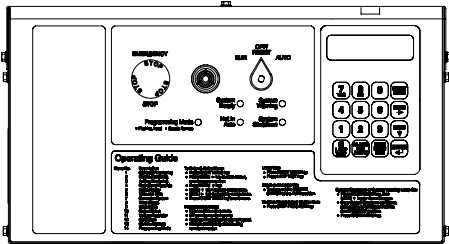


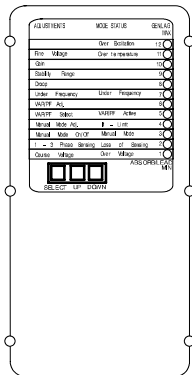
# Industrial Generator Set Accessories

# KOHLER POWER SYSTEMS

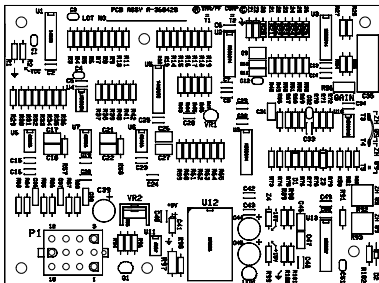
## 20-2800 kW Industrial Generator Set Voltage Regulators



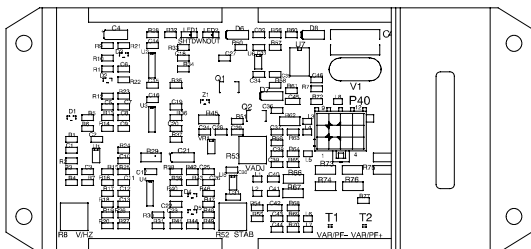
**550 Controller with Menu-Driven Integral Voltage Regulator**



**Digital DVR® 2000E Voltage Regulator**



**Fast-Response™ II PMG/RMS Voltage Regulator (RMS Voltage Regulator Circuit Board Shown)**



**Fast-Response™ III Voltage Regulator**

## Voltage Regulators

The following information provides general features, specifications, and functions of available voltage regulators.

This information generally applies to a single generator set and multiple generator sets with paralleling applications. Refer to the respective generator set specification sheet and see your authorized distributor for information regarding specific voltage regulator applications and availability.

### Integral Voltage Regulator with Kohler® Decision-Maker®550 Controller and Menu-Driven Selections (20-2800 kW Generator Set Models)

The voltage regulator is integral to the controller and uses microprocessor logic providing  $\pm 0.25\%$  no-load to full-load regulation using root-mean-square (RMS) voltage sensing.

The voltage regulator features three-phase sensing and is available for 12- or 24-volt engine electrical systems.

### Digital DVR® 2000E Voltage Regulator (350-2000 kW Generator Set Models)

The digital voltage regulator has  $\pm 0.25\%$  no-load to full-load regulation using RMS voltage sensing.

The voltage regulator features three-phase sensing and is available for 12- or 24-volt engine electrical systems.

### Fast Response™ II PMG with Average Voltage Sensing Voltage Regulator (20-300 kW Generator Set Models)

The solid-state voltage regulator has  $\pm 2\%$  no-load to full-load regulation using average voltage sensing.

The voltage regulator features single- or three-phase sensing options and is available for 12- or 24-volt engine electrical systems.

Available with optional  $\pm 1\%$  no-load to full-load regulation using average single-phase voltage sensing.

### Fast Response™ II PMG with RMS Sensing Voltage Regulator (20-300 kW Generator Set Models)

The solid-state voltage regulator has  $\pm 0.5\%$  no-load to full-load regulation using RMS voltage sensing.

The voltage regulator features single- or three-phase sensing options and is available for 12- or 24-volt engine electrical systems.

Not available on all models.

### Fast Response™ III with Average Voltage Sensing Voltage Regulator (20-300 kW Generator Set Models)

The solid-state voltage regulator has  $\pm 0.25\%$  no-load to full-load regulation using average voltage sensing.

The voltage regulator features single-phase sensing and is available for 12- or 24-volt engine electrical systems.

Available with the wound-field alternator only.

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## Specifications and Features

Specification/Feature	Voltage Regulator Type				
	Integral with 550 Controller	Digital DVR® 2000E	Fast Response™ II	Fast Response™ II w/RMS Sensing	Fast Response™ III
Generator Set Availability	20-2800 kW Models	350-2000 kW Models	20-300 kW Models	Selected 20-300 kW Models	20-400 kW Models
Type	Microprocessor based		Analog/Discrete		
Status and Shutdown Indicators	LEDs and Digital Display	LEDs	—	DC Power LED	Power + Shutdown LEDs
Operating Temperature	-40°C to 70°C (-40°F to 158°F)				
Storage Temperature	-40°C to 85°C (-40°F to 158°F)				
Humidity	5-95% Non-Condensing	MIL-STD-750, Method 711-1C Compliant	NA		5-95% Non-Condensing
Circuit Protection	Solid-State, Redundant Software and Fuses	5 Amp Fuse	15 Amp Fuse		10 Amp Fuse
Sensing, Nominal	100-240 Volts (L-N), 50-60 Hz	95-600 Volts (L-L), 25-420 Hz	190-277 Volts, (L-L), 50-60 Hz	100-160 Volts (L-N), 50-60 Hz	190-277 Volts, (L-L) 50-60 Hz
Sensing Mode	RMS, Single- or 3-Phase		Average, Single- or Three-Phase	RMS, Single- or 3-Phase	Average, 1-Phase
Input Requirements	8-36 VDC	180-240 VAC, 200-360 Hz (PMG)	8-32 VDC	9-18 or 18-36 VDC	8-36 VDC
Continuous Output	100 mA at 12 VDC	3 Amps at 75 VDC	100 mA at 2 VDC		4 Amps at 75 VDC
Maximum Output	100 mA at 12 VDC	7.5 Amps at 150 VDC (1 minute)	100 mA at 2 VDC		7.5 Amps at 150 VDC (1 minute)
Transition Frequency	50-70 Hz	40-70 Hz	50-70 Hz		
Exciter Field Resistance	NA	18-25 Ohms	NA		12.5 Ohms Min.
No-Load to Full-Load Voltage Regulation	±0.25%	±0.25%	±2% * Linear Loads	±0.5% Linear Loads	±0.25%
Thermal Drift	<0.5% (-40°C to 70°C range) [-40°F to 158°F]	Less than 0.5% for 40°C (104°F) Ambient Temperature Change (15°C to 70°C range) [59°F to 158°F]	<1.0% 40°C (104°F) Change (-40°C to 70°C range) [-40°F to 158°F]	<0.5% 40°C Change (-40°C to 70°C range) [-40°F to 158°F]	<1.0% 40°C Change (-40°C to 70°C range) [-40°F to 158°F]
Response Time	Less Than 5µS	Less Than 7µS			
Voltage Adjustment (of system voltage)	±10%		150-300 (low volt connection) 300-600 (high volt connection)		±10%
Voltage Adjustment	Controller Keypad	Pushbutton Switches	Potentiometer		
Remote Voltage Adjustment	Digital Input Standard/ Analog 0-5 VDC Input Optional	Remote-Mounted Digital or Analog Input Optional, 46 m (150 ft.) Max.	Remote-Mounted Potentiometer Optional	Remote-Mounted Potentiometer or Analog Input Optional	Remote-Mounted Potentiometer
Paralleling Capability	Reactive Droop Standard	Optional Reactive Droop Kit Required	Optional Reactive Droop Kit Required		
VAR/PF Control Input	Standard	Optional	—	Optional VAR/PF Control Kit Required	Standard

\* A ±1% (linear loads) voltage regulator with single-phase voltage sensing is available on selected models.  
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NA Data not available at time of print.

## Integral Voltage Regulator with 550 Controller

Calibration	Digital Display	Range Setting	Default Selection
Voltage Adjustment	Volt Adj.	±10% of System Voltage	System Voltage
Amplifier Gain	Regulator Gain Adj.	1-10000	100%
Underfrequency Unload or Frequency Setpoint	Frequency Setpoint	30 to 70 Hz	1 Hz Below System Frequency (ECM) 2 Hz Below System Frequency (non-ECM)
Underfrequency Unload Slope	Slope	0-10% of Rated Voltage (volts per cycle)	15 Volts per Cycle at 480 Volts (3.1%)
Reactive Droop	Voltage Droop	0-10% of System Voltage	4% of System Voltage
VAR Control	kVAR Adj.	0 to Rated kVAR Generating 0 to 35% of Rated kVAR Absorbing	0 kVAR
PF Adjust Control	PF Adj.	0.7 to 1.0 Leading, 0.6 To 1.0 Lagging	0.8 Lagging
VAR/PF Gain Adjustment	VAR/PF Gain Adj.	1-10000	100%

## Integral Voltage Regulator with 550 Controller

- A digital display and keypad provide access to data. A two-line vacuum fluorescent display provides complete and concise information.
- The Decision-Maker™ 550 controller provides an interface between the generator set and switchgear for paralleling applications incorporating multiple generator set and/or utility feeds.
- The controller can communicate with a personal computer directly or on a network. See spec sheets G6-76, Monitor III Software, and G6-50, Decision-Maker™ 550 Controller Communications, for more information.
- Using optional menu-driven, Windows®-based PC software, an operator can monitor engine and alternator parameters and also provide control capability.
- The controller supports Modbus® RTU (Remote Terminal Unit), an industry standard open communication protocol.
- The Decision-Maker™ 550 controller provides ISO 8528-5, Class G3, compliance for transient response on some 20–300 kW generator set models. See the respective generator set spec sheet for specific applications.

## Voltage Regulator Menu 11 Displays

### AVG L-L V

#### Volt Adjustment

- L1-L2 Volts
- L2-L3 Volts (3-phase)
- L3-L1 Volts (3-phase)

#### Under Freq. Unload

##### Enabled N/Y

- Frequency Setpoint (cut-in point)
- Slope Volts-Per-Cycle

#### Reactive Droop

##### Enabled N/Y

- Voltage Droop at 0.8 PF Rated Load

#### VAR Control

##### Enabled N/Y (active only when the digital input is active)

- Total kVAR (running) kVAR Adjustment
- Generating/Absorbing Y/N

#### PF Control

##### Enabled N/Y (droop at rated load, 0.8 PF)

- Average PF (running) PF Adjustment
- Lagging/Leading Y/N

#### Regulator Gain Adjustment

#### Utility Gain Adjustment

#### Reset Regulator Defaults

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Modbus® is a registered trademark of Schneider Electric.  
Windows® is a registered trademark of Microsoft Corporation.

## Digital DVR® 2000E Voltage Regulator

- The sealed electronic, solid-state microprocessor-based digital voltage regulator controls the generator set output by regulating the current flow into the exciter field.
- The digital voltage regulator is equipped with single- and/or three-phase sensing. Single-phase sensing is achieved by connecting terminal E2 and E3 to the same generator set terminal.
- Provisions are included in the regulator to allow the paralleling of two or more generator sets using either reactive droop or reactive differential (cross current) compensation with the addition of an external 5-amp 5VA current transformer (paralleling capability with optional DVR® 2000EC model only).
- The underfrequency function allows the generator set to operate with a constant volts-per-hertz characteristic.
- The over-excitation function monitors the voltage regulator output voltage and causes the voltage regulator to shut down when the output voltage exceeds the preset trip level of 80 volts for 15 seconds.
- The overvoltage function monitors the voltage regulator sensed voltage and causes the voltage regulator to shut down when the sensed voltage exceeds the preset trip levels of 120% for 0.75 seconds.
- The voltage regulator is equipped with a sensor that monitors the ambient temperature and will turn itself off when the temperature exceeds 70°C (158°F).
- The loss of the sensing function causes the voltage regulator to shut down if an open circuit occurs in one or more of the sensing leads.
- The field current limit function monitors voltage regulator output current and limits current should a heavy load or short circuit occur across the field output terminals.
- The manual mode of field current controls aid in setup and troubleshooting.
- The alarm output contacts provide remote indication of fault condition.

## Status and Mode Adjustments

### Status and Shutdown Indicators

- Field Amp Limit
- Loss of Sensing
- Manual Mode
- Over Excitation
- Over Temperature
- Over Voltage
- Under Frequency
- VAR/PF Active

### Adjustments

- Coarse Voltage Adjustment
- Droop
- Fine Voltage Adjustment
- Gain
- Manual Mode Adjustment
- Manual Mode On/Off
- Phase Sensing, 1–3
- Stability Range
- Under Frequency
- VAR/PF Adjustment
- VAR/PF Select

## Fast Response™ II PMG Voltage Regulator

- The voltage regulator monitors output voltage magnitude and frequency to supply current to the stationary LED board.
- The stability potentiometer adjusts the voltage regulator to reduce light flicker.
- The volt/Hz adjustment potentiometer determines the engine speed (Hz) at which the generator output voltage begins to drop.

### Adjustment Potentiometers

- Stability
- 50 Hz Volt/Hz Adjustment
- 60 Hz Volt/Hz Adjustment

### Jumpers

- 50 or 60 Hz Selection Jumper for Volts/Hz

### Standard Average Voltage Sensing Model

- 12- or 24-Volt Engine Electrical System,  $\pm 2\%$  Single-Phase Voltage Sensing

### Average Voltage Sensing Models Available

- 12- or 24-Volt Engine Electrical System,  $\pm 2\%$  Three-Phase Voltage Sensing
- 12- or 24-Volt Engine Electrical System,  $\pm 1\%$  Single-Phase Voltage Sensing (some models)

## Fast Response™ II RMS Voltage Regulator

- The voltage regulator monitors output voltage magnitude and frequency to supply current to the stationary LED board.
- The gain potentiometer adjusts the voltage regulator to reduce light flicker.
- The volt/Hz adjustment potentiometer determines the engine speed (Hz) at which the generator output voltage begins to drop.

### Adjustment Potentiometers

- Gain
- 50 Hz Volt/Hz Adjustment
- 60 Hz Volt/Hz Adjustment

### Jumpers

- 50 or 60 Hz Selection Jumper for Volts/Hz
- VAR/PF Input (or Analog Voltage Adjust Input)

### Standard Models (RMS Voltage Sensing Model)

- 12- or 24-Volt Engine Electrical System, Single-Phase Voltage Sensing

### Three-Phase RMS Models Available

- 12- or 24-Volt Engine Electrical System, Three-Phase Voltage Sensing

## Fast Response™ III Voltage Regulator

- The voltage regulator monitors output voltage magnitude and frequency to supply current to the stationary exciter field.
- The stability potentiometer adjusts the voltage regulator to reduce light flicker.
- The volt/Hz adjustment potentiometer determines the engine speed (Hz) at which the generator output voltage begins to drop.

### Adjustment Potentiometers

- Stability
- Volt/Hz Adjustment

### Jumpers

- VAR/PF Input

### Standard Model (Average Voltage Sensing Model)

- 12- or 24-Volt Engine Electrical System, Single-Phase Voltage Sensing

## Accessories

Refer to the respective generator set spec sheet and your authorized distributor for specific accessories.

### 550 Controller with Menu-Driven Integral Voltage Regulator

- Utility Paralleling, Protective Relay Functions

### Digital DVR® 2000E Voltage Regulator

- Reactive Droop Compensator Kit
- Voltage Regulator Relocation Kit
- VAR/PF Control (with DVR® 2000EC only)

### Fast Response™ II PMG Voltage Regulator

- Reactive Droop Compensator Kit
- Voltage Adjustment Potentiometer Kit
- Voltage Regulator Relocation Kit

### Fast Response™ II RMS Voltage Regulator

- Reactive Droop Compensator Kit
- Voltage Adjustment Potentiometer Kit
- Voltage Regulator Relocation Kit
- VAR/PF Controller Kit

### Fast Response™ III Voltage Regulator

- Reactive Droop Compensator Kit

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