Use Instructions for CE Compliance

Covers the SSt-EMF75 Power Supply

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Introduction

One of the many original design objectives of Teknic's SSt EMF75 power supply was to make it easy for you to receive the CE mark on your machine design. This document is intended to assist you in the design of CE-compliant machinery that use the SSt-EMF75 unregulated, linear power supply. Provided that this power supply is properly used as outlined in this document, the Teknic SSt-EMF75 meets and/or exceeds all of the prerequisite CE inspection and testing specifications.

> EN 61010: "Safety requirements for electrical equipment for measurement, control and laboratory use." This standard covers hazards from electrical shock, fire, excessive temperature and radiation.
>
> ANSI/UL 508C-2005: "Standard for Power Conversion Equipment; UL Recognized; UL File Number e301182".

Wherever possible, we have referenced the applicable standards and terminology used in the EN documents. We hope you find the following instructions helpful and informative. Please give us a call if you have any questions.

Warning Labels Safety Precautions & Scope

1. CAUTION, RISK OF ELECTRICAL SHOCK !

2. HOT SURFACE !

3. WARNING, SEE USER MANUAL FOR DETAILS !

Safety Precautions & Scope

The user should be aware that, if the SSt-EMF75 is used in a manner not specified herein, the protection provided by the equipment may be impaired. Please read all of the following instructions before operating the SSt-EMF75 power supply.

Intended Operating Environment

- For indoor use, protected from fluid spray or mist and falling particulate (Pollution Degree 2),
- Temperature: 0-40 degrees C. (ambient air),
- Humidity: 10-90% non-condensing,
- Power connection is to Installation Category II per IEC 664 (Powered from local level AC power),
- Environment Type (per UL508C and EN61010, Pollution degree 2).

Mounting

The SSt-EMF75 should be mounted behind covers or machine skins that can only be opened with a tool. The covers or machine skins should be marked as having hazardous voltages within. Alternatively, the supply can be mounted behind doors that have a safety interlock which removes power to the supply when opened.

The power supply should not be mounted in an area where the ambient temperature exceeds 40 degrees C, as measured when the power supply is fully loaded to its intended use. It is a good practice to mount the supply such that the transformer is furthest away from the center of the earth.

EMF-75 Specifications and Ratings

Rated Load Current (RMS)	10 A
Peak Current Capability (3 sec.)	30 A
Output Voltage, No Load	82.0 VDC max.
Output Voltage @ Rated Current	70.0 VDC min.
Input Voltage	115 VAC / 230 VAC via 4 tap settings.
Power Consumption	1280 VA
Input Frequency Range	50 – 60 Hz
Regen Turn-On Voltage	84 VDC ± 1V
Energy Storage	158 joules
Isolation (Hi-Pot test voltage)	1,350VAC
Weight	12.7 kg

Grounding & Bonding

The negative output of the SSt-EMF75 should be grounded directly to a machine frame ground, i.e. a machine frame that is referenced to safety ground. This effectively grounds the output of the supply and prevents the supply from becoming live with AC in unlikely event of a transformer failure. Connect a grounding strapping lug between the chassis ground and the -75V, (minus) terminals at TB1, (output terminal block). Note that you should not make the

connection to machine frame chassis ground at any point in the output power harness as part of the harness can be disconnected leaving the supply ungrounded.

Since the EMF75's PCB is well grounded to its chassis, mounting the power supply via the threaded mounting screws to the machine frame will effectively ground the power supply to machine frame ground. If you are going to mount the power supply via the three key hole slots or to a surface that is insulated from safety ground, you must have a separate grounding cable from the minus side of the DC output voltage tied directly to machine frame safety ground.

Note if the mounting plates are anodized, painted, etc., they will not be well grounded to machine chassis ground, (clear anodizing can be particularly difficult to spot here).

SSt-EMF75 AC Input Fusing

The SSt-EMF75 has two internal 5A/250V double time delay fuses to protect against catastrophic failure of the unit. When you connect 220 VAC-input to the power supply, these fuses are wired in series configuration, (they are wired in parallel under 110VAC input wiring.

Under rare circumstances this fuse can blow if the SSt-EMF75 is improperly configured for the application. If this fuse blows, disconnect main input AC-power and check the main AC-input wiring, the output transformer wiring and the output DC voltage wiring for shorts. If the wiring is correct, disconnect the load from the supply and replace the blown fuse with a 5A/250V double time delay fuse only, (Bussmann part# MDQ-5). Then, reconnect main AC-input power to the supply and finally connect the load to the supply. If, during this procedure, the fuse blows again, the supply should be returned to the factory for repair or replacement.

Note that the SSt-EMF75 power supply has a capacitance bank of 47,000 uf and can hold a significant charge. After disconnecting AC-input, we recommend that you measure the DC voltage across the output terminals to ensure that the capacitors has been sufficiently discharged prior to handling. Do not handle the supply until the voltage is below 40VDC.

EMF75 AC Input Wiring and Voltage Selection

When connecting AC to the input of the supply use the following wiring table to configure the 110 or 220 AC input voltage.

Input AC Voltage	**AMP: Pin 1**	**AMP: Pin 2**	**AMP: Pin 3**	**AMP: Pin 4**	**AMP: Pin 5**
115 VAC	AC Input	Jumper to 4	Jumper to 1	AC Input	Chassis ground
230 VAC	AC Input	AC Input	Jumper to 4	Jumper to 3	Chassis ground

The SSt-EMF75 does not include a AC-input power cable – this cable requires an 5 pin Mate-N-Lok connector to be terminated at the cable end that is to be plugged into the power supply:

AMP connector info and distributor contacts for connector and pins:

Vendor	5 pin Universal Mate-N-Lok Part #	Socket Part #	Crimp Tool Part#
AMP	1-480763-0	350550-3	90546-1
Digi-Key	A1454-ND	A25344-ND	A25160-ND
Mouser	571-14807630	571-350550-3	571-905461

EMF75 Output wiring and fusing

Note that the SSt-EMF75 power supply has a large output capacitance bank (47,000 uf) and can deliver hazardous voltages with high associated current.

The power output wiring (from supply to various motion drives) gauge shall be sized dependent upon how many SSt drives are daisy chained connected, (from one power connector on an SSt-EMF75 and out the other power connector on the same SSt drive on to the next SSt drive, etc.). You should use a wire gauge that is appropriate for the estimated amount of peak and continuous current draw for the machine application. Your Teknic application engineer can help provide you with the peak and continuous current requirements of the SST servo drive(s).

# SSt-1500s in a power chain	Maximum (smallest diameter) wire gauge required	Output Fuse/breaker required	Fuse Vendor: LittleFuse, Part #:
1-3	18 AWG	15A time delay (T)	326-015
4-5	16 AWG	20A time delay (T)	326-020
5-6	12 AWG	30A time delay (T)	326-030

The total resistance of the supply wiring to any SSt-1500 drive through other SSt-1500s, switches, connectors, breakers, fuses, etc. shall not exceed 0.1 ohms.

There is an output fuse protection that is provided as a courtesy to protect the output DC wiring from the supply to the various drives. Note that this output fuse is not designed to protect the supply, (there is input fusing for this purpose). The factory installed output fuse is a 15 Amp single time delay; swap with the appropriate fuse for your application requirements.

DC Voltage Output Connector:
The 75V DC output connector is either a Terminal block or an AMP Universal Mate-N-Lok, Part # is 1-480698-0. See "EMF75 AC Input Wiring and Voltage Selection" on previous page for more information.

Benefits

Today, when considering the routing of power to motion control axes, one typically has to decide whether to bus AC or DC power around the machine. Although, there are clearly some advantages of busing AC for single-axis machines, when the number of axes within the machine is greater than one, busing DC power offers OEMs

improved machine reliability, consistent machine performance, wiring advantages and cost savings. These points are reviewed below.

Reliability:

Reliability covers three main areas: the reliability of the supply itself, the reliability of other components within the machine and the overall machine reliability.

The SSt-EMF75 is a bulk, linear, unregulated power supply and consists of a transformer, bridge rectifier, regeneration circuit and an output capacitor. This simple architecture makes the EMF75 a highly reliable unit with a MTBF that is measured in the *tens of years*! These four primary components are amortized over all of the motion axes within a machine which, depending on the machine application, can be as high as 8-12 axes. Compare this to a drive that directly takes in AC power, where each drive (or each axis) requires a local, internal switching power supply. In this scenario, the machine no longer has simply one power supply, but actually, *n* power supplies in it, where *n* is equal to the number of motion axes within the machine. Virtually all quality standards consistently state that, reducing, not increasing, the number of components within a machine is an extremely effective method of improving machine reliability.

The DC-power architecture has further advantages as compared to drives that require an AC source. The internal switching supplies in these drives generate electrical noise and heat causing additional stress on the drive components. As a result, the manufacturers of the AC-input drives are required to oversize the internal components, add heat sinking, and shielding, just to meet CE. If they don't do this, then you, the machine designer, are required to add this to your machine. In either case, this further increases both amplifier cost and real estate or volume requirements.

On the other hand, the SSt servo drive uses a clean, filtered DC bus voltage source, like the EMF75, and subsequently runs much cooler than AC-powered drives in a comparable power class. Not coincidentally, the SSt also has the highest power density in its class!

Since this DC power architecture uses fewer parts within a machine and the sub-components are inherently more reliable, the overall machine reliability will increase. Also the mean time between operator assists will increase as well.

Performance:

Consistent and repeatable performance is an important requirement for automated machinery. Often the machine power source itself can be a limiting factor of the machine's performance as the local AC power sources vary widely from country to country, (many countries run as high as 240 VAC while others run as low as 165 VAC). Such a wide input power range can wreak havoc on a servo axis that has tight performance and tuning requirements, such as fast settling time or extremely smooth motion with no ripple. Since the EMF75 has provisions for high/low AC-line via a multi-tapped transformer, it is a simple procedure to measure the AC-input voltage and set the appropriate jumpers to deliver a consistent DC voltage to all motion control axes throughout the machine. Direct AC-input motion drives do not have this flexibility and therefor force you to operate at the wide variation of AC-input voltages, (and require you to quantify the machine operating parameters at the minimum input AC-voltage).

Another consideration is the case of inertial loads that have high acceleration and deceleration rates. The rapidly decelerating load causes the motor to act as a generator and creates a back emf into the motion drive. This excess energy must be addressed and often requires a separate regeneration unit on the drive as the local capacitor inside the AC-input drive is too small to handle this voltage increase. However, with a bulk,

linear supply, the native capacitance bank on the unregulated drive is usually sufficient to handle the regenerative energy from multiple decelerating loads. In the rare cases where this may be insufficient, the EMF75 comes standard with a regeneration protection circuit. Please call your Teknic application engineer for assistance with these calculations.

Cost:

Many AC-input drives have options, such as heat sinks, regeneration subsystems, shielding, custom connectors, and ferrite beads, that increase the total machine cost and volume requirements. Consider the fully burdened cost of the motion drives, and any required options in additional to the cable costs here. You'll find the EMF75 and the SSt servo line to be the most cost-effective product in its power class.

DECLARATION of CONFORMITY
(ACCORDING TO ISO/IEC GUIDE 22 AND EN 45014)

Manufacturer's Name:	Teknic, Inc.
Manufacturer's Address	1150-E Pittsford Victor Road Pittsford, NY 14534
Declares that product:	
Product Name:	Linear DC Power Supply
Model Number:	SSt-EMF75
Complies with the requirements of:	Standard EN 61010, LVD 73/72/EEC

Dave Sewhuk

VP Engineering, Teknic, Inc.