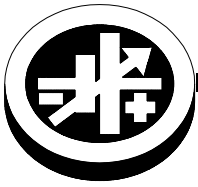


# OPERATOR MANUAL



**KEPCO** An ISO 9001 Company.

**JBW**  
**50W SERIES** 

## 50 WATT SINGLE OUTPUT SWITCHING POWER SUPPLIES

### I — INTRODUCTION

**SCOPE OF MANUAL.** This instruction manual covers the installation and operation of the Kepco JBW 50W Series of RoHS (Reduction of Hazardous Substances) compliant Switching Power Supplies.

**DESCRIPTION.** The Kepco JBW 50W Series consists of four models of switching power supplies, each with a single output as shown in Table 1. Units may be operated with a nominal 100 to 120V a-c and 220 to 240V a-c (input voltage range 85 to 265 Va-c), 50-60 Hz (input frequency range 47-440Hz.) They will also operate on 110V to 370V d-c input. The JBW 50W Series employs a light weight ferrite core. Regulation is provided by pulse width modulation. A FET power stage, operating as a forward converter with a fixed switching frequency of 140KHz provides a smooth isolated

d-c output. A thermistor circuit prevents excessive turn-on current surge. Overvoltage protection is provided. Current limiting with automatic recovery from short circuit is featured. Units are manufactured on an open frame PC board.

Table 1 contains specifications and operating limits of individual JBW 50W Series models. Section II (following) contains specifications and operating limits common to all JBW 50W Series Models

### II — SPECIFICATIONS

The following specifications are at nominal input voltages and 25°C and apply to all models unless otherwise specified.

**TABLE 1. OUTPUT RATINGS AND SPECIFICATIONS, JBW 50W SERIES**

MODEL		JBW 05-10R	JBW 12-4R3	JBW 15-3R5	JBW 24-2R1
OUTPUT VOLTS, d-c		5V	12V	15V	24V
ADJUSTMENT RANGE		4.5-5.5V	10.8-13.2V	13.5-16.5V	21.6-26.4V
CURRENT/POWER RATINGS		10.0A/50W	4.3A/51.6W	3.5A/52.5W	2.1A <sup>(1)</sup> /50.4W
CURRENT LIMIT (AMPS)		10.5 min	5.4 min	4.4 min	3.0 min
OVP RANGE (VOLTS)		5.75-6.9	13.8-16.8	17.2-21.0	27.6-33.6
EFFICIENCY	100 Va-c	77%	80%	80%	81
	240 Va-c	79%	81%	81%	83%
ACCEPTABLE EXTERNAL OUTPUT CAPACITOR μFmax., (fixed load resistance)		10,000	10,000	10,000	10,000
RIPPLE AND NOISE <sup>(2)</sup> (mV p-p)	ripple (typ)	80	120	120	120
	ripple (typ) (-10 to 0°C)	140	160	160	160
	spike noise (typ)	120	150	150	150
	spike noise (typ) (-10 to 0°C)	160	180	180	180

(1) 2.6A peak, t ≤ 10 seconds, not to exceed 2.1A rms, output power ≤ 50.4W.

(2) 0 to 100% load, 0 to 60 °C, tested with 100μF electrolytic and 0.1μF film capacitors across the measuring points, connected to the power supply via 5.9 in (150mm) wires; oscilloscope bandwidth ≤ 20MHz.

#### INPUT CHARACTERISTICS:

##### INPUT VOLTAGE: (0 to 100% load, -10 to 60°C)

Nominal 100-120V a-c, 220-240V a-c  
Range: 85-265V a-c, 110 -370V d-c

**NOTE:** The power supply may shut down if operated at below the input voltage range or if the input voltage increases slowly at start up (> 1 second). To reset the power supply, unplug the unit, wait one minute and reapply input power.

##### INPUT SOURCE FREQUENCY:

Nominal 50/60 Hz;  
Range 47-440 Hz (Above 66Hz to 440 Hz the leakage current may exceed the VDE safety specification limit.)

##### INPUT CURRENT: (100% load at 25°C with nominal output voltage):

100V a-c input:  
All except 24V Model: 0.7A typ., 0.88A max.  
24V Model: 0.8A typ., 0.88A max.  
240V a-c input: 0.35A typ., 0.5A max.

**INPUT PROTECTION AND SOFT START:** A thermistor circuit reduces start-up surge. Units are protected against shorts by an input fuse. Fuse value 3.15A, 250V.

##### INPUT SURGE: Cold start:

100V a-c input, 100% load: 15A typ., 30.0A max.  
240V a-c input, 100% load: 40A typ., 60.0A max.

**LEAKAGE CURRENT:** Cold start:

100V a-c and 60 Hz (single pole switching) (operating in conformance with Den-An):

0.75mA max, 0.35mA typ

240V a-c and 60 Hz (single pole switching in conformance to UL 1950/IEC 950):

0.75mA max, 0.50mA typ

**POWER FACTOR:**

100V a-c: 0.99 typ.

240V a-c: 0.93 typ.

## OUTPUT CHARACTERISTICS:

**SOURCE EFFECT:** (85 to 265 Va-c)

0.4% max.

**LOAD EFFECT:** measured at sensing terminals

(0% - 100% load change)

0.8% max.

**TEMPERATURE EFFECT:** (-10 to 50°C)

1.0% max.

**COMBINED EFFECT:**

2.0% max. (4% typical for overshoot at start-up)

**TIME EFFECT OR DRIFT:** (1/2 to 8 hr. at 25°C)

0.4% max.

**TRANSIENT RECOVERY:** A step load change from 50% to 100% of rated load in 50 microseconds or more produces no more than 4% output voltage excursion. Temperature range from -10 to 50°C. Recovery time is 1mS maximum.

**HOLD UP TIME:** Condition: 100% output load. Upon input interruption the output is maintained for:

100 Va-c: 20mS typ.

240 Va-c: 20mS typ.

**START UP TIME:**

100 Va-c, 240 Va-c: 500ms max., 400ms typ.

**OVERVOLTAGE PROTECTION:** Fixed, factory set. See Table 1. The overvoltage circuit is set by Zener diode clamp, latching will occur.

**OVERCURRENT:** Square type, output voltage returns to rated level upon removal of cause of malfunction (long term overcurrent could damage unit).

## ENVIRONMENTAL CHARACTERISTICS

**OPERATING TEMPERATURE:** -10 to 60°C (start up -20 to -10°C). See the derating, Figure 1.

**STORAGE TEMPERATURE:** -30°C to + 75°C.

**COOLING:** Natural convection. Do not allow the power supply to become dust covered because that will decrease the cooling efficiency of the unit and cause insulation to deteriorate.

**ORIENTATION:** Vertical or horizontal (see Figure 2).

**HUMIDITY:** 10% to 90% relative humidity, operating and storage, noncondensing, wet bulb temperature < or = 35°C.

**VIBRATION:** Three axes, one hour each, sweep time 10 min., nonoperating.

5-10 Hz., 10 mm amplitude

10-200 Hz., 2G (19.6m/s<sup>2</sup>) acceleration

**SHOCK:** Three axes, 60G (588m/s<sup>2</sup>), 11 mS ±5mSec pulse duration, three shocks each axis, nonoperating, 1/2 sine pulse.

## GENERAL CHARACTERISTICS

**WITHSTANDING VOLTAGE:** (at 5 to 35°C ambient, 45 to 85% relative humidity, cutout current 10 mA):

Between input and output terminals:

3.0 KV a-c for 1 minute (with Y-capacitor removed).

Between input terminals and ground:

2000V a-c for 1 minute.

Between output terminals and ground:

500V a-c for 1 minute.

**INSULATION RESISTANCE:** Between input and output, input and ground, output and ground: 100 megohms minimum (500V d-c, 5 to 35°C ambient, 45 to 85% relative humidity)

**SAFETY:** All units designed to meet UL 60950, CSA C22.2, No. 60950-1(C-UL), and TÜV Rheinland EN60950 (ambient temp. 50°C). JBW 50W units are CE marked per the Low Voltage Directive (LVD), EN60950.

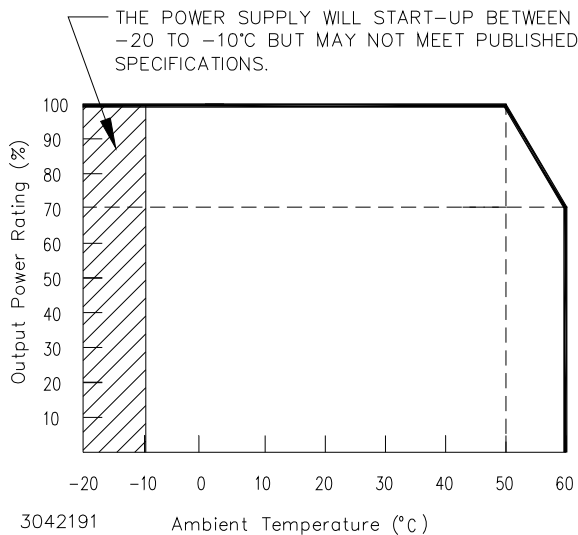
**EMC - EMISSIONS:**

- Conducted Noise 0.15MHz to 30MHz: FCC Class B, VCCI-B, EN55011-B, EN55022-B.
- Input Harmonics (on AC Mains) 0 to 2KHZ: EN 61000-3-2.

**EMC - IMMUNITY:**

- ESD: EN 61000-4-2 Level 4, Normal operation.
- Radiated Field Noise: EN 61000-4-3 Level 3, Normal operation.
- Electrical Fast Transient/Burst (EFT): EN 61000-4-4 Level 3, Normal operation.
- Surge: EN 61000-4-5 Level 4, no damage.
- Conducted Noise: EN 61000-4-6 Level 3, Normal operation.
- Power Frequency Magnetic Field: EN 61000-4-8 Level 4, Normal operation.
- Interruptions and voltage dips, short variations: EN 61000-4-11, Normal operation.

**WARRANTY:** One year.



**FIGURE 1. OUTPUT POWER VS. TEMPERATURE**

### III — INSTALLATION

**MOUNTING POWER SUPPLY.** Refer to Figures 2 and 4. The unit may be mounted on one mounting surface. The air surrounding the power supply must not exceed the ambient values given in the graph in Figure 1.

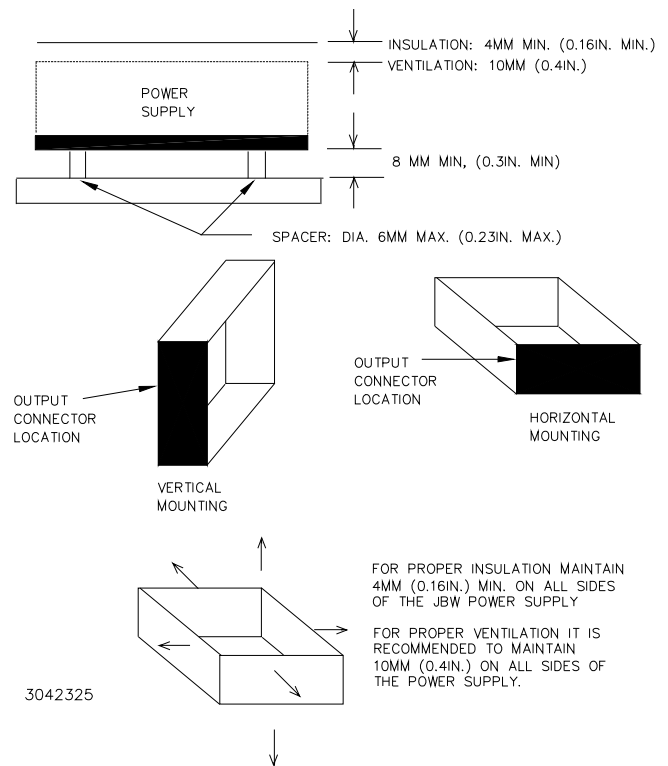
**INSULATION.** Install unit 0.3 inches (8mm) away from base with the use of 0.24 inch (6mm) diameter spacers attached to the PC board. Keep at least 0.16 inches (4mm) spacing around and above the unit to comply with insulation and safety requirements. An insulator must be used if the spacing is less than 0.16 inches (4mm) (see Figure 2).

**VENTILATION.** It is recommended to keep at least 0.40 inches (10mm) clearance from adjacent equipment for proper ventilation.

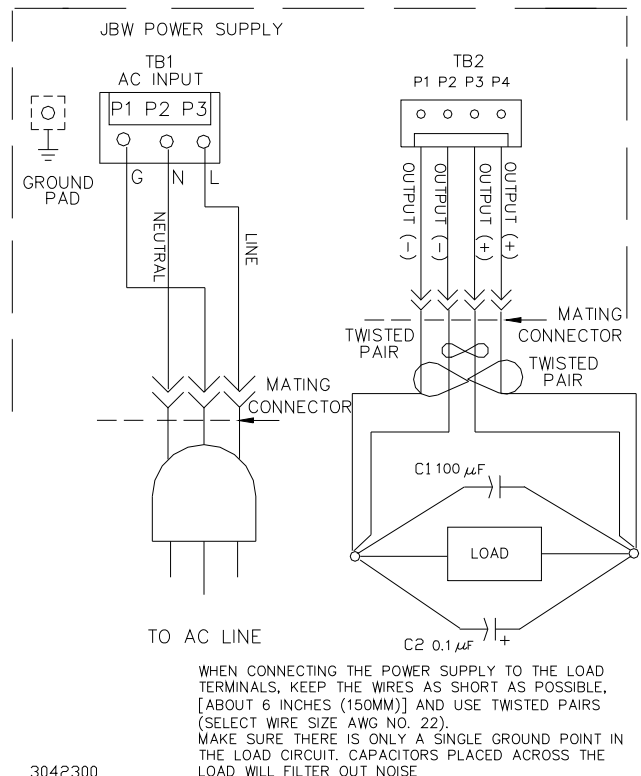
**CONNECTIONS.** Connect the load to the power supply by connecting the two (+) output wires from terminal block TB2 to the load (+) terminal, and the two (-) output wires from TB2 to the load (-) terminal. The AC input power is applied via the terminal block TB1. Make sure to connect the AC input Neutral and Line wires to the P2 and P1 pins respectively of TB1 (see Figure 3). A Cable Kit (P/N 219-0406) is available as an option from Kepco (see Figures 3 and 5). The kit includes an input cable, terminated on one end with an input mating connector; and an output cable, terminated on one end with an output mating connector.

### IV — OPERATION

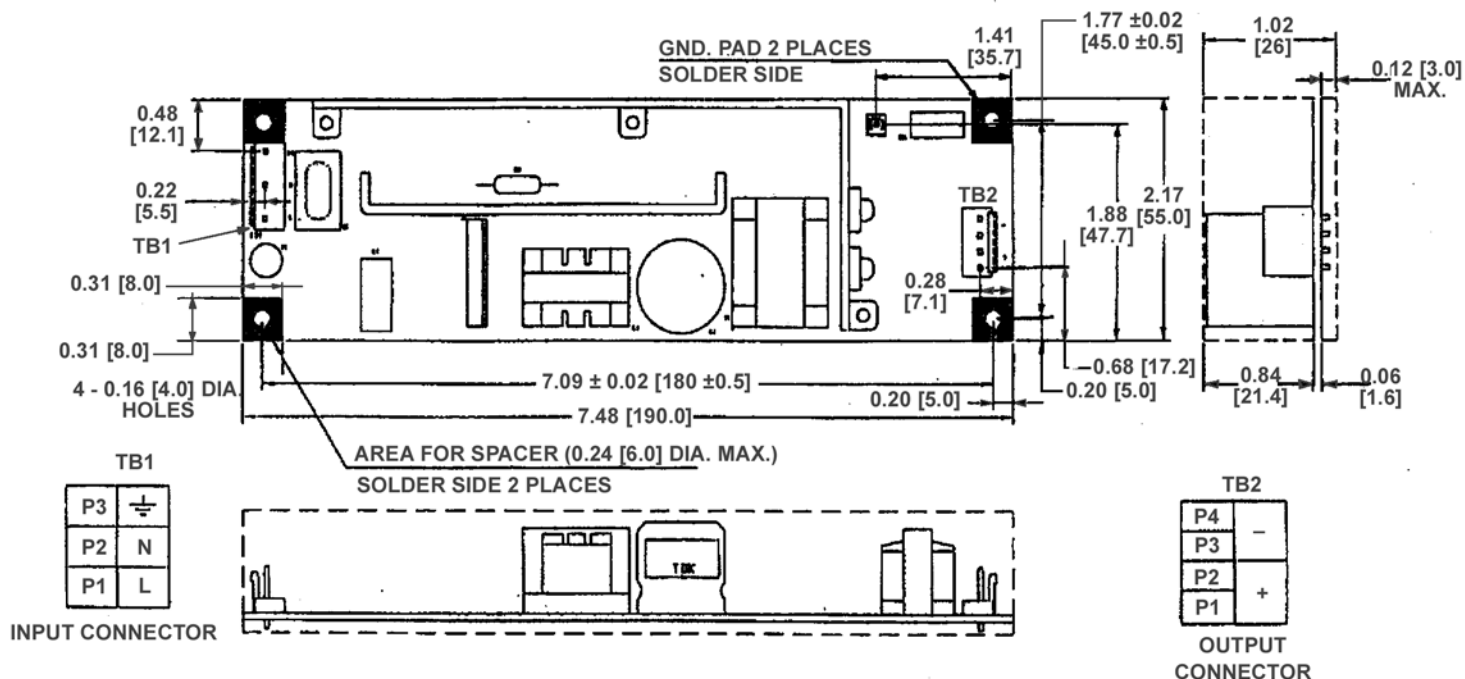
**PROTECTION DIODE:** When a number of power supplies are operating in series, the current rating is to be limited to the rating of the power supply with the lowest rating. A diode ( $V_r > 2\sum V_o$ ,  $I_f > 2I_o$ ,  $V_f \ll \text{low}$ ) must be connected to the power supply output terminals to protect the unit from reverse voltage.



**FIGURE 2. VENTILATION, INSULATION AND MOUNTING DIRECTION**



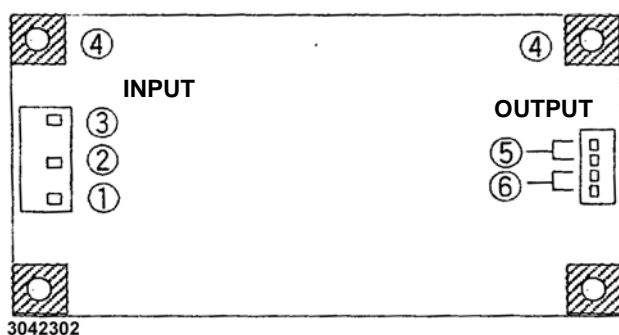
**FIGURE 3. LOAD CONNECTIONS**



- NOTES:
1. DIMENSIONS ARE IN INCHES, DIMENSIONS IN BRACKETS ARE IN MILLIMETERS.
  2. TOLERANCES:  $\pm 0.04$  IN. ( $\pm 1$  MM) UNLESS OTHERWISE SPECIFIED.
  3. PCB THICKNESS:  $0.063 \pm 0.008$  [1.6  $\pm$  0.2].
  4. WEIGHT: 0.49 LBS [220 GRAMS].

3010269

FIGURE 4. JBW 50W MECHANICAL OUTLINE DIAGRAM



3042302

Terminal	Function
1	Input L
2	Input N
3	Ground
4	Ground Pad
5	Output (-)
6	Output (+)

Mating Connectors <sup>(4)</sup>			
Connector	Terminal Pin	Socket Housing	MFR
Input	SVH-21T-P1.1	VHR-5N	JST <sup>(1)</sup>
	T101	H101-05	LCE <sup>(2)</sup>
	50539-8100	51144-0500	MLX <sup>(3)</sup>
Output	SVH-21T-P1.1	VHR-4N	JST <sup>(1)</sup>
	T101	H101-04	LCE <sup>(2)</sup>
	50539-8100	51144-0400	MLX <sup>(3)</sup>

- (1) JST= Japan Solderless Terminal Mfg. Co.
- (2) LCE= Long Chu Electronics Co.
- (3) MLX = Molex
- (4) Optional cable kit (P/N 219-0408) includes one input and one output cable (one meter long) with mating connectors for TB1 and TB2, unterminated at other end.

FIGURE 5. INPUT/OUTPUT CONNECTIONS