

DEVICE NUMBER 90

CLASS 300 EQUIPMENT KR-FF, KR-FFMX STATIC VOLTAGE REGULATORS

APPLICATIONS:

The KR-FF and KR-FFMX static voltage regulators provide precise generator line voltage regulation. They are suitable for use with small and medium size generators using brush or brushless rotary exciters. The KR-FF and KR-FFMX series of regulators also provides underfrequency protection and contains built-in suppression for conducted EMI.

DESCRIPTION:

The KR series of regulators provides field excitation voltages of 32, 63, and 125 Vdc for 50/60 Hz generators to maintain the generator line voltage within a tight regulation band. Sensing voltage selection is accomplished using easily accessible, Faston terminals.

All KR voltage regulators utilize thyristors in the power stage. They employ built-in electromagnetic interference (EMI) suppression to reduce the conducted interference generated by the thyristors. Figure 4 provides details on the levels of EMI suppression.

Selection of 50 Hz or 60 Hz underfrequency protection is easily accomplished through the use of Faston terminals. *Although the underfrequency operational threshold is normally factory preset at a nominal 6.0 Hz below the system frequency. The percentage of generator output voltage obtained for a specific reduction in frequency is illustrated in Figures 2 and 3.

A full line of accessories is available for use with the KR regulators, enabling the user to meet other system requirements including excitation support, paralleling, and manual voltage control. These accessory items are described on page 3.

KR-FFMX: The KR-FFMX regulators are designed to operate in a high humidity environment. Although similar to the KR-FF, the KR-FFMX utilizes hermetically sealed components, moisture resistant sealed transformer, sealed potentiometers and urethane coated printed circuit board and wire connections.

* Unit is shipped connected for 60 Hz operation.

FEATURES:

- Regulation accuracy better than $\pm 1\%$.
- Applicable to either 50 Hz or 60 Hz generators.
- EMI suppressed.
- Built-in underfrequency protection for voltage regulator and generator system.
- Moisture resistant (KR-FFMX only).
- Adjustable stabilization network.
- Externally adjustable voltage range.
- Internal "build-up" circuits.
- Solderless reconnectable Faston terminals facilitate selection of sensing voltage and frequency (50 Hz or 60 Hz).
- Mechanically rugged, welded steel chassis.
- Compact, reliable, economical.
- Complete accessory line available.
- CSA approved.



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INSTRUCTION MANUALS

Reference Publication Number

9 1606 00 991 (KR4FFX/FFMX, KR7FFX/FFMX)
9 1160 00 99X (KR2F/FM, KR2FF/FFM,
KR4F/FM, KR4FF/FFM,
KR7F/FM, KR7FF/FFM)

SPECIFICATIONS:

OUTPUT POWER: See Table 1.

MINIMUM FIELD RESISTANCE: See Table 1.

MAXIMUM FIELD RESISTANCE: See Table 1.

INPUT POWER:

Voltage: See Table 1.

Frequency: 50/60 Hertz

Phase: Single

Burden: See Table 1.

INPUT SENSING:

Voltage 120-139/208-240/416-480/520-600 Vac
±10% (60 Hz)

100-110/220-230-240/380-400-415/500
Vac ±10% (50 Hz)

Phase: Single

Burden (maximum): 10VA

VOLTAGE ADJUST RANGE: Minimum ±10% of nominal voltage.

REGULATION ACCURACY: ±1% maximum over full range of generator loading and 5% frequency variation.

REGULATOR RESPONSE: Less than 17 milliseconds.

REGULATOR DRIFT: Less than 1% over a 40°C (72°F) ambient temperature change.

REGULATOR SENSING: Single phase average voltage.

UNDERFREQUENCY OPERATIONAL THRESHOLD (KR-FF/FFM SERIES ONLY): 44 Hz nominal in 50 Hz systems. See Figure 2.

54 Hz nominal in 60 Hz systems. See Figure 3.

EMI SUPPRESSION: See Figure 4.

OPERATING TEMPERATURE RANGE: -40°C (-40°F) to +60°C (+140°F).

STORAGE TEMPERATURE RANGE: -65°C (-85°F) to +85°C (+185°F).

POWER DISSIPATION: Less than 20 watts at maximum continuous rating.

SHOCK: Withstands up to 20 Gs in each of three mutually perpendicular planes.

VIBRATION: Withstands 5 to 26 Hz @ 1.2 G's; 27 to 52 Hz @ .036 double amplitude; 53 to 260 Hz @ 5.0 G's.

DIMENSIONS: 7.125" (180.975 mm) x 7.100" (180.34 mm) x 3.937" (99.999 mm).

FINISH: Chassis zinc coated per MIL-Z-325A, type II, class 2; circuit board epoxy conformal coated.

WEIGHT: 6.0 pounds (2.718 kg) net; 7.0 pounds (3.171 kg) shipping.

TABLE 1.

Model	Power Input *			Power Output				Field Resistance	
	*** AC Volts	Freq (Hz)	Burden (VA)	Maximum Continuous		1 Minute Forcing		Min. Ohms	Max. Ohms
				Volts DC	Amps DC	Volts DC ****	Amps DC		
KR2FF**	100-139	50/60	640	32	8	45	12	4.25	400
KR4FFMX			300	63	2.5	90	3.5	25	400
KR7FFMX	208-277	50/60	840	125	3.5	180	5	36	400

* If correct voltage is not available, a suitable power transformer must be selected.

** The halfwave output of these regulators requires the use of an airgap isolation transformer (when a transformer is required).

*** All voltage ranges in Vac ±10%.

**** Voltage forcing ratings are based upon the following power inputs: KR2FF, KR4FFMX - 120 Vac; KR7FFMX - 240 Vac. Operation with power inputs other than these will result in a proportional increase or decrease in voltage forcing.

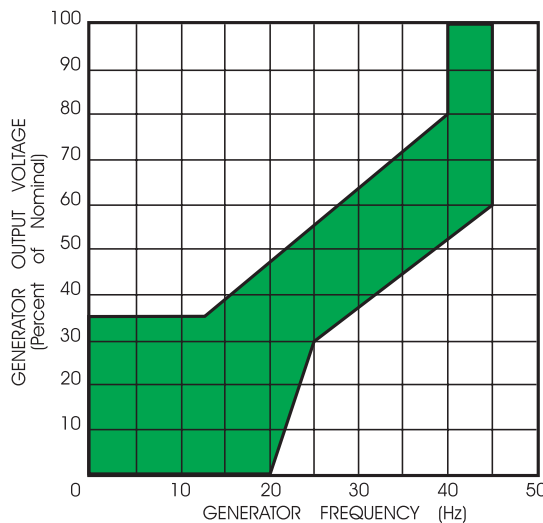


FIGURE 2. Voltage-Frequency Characteristic Curve for 50 Hertz System*

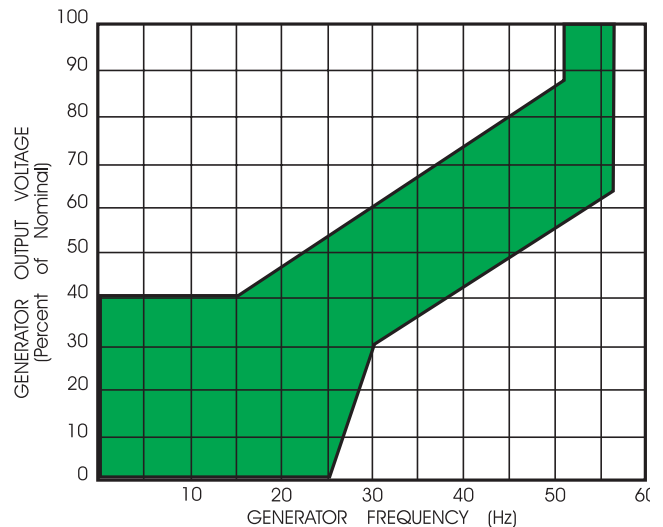
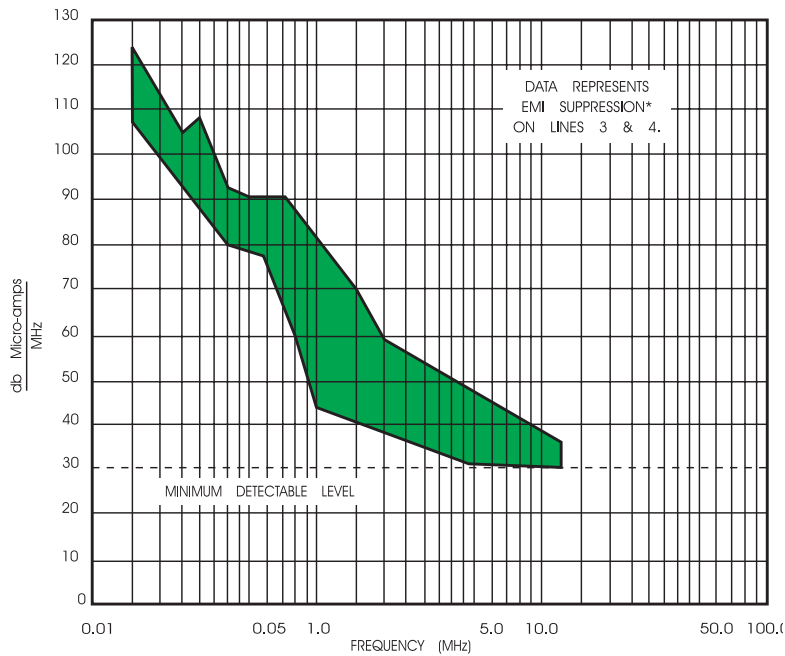


FIGURE 3. Voltage-Frequency Characteristic Curve for 60 Hertz System*

*Limits of the operational envelope (shaded area) are primarily a function of operational temperature and normal tolerances in components.



* Shaded area is a composite of the EMI suppression for all 50/60 Hz models.

FIGURE 4. TYPICAL SUPPRESSION OF CONDUCTED EMI.

STANDARD ACCESSORIES AVAILABLE FROM STOCK

POWER ISOLATION TRANSFORMERS: Basler Electric power isolation transformers are designed specifically for use with these voltage regulators and power generating systems. See complete power isolation transformer information in Power Isolation Transformer Bulletin (SP).

EXCITATION SUPPORT SYSTEM (Series Boost Option): Many applications require the support of higher than normal output currents for either motor starting (inrush) or selective breaker tripping under fault conditions. The Basler patented Excitation Support System (U.S. Patent No. 3,316,479) is an all static device which provides the regulator with a relatively constant input voltage from both the generator output voltage and current. Power current transformers are available for virtually all generator-exciter-regulator combinations. See Excitation Support System Bulletin (SP) for additional information.

PARALLELING MODULE: For applications involving multiple units, the Basler APM300 Paralleling Module provides reactive load division control for the regulators. By isolating the current signal before combining it with the voltage

sensing signal, the Paralleling Module is capable of compensation by either the reactive droop or the reactive differential (cross-current) method. Detailed description is given in the APM300 Paralleling Module Bulletin (SPI). A complete line of Paralleling Current Transformers for use with the APM300 is also available. See Current Transformer Bulletin (SPB).

MANUAL VOLTAGE CONTROL: Basler Manual Voltage Control (MVC) Modules are for use with the regulators in brushless exciter applications. These modules make use of a three-position switch to allow the generator voltage to be controlled either manually or automatically, and also to provide the means for system voltage shutdown. See MVC Module Bulletin (SRK).

MOTOR OPERATED CONTROL: Basler's MOC2-Series of Motor Operated Potentiometers provides remote, multipoint adjustment of generator voltage in a wide range of resistance values. These controls operate on either AC or DC power at voltages of 24, 32, 48 or 125 volts. See Motor Operated Control Bulletin (SRA).

NON-STANDARD ACCESSORIES AVAILABLE ON SPECIAL ORDER

The following non-standard accessories are available for use with Regulators in specific applications. Consult the factory for more information:

- WIDE RANGE VOLTAGE ADJUST MODULE
- VOLTS/HERTZ SENSING MODULES
- DC SENSING MODELS

HOW TO ORDER:

Refer to the Output Power portion of Table 1 and locate the appropriate ratings for your application. Order the regulator in the "Model" column, opposite the selected ratings.

SAMPLE SPECIFICATION:

The voltage regulator shall control the exciter field to maintain the generator output voltage within $\pm 1\%$ for all steady state load conditions from no load to full

load, and for 5% frequency variation. The regulator shall be a solid state device employing SCR's in the power control stage. It shall have built-in electromagnetic interference suppression and built-in underfrequency control for 50/60 Hz operation. The regulator shall be capable of $\pm 10\%$ adjustment of generator output voltage.

The voltage regulator shall be a Basler Electric Company type KR-FF or KR-FFMX or equivalent.

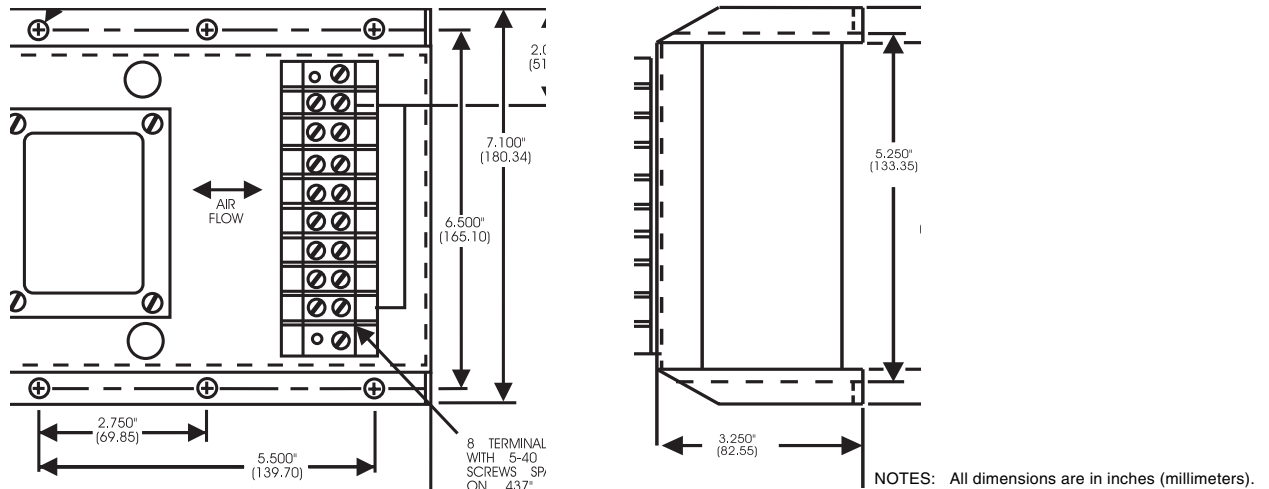


FIGURE 5. OUTLINE DRAWING.

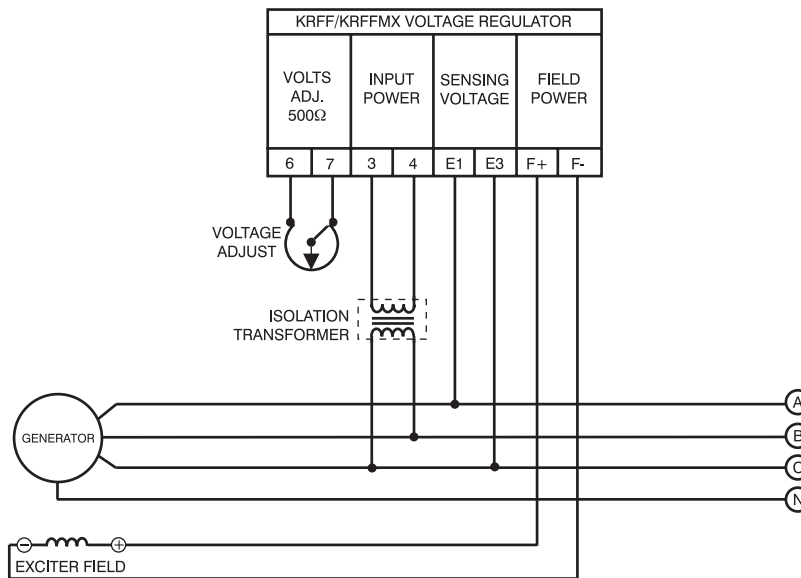


FIGURE 6. TYPICAL INTERCONNECTION.

