltage regulator.

Table 1. DECS-150 and SRA Voltage Regulator Comparison

DECS-150 Features and Functions	SRA Features and Functions
0.25% voltage regulation accuracy 0.5% accuracy up to 40% Total Harmonic Distortion (THD) (harmonics associated with six thyristor load)	0.5% Voltage Regulation – Single Function SRA
63 Vdc and 125 Vdc @ 7 Adc pulse width-modulated (PWM) output. Capable of 10 Adc continuous field current output when system temperature is 55°C (131°F) or below	63 Vdc @ 7 Adc for SR4A and 125 Vdc @ 7 Adc for SR8A
Underfrequency or V/Hz limiting	Under Frequency (add UFOV 260)
Var/PF control	Var/PF Control (add SCP 250)
Overexcitation/Underexcitation and Stator current limiting functions	Overexcitation/Underexcitation Limiting (add EL 200)
Paralleling input from 1 A or 5 A CT secondary selectable by style chart	Paralleling input from 5 A CT Secondary
Integrated brushless exciter diode monitor	Brushless exciter diode monitor (add EDM-200)
Meets UL, CSA, CE	Meets CSA
Integrated manual control of field current	Manual control (add MVC 301 or MVC 108)
Power input from 50/60 Hz shunt connection or permanent magnet generator (PMG) operating at 50 to 500 Hz	50/60 Hz power input
Nominal sensing inputs of 120, 240, 480, and 600 Vac	Nominal sensing inputs of 120, 240, 480, and 600 Vac
Integrated protection functions including Loss of Sensing and Transfer to Manual	Not available in SRA
LED annunciation of operating conditions	Not available in SRA
Setup via PC using BESTCOMSPi [®] software	Not available in SRA
Customizable logic in BESTlogic [™] Plus	Not available in SRA
Auto tuning feature with two PID stability groups	Not available in SRA
Optional power system stabilizer (PSS)	Not available in SRA
Voltage matching	Not available in SRA
IP54 rating when rear-mounted USB option is selected	Not available in SRA

DECS-150 Provides Improved Performance and Increased Functionality

Unlike SRA voltage regulators that required a separate manual control such as the Basler MVC 108, the DECS-150's built-in manual control is available to regulate the field current as a standby mode. Typically, the field current regulator mode is used for commissioning. However, in the event that a PT sensing fuse opens at the input to the voltage regulator, the integrated loss of voltage sensing function initiates an automatic transfer to manual control to maintain the pre-fault generator terminal voltage.

The DECS-150 field current regulator (manual controller) automatically tracks the active mode setpoint to ensure that transfer between non-active and active operating modes is "bumpless". Digital auto-tracking monitors the setpoint for voltage regulation, manual control, or var/ power factor control and eliminates the need for balance or transfer meters.

Prolonged underfrequency operation can cause excessive field heating and potential generator damage. The DECS-150 is equipped with underfrequency voltage compensation to prevent underfrequency damage and to aid engine recovery for turbocharged diesel gensets during large block load pickups.

Voltage response speed is optimized by PID control loop feedback to provide exceptional voltage control and responsiveness to dynamic changes in the generator system. In the past, tuning a PID controller was a time consuming and tedious task. However, the DECS-150 can do this automatically without the need for laborious user intervention.

Compared with the SRA family of regulators, the DECS-150 offers configurable and much faster voltage response (Figure 3). This improves relay coordination and quickly boosts voltage levels when large sags in the distribution system voltage occur due to system faults.

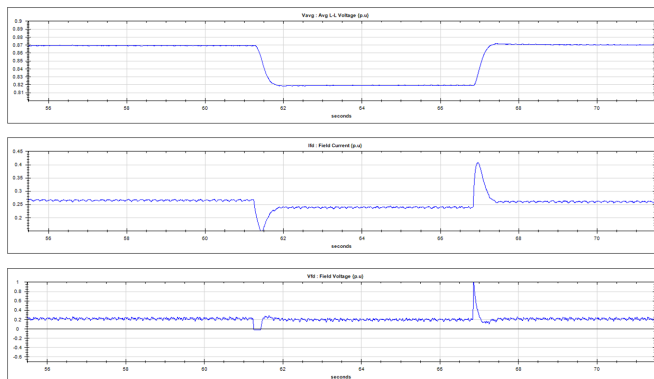


Figure 3. Plot of DECS-150 Voltage Response in BESTCOMSPUs®

While the SRA regulators could experience up to 20% voltage overshoot at startup, the DECS-150 avoids this by incorporating a voltage soft start feature (Figure 4) that predictably controls the buildup of generator voltage based upon the preprogrammed parameters.

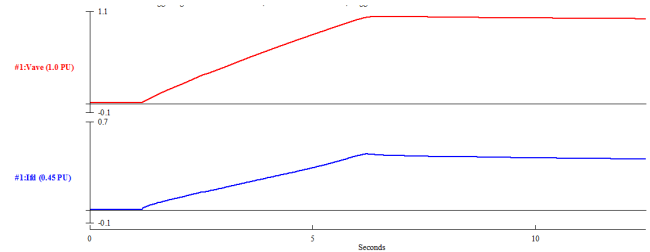


Figure 4. Plot of DECS-150 Soft Start Feature in BESTCOMSPUs

BESTCOMSPUs® Software

Yet another advantage of the DECS-150 is its included BESTCOMSPUs software. BESTCOMSPUs is a Windows®-based PC application that provides a point-and-click means to set and monitor the DECS-150. The capabilities of BESTCOMSPUs make the configuration of one or several DECS-150 controllers fast and efficient. The DECS-150 can be powered offline through its USB port and programmed using BESTCOMSPUs.

During programming, application parameters such as PT and CT ratios, the machine rating, and field voltage and current are entered. Examples of BESTCOMSPUs settings are shown in the overexcitation limiter settings screens of Figure 5 (summing point limiter) and Figure 6 (takeover style limiter).

Figure 5. Summing Point Overexcitation Limiter Settings Screen

The sample logic in BESTCOMSPlus® is easily modified to accommodate the requirements of the application. Examples of the DECS-150 default logic are shown in Figure 7.

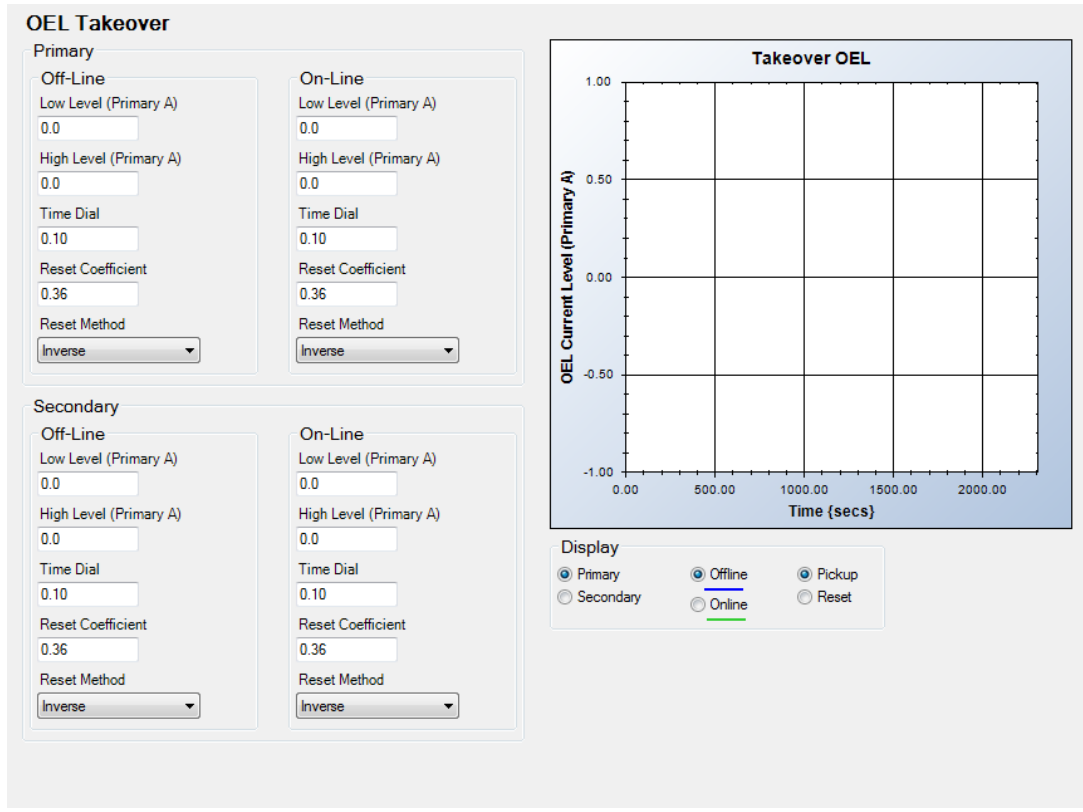
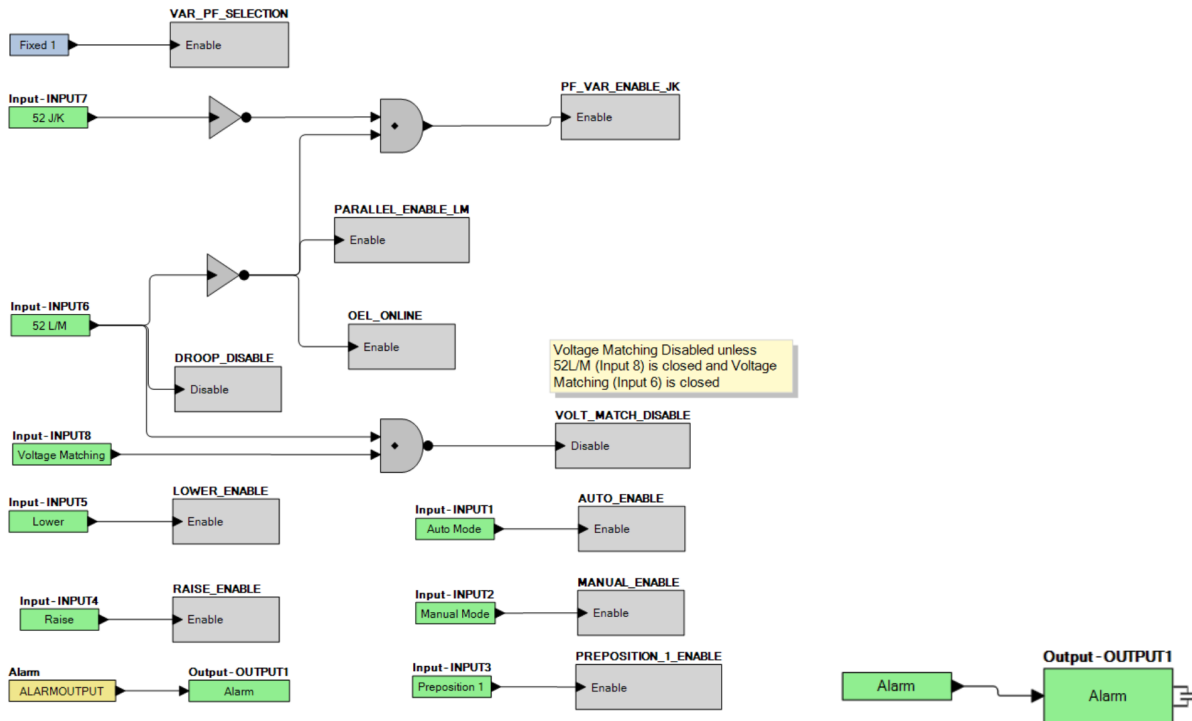


Figure 6. Takeover Style Overexcitation Limiter Settings Screen



Default Logic Tab 1

Default Physical Output Tab

Figure 7. DECS-150 Default Logic Examples

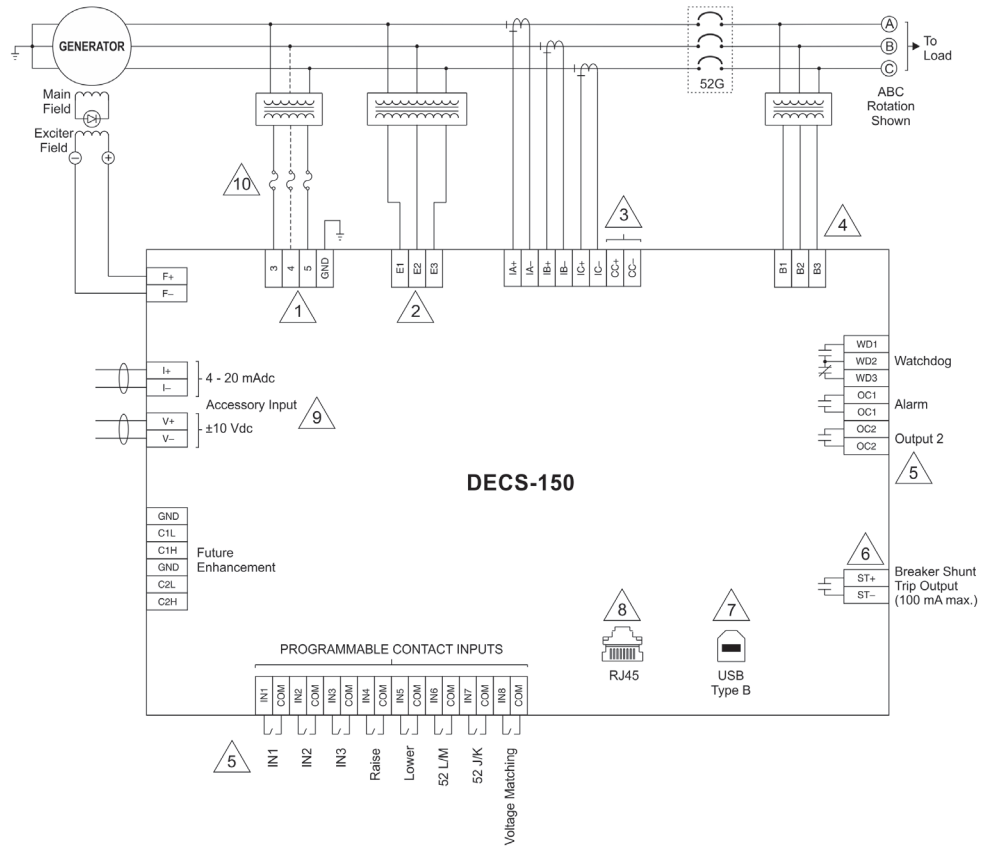
DECS-150 Interface and Connections

The DECS-150 interface consists of 11 status LEDs on the front panel. Depending on the DECS-150 style, a USB port is located on the front or rear panel.

DECS-150 connections for a typical shunt-powered application are illustrated in Figure 8. For operating power, the DECS-150 can utilize the same source used by the SRA. A separate control power source is not required for the DECS-150.

For more information

For more information on the DECS-150, download the product bulletin or instruction manual at www.basler.com. For assistance with product orders or questions, visit www.basler.com/support, contact your Application Engineer, or contact Technical Support at +1 618.654.2341.



Notes:

- 1 Operating (bridge) power input. For single-phase power, omit one phase connection.
- 2 Generator voltage sensing input. Potential transformer required if line voltage exceeds 600 Vac.
- 3 Cross-current compensation input, 1 Aac or 5 Aac.
- 4 Connections required only if voltage matching or sync-check functions are used.
- 5 Labels indicate the functions assigned by the default programmable logic to the contact inputs and output contacts.
- 6 The Breaker Shunt Trip Output provides a switch capable of 100 mA to operate an external circuit breaker.
- 7 Type B USB jack for temporary, local communication.
- 8 Ethernet communication port.
- 9 The accessory input accepts voltage or current.
- 10 Bussmann type KTK-15 or equivalent fuses recommended.

Figure 8. Typical DECS-150 Connections for Shunt-Powered Applications