

*"The Right Control  
for your Application"*

## **Explanation of CE Approvals**

### **Section I**

These instructions are supplemental to any "Installation and Operating Manuals" and are intended to provide additional information regarding Electro Magnetic Compliance (EMC). These instructions offer suggestions on installing and wiring speed controls and filters. These instructions in no way infer that any combination of the suggested components GUARANTEE the combination will pass all required CE tests. Only the equipment in its final form can be tested by a certified body to insure full compliance with any of the following:

EN61010-1: Safety Requirements for Electrical Equipment  
EN61800-3: Adjustable Speed Electrical Power Drive Systems EMC Product Standard  
EN50081: Electromagnetic Compatibility- General Emissions Standard  
EN50082: Electromagnetic Compatibility- General Immunity Standard  
EN55011: Radiated and Conducted Emissions  
EN61000: Electromagnetic Compatibility- Low Voltage Supply Fluctuations and Harmonics

The CE mark on a product does not inform the purchaser of which Directive the equipment complies with. It is up to the manufacturer to ensure their product complies with the appropriate Directives. Speed controls are considered a component part and therefore are not REQUIRED to have the CE mark. As a service to our customers we have gone through the necessary testing in order to make sure that our products can be made to pass the required testing.

It is not a requirement to provide a copy of the manufacturers declaration with every product. We do NOT supply test data as this information is not of use to any customer having their equipment being tested and will not be valid for any related purpose.

### **Section II: General information**

The main sources of noise are electronic circuits that switch at very high frequencies. The higher the switching frequency the harder it is to confine the electrical noise. There are two different ways noise is generated to other equipment, conducted through the AC line or emitted through the air. In order to reduce the noise generated to other equipment, filters are used on either the input or output circuits, or both.



In addition to adding filters to a system you may also need to use other installation methods to even further reduce electrical noise. These items include, but may not be limited to application specific shielded motor and AC line cables and/or mounting the equipment in a proper metal enclosure and/or mounting the equipment to a common conductive/metal surface.

**Some items to consider when designing an electrical system for CE approval are:**

- 1) Proximity of filter(s), speed control(s), and motor(s). The filter(s) should be mounted as close to the speed control as possible. Motor leads should be kept as short as possible. The longer the leads the more radiated noise there will be.
- 2) All logic level leads should be routed away from all AC line or motor leads. Logic leads can pick up unwanted noise from these leads and cause undesired results.
- 3) Shielded cables should be used on all AC line and Motor wiring. Shields must be earth grounded at both ends to the common ground point of the system.
- 4) All system components (control, motor, filters) should be mounted in such a way as to limit conducted and radiated noise. (See diagrams included in these instructions for installation suggestions pages 3,6,7.)

**General Considerations for reducing radiated and conducted noise.**

- a) All cables that connect to speed control and motor should be shielded.
- b) Signal, Input (AC line) and motor cables should not be bundled together at any time. If wires need to cross each other it should only be at 90 degree angles.
- c) All cables should lay flat to the ground plane (Panel/Enclosure) and should be securely mounted.
- d) A common ground plane is a metal surface or cabinet which is used to connect all ground connections for the system components such as the speed control, motor, etc. The panel/enclosure should not be painted in the areas at which you are making any connections.
- e) Most residential applications will require an enclosure be used to shield the electronic components.
- f) Other equipment that may not comply with EN50082-2 (Radiated Susceptibility) may experience EMI.

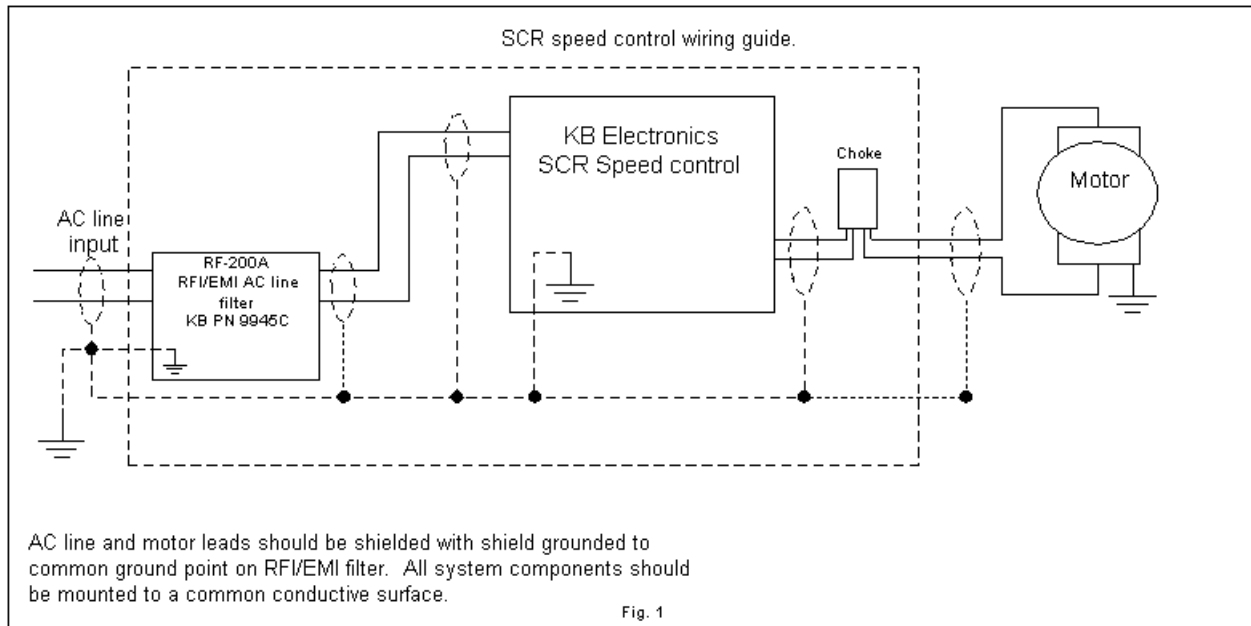
**Section III: SCR control instructions**

Speed controls that utilize SCR devices to rectify AC to DC voltage can pass both Class "A" and "B" Radiated and Conducted CE requirements as follows.



### **EN55022 and EN55011 Radiated and Conducted Class B (Residential):**

The speed control is to be mounted to a common metal plate/ground plane with the RFI filter and motor. All components need to be grounded to the common ground point on the RFI/EMI filter.



The KB Electronics model KBRF-200A or KBRF-250 AC line filter must be used on the AC line input before the speed control. The filter should be mounted as close to the speed control as possible and no more than 30 cm away. The wires should be shielded with the shield connected to the common ground point. Leads between the speed control and motor should be as short as possible. Ferrite chokes, KB part number 9993, should be used on motor leads to reduce EMI/RFI. Motor leads should be shielded with the shield grounded to the common ground point on the RFI/EMI filter. Motor leads should not be more than 30 meters long.

### **Section IV: PWM control/AC Inverter instructions**

Models KBWD, KBWT, KBPW, KBAC, KBVF, and KBLF can pass both Class “A” and “B” Radiated and Conducted CE requirements as follows.

### **EN55022 and EN55011 Radiated and Conducted Class B (Residential):**

The speed control is to be mounted in a shielded/metal box and mounted to a metal surface. The box should be grounded to the common ground point on the RFI/EMI filter.



The KB Electronics model KBRF-300 or KBRF-350 RFI/EMI AC line filter must be used in series with the AC line input before the control inside the shielded/metal box. See figure 1 page 3. The KBRF-350 mounts beneath the speed control and wired with leads provided. The KBRF-300 is to be wired with maximum of 30 cm of wire twisted at one twist per 2-3 cm between the filter and the control. The ground point on the filter should be used as the common ground point for entire assembly.

Wires from the main AC line terminal box to the input of KBRF-300 RFI/EMI filter should not be more than 30 meters in length and also must be twisted at one twist every 2-3 cm.

Leads between the speed control and the motor are to be no longer than 30 meters long. All leads are to be twisted together at one twist per 2-3 cm and enclosed in a shielded cable with the shield grounded to the common ground point on the RFI/EMI filter.

Ferrites need to added to the motor leads no more than 30 cm from output of the speed control. Ferrites (4pcs) 225 to 348 ohms at 25 to 100MHz EMI Suppressor. Reference Fair-Rite Products Corp. P/N 26502, PH# (888)314-7748 ([www.fair-rite.com](http://www.fair-rite.com)).

### **EN55022 and EN55011 Radiated and Conducted Class A (Industrial):**

The speed control is to be mounted to a metal surface. The surface should be grounded to the common ground point on the RFI/EMI filter.

The KB Electronics model KBRF-300 RFI/EMI filter or KBRF-250 RFI/EMI AC line filter must be used on the AC line input before the control. The KBRF-250 mounts beneath the speed control and wired with leads provided. The KBRF-300 should be wired with maximum of 30 cm of wire twisted at one twist per 2-3 cm between the filter and the control. The ground point on the filter should be used as the common ground point for entire assembly.

Leads from the main AC line terminal box to the input of RFI/EMI filter should be no more than 30 meters in length and also must be twisted at one twist 2-3 cm.

Motor leads are to be no longer than 30 meters long. All leads are to be twisted together at one twist per 2-3 cm and enclosed in a shielded cable with the shield grounded to the common ground point.

Ferrites need to added to the motor leads no more than 30cm from output of the speed control. Ferrites (4pcs) 225 to 348 ohms at 25 to 100MHz EMI Suppressor. Reference Fair-Rite Products Corp. P/N 26502, PH# (888)314-7748 ([www.fair-rite.com](http://www.fair-rite.com)).



### **EN55022 and EN55011 Radiated and Conducted Class B (Residential) for KBAC:**

The speed control is to be mounted in a shielded/metal box and mounted to a metal surface. The box should be grounded to the common ground point on the RFI/EMI filter.

The KB Electronics model KBRF-300 RFI/EMI AC line filter or equivalent must be used on the AC line input before the control and wired with maximum of 30cm of wire twisted at one twist per 2-3 cm between the output of the filter and AC input terminal of the control. The ground connection on the filter should be used as the common ground point for entire assembly.

Leads from the main AC line terminal box to the input of RFI/EMI filter should be no more than 30 meters in length and also must be twisted at one twist per 2-3 cm.

Motor leads are to be no longer than 30 meters. All leads are to be twisted together at one twist per 2-3 cm and/or enclosed in a shielded cable with the shield grounded to the common ground point.

Ferrites need to added to the motor leads no more than 30cm from output of the speed control. Ferrites (4pcs) 225 to 348 ohms at 25 to 100MHz EMI Suppressor. Reference Fair-Rite Products Corp. P/N 26502, PH# (888)314-7748 ([www.fair-rite.com](http://www.fair-rite.com)).

### **EN55022 and EN55011 Radiated and Conducted Class A (Industrial) for KBAC:**

The speed control is to be mounted to a metal surface. The control and surface should be grounded to the common ground point on the RFI/EMI filter.

The KB Electronics model RFAC-24 (internally mounted) RFI/EMI AC line filter must be installed in the enclosure as per the instructions provided with the filter.

Leads from AC line terminal box to input of RFI/EMI filter should be no more than 30 meters in length and also must be twisted at one twist per 2-3 cm.

Motor leads are to be no longer than 30 meters long. All leads are to be twisted together at one twist per 2-3 cm and enclosed in a shielded cable with the shield grounded to common ground point.

Ferrites need to added to the motor leads no more than 30cm from output of the speed control. Ferrites (4pcs) 225 to 348 ohms at 25 to 100MHz EMI Suppressor. Reference Fair-Rite Products Corp. P/N 26502,PH# (888)314-7748 ([www.fair-rite.com](http://www.fair-rite.com)).



**EN61800-3 Electromagnetic Compatibility Limits for Harmonic Current Emissions:**

The KBVF passes the EN61800-3 Industrial Criterion in typical applications where the KBVF is less than 10% of the total site power.

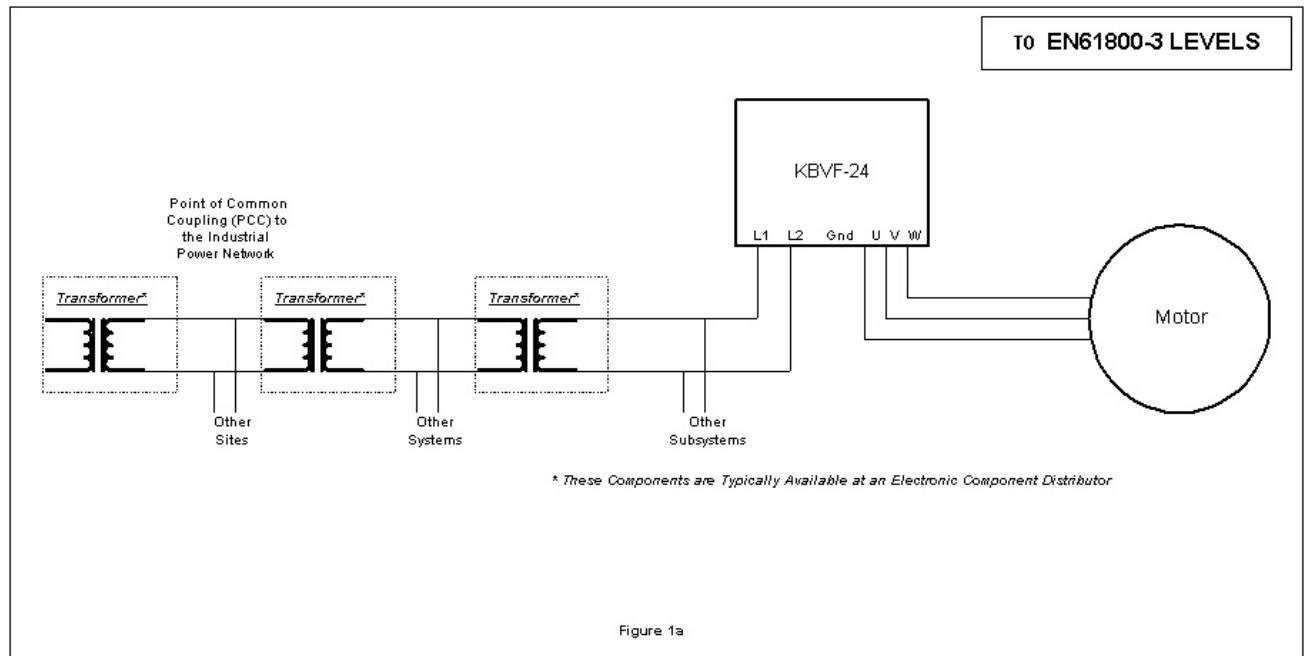
To meet the EN61800-3 Industrial Criterion in applications where the KBVF is greater than 10% of the site power or where other subsystems generate harmonics, site harmonic reduction can be accomplished with the following guidelines:

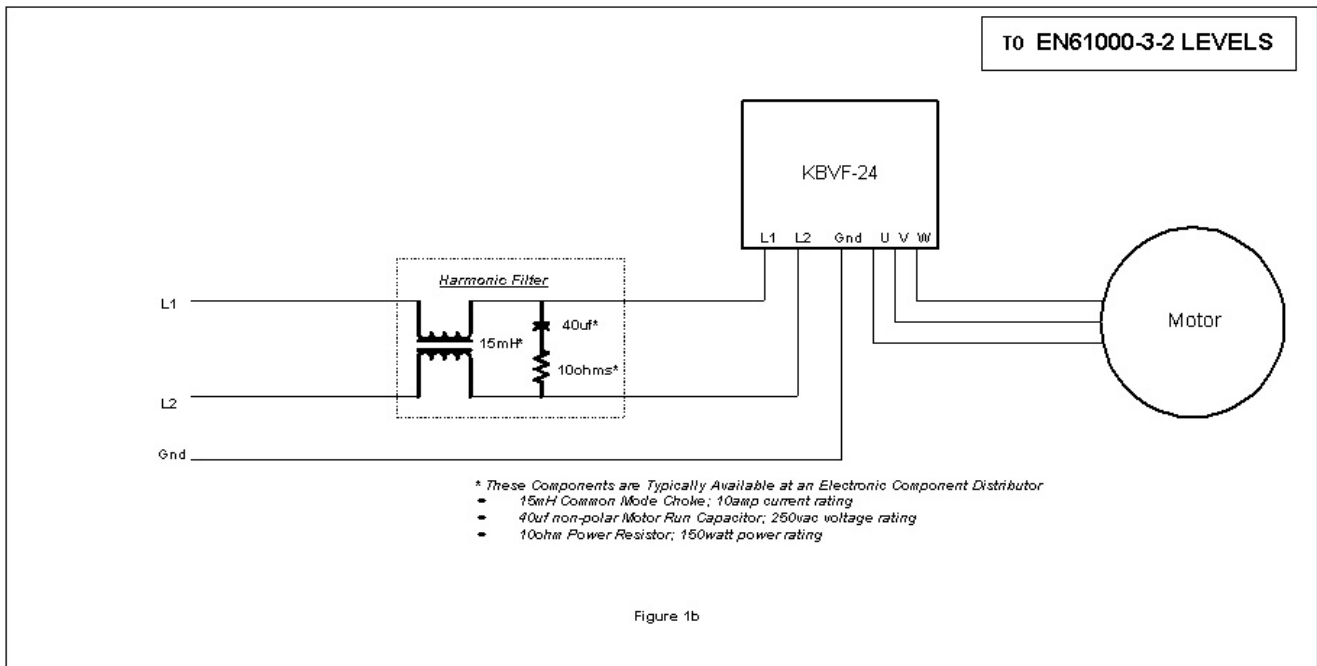
Add transformers or inductors in the power lines supplying the KBVF as in Figure 1a. Use the data in harmonic data in Figure 1a for site analysis

Cancel the harmonics by connecting the harmonic generating subsystems to different phases of the three phase AC line. Again, use the harmonic data in Figure 1a for site analysis.

**EN61000-3-2 Electromagnetic Compatibility Limits for Harmonic Current Emissions:**

The impedance of the AC line greatly affects the results of this test. Due to low line input impedance, it may be necessary to add an additional “Harmonic filter” to the circuit to the AC line input to the control. Please see Figure 1b for values:





## **Section V: Other resources**

Some additional resources you may consider reviewing are:

Technical note: Proper wiring practices on our web site [www.kbelectronics.com](http://www.kbelectronics.com)

Global Engineering Documents (<http://global.ihs.com/>)

Corcom Filters ([www.corcom.com](http://www.corcom.com))

Schaffner Filters ([www.schaffner.com](http://www.schaffner.com))

Cenelec Reference site for European Standards ([www.cenelec.org](http://www.cenelec.org))

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