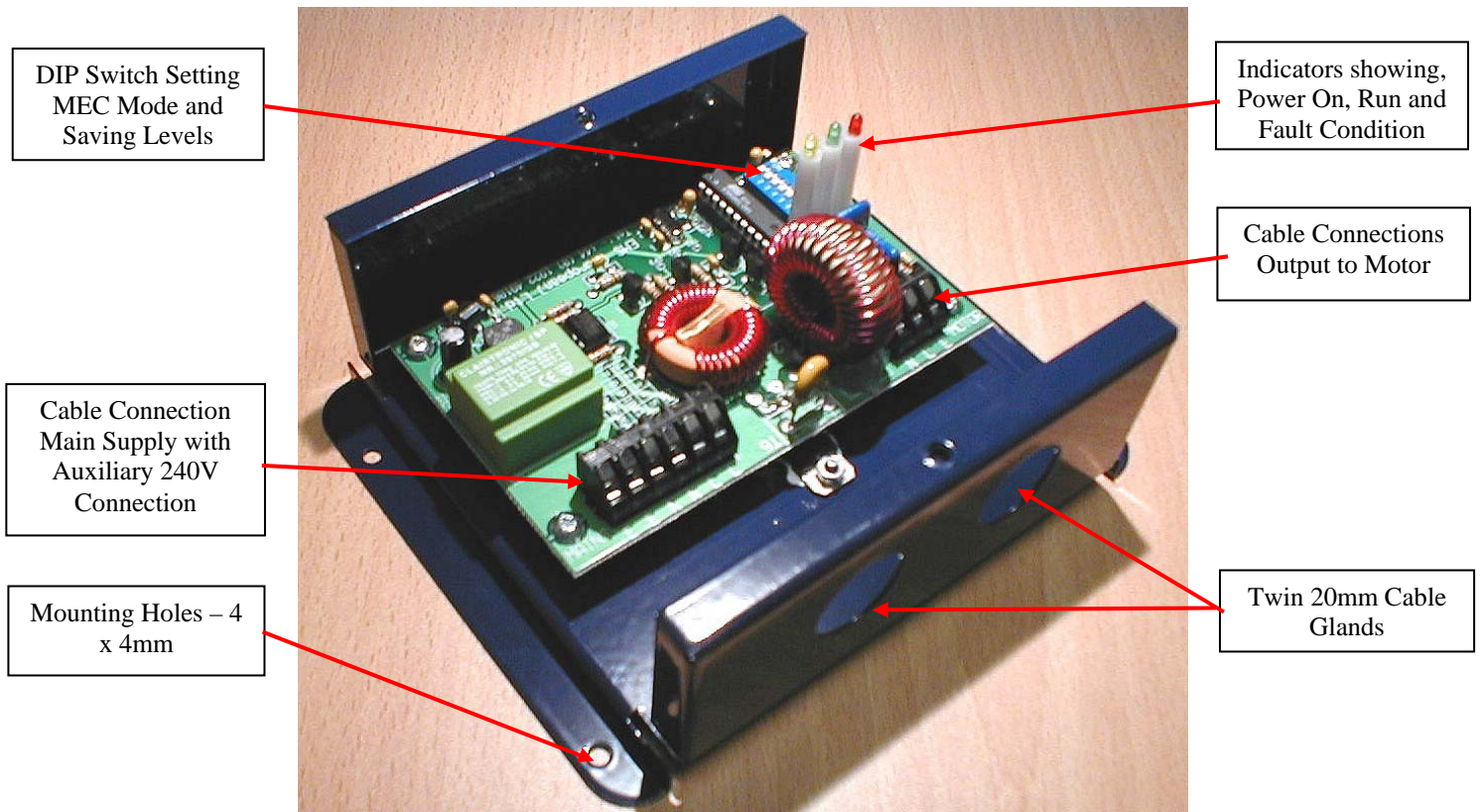


EnviroStart Single Phase Motor Energy Controller Installation & Commissioning Guide

Version 9 April 2005



Single Phase - ENVIROSTART Installation & Operation Instructions



Range

Part Number	If _{cont} @ 40°C	Supply Voltage	Dimension
240-SPMEC-4A	4A	200 – 260V	120 x 140 x 45
240-SPMEC-10A	10A	200 – 260V	120 x 140 x 45
110-SPMEC-4A	4A	90 – 130V	120 x 140 x 45
110-SPMEC-10A	10A	90 – 130V	120 x 140 x 45

15A & 20A units are available as special order items. Please contact EMS (European) for details and pricing.

Installing and Wiring EnviroStart

- (1) The installer should be a competent person for installation of electrical goods.
- (2) The power should be disconnected before installation and only put back on once installation is complete.
- (3) The only motors for which the Single Phase EnviroStart is suitable are 200 - 250V AC single-phase induction motors. (Also known as “Cage” or “Squirrel Cage” motors). EnviroStart **cannot** be used on DC motors, Switched Reluctance motors or any form of Three Phase motor.
- (4) Check that the current rating of the unit is the same or higher than the full load current (FLA) of the motor, which should be on the nameplate of the motor. If in doubt contact the motor manufacturer or supplier.
- (5) The single phase EnviroStart is specified for a nominal 240V AC, but can handle lower voltages for short periods of time. However as the voltage drops the current may go up. The current rating of the unit should not be exceeded.
- (6) Use the correct size of cable for the current rating of the unit.
- (7) The EnviroStart must be installed as the last piece of equipment before the motor.

Once you are ready to install the unit, unscrew and remove the lid. Make ready your connection cables and thread them through the glands found on the side of the unit. Make the ends of the cable off and connect into the terminals, which are found on the circuit board. Make sure the earth cables are connected between the box, lid and circuit board terminal block and replace the lid. The unit is ready to be switched on.

EnviroStart provides terminals for the incoming mains supply and also a set of auxiliary connections to provide supply for additional components that cannot be optimized such as secondary fans in refrigeration systems and condenser pumps in freezers.

The controlled output to the motor is found on a separate connector set clearly marked “Motor”. Under no circumstances should the supply voltage be applied to this connector block.

Setting up EnviroStart

All EnviroStart DIP Switches are polled continuously and it should be possible to make changes whilst the unit is running to change between operational modes. It is however good practice to make changes whilst the unit is switched off to ensure that the software is not “hung” or “corrupted” as a result of a spike being transmitted to the chip during “live” switching.

After making sure all the connections are correct, the unit can be switched on. (It is recommended that any switching of the motor be carried out by switching the supply to the EnviroStart and not by switching the load). As power is applied the green **POWER ON** light should light up on the front of the unit, the motor should start turning immediately, ramping from stationary to full speed. It will take approximately five seconds after the motor has reached its top of ramp speed before the energy saving routine is initiated. Depending upon the operational mode selected, fully automatic or fixed pedestal voltage, (see below), the optimization routine will then take approximately fifteen seconds to fully establish itself at which point the amber **RUN** light will come on. Depending upon mode and the level of savings being achieved the amber **RUN** light may be on constantly or flicker on and off; either condition is perfectly normal.

During the course of normal operation, the red **FAULT** lamp may flicker on and off occasionally as the optimization process establishes the torque limits for the motor – load combination.

Commissioning

It is necessary to establish the “safe operating level” mode for the EnviroStart with the given motor-load combination. In the first instance, unless otherwise directed, always try the default setting for the unit; this is Automatic Mode – Level 2, as indicated within the Table 2 below. If the motor runs up, EnviroStart goes into saving mode, (as indicated by the amber **RUN** light flickering on and off) and the motor remains stable throughout any load variations, (including re-starts if the unit is externally controlled by say a thermostat or PLC), then you may want to try Automatic Mode – Level 1. This level will provide a slightly higher degree of saving if the motor-load combination can handle the voltage and current reductions created by the EnviroStart. If the motor becomes unstable and is unable to maintain the load torque requirement then try Automatic Mode – Level 3, and so on to Level 4. If the Automatic Mode levels do not provide a capability to maintain the motor load demands then move to the Pedestal Voltage Modes, shown in Table 3. This Mode provides four operating levels. If Automatic Mode – Level 4 has not worked then move to Pedestal Voltage Mode Level 1 and work through to Level 4. If none of the Automatic Modes works then one of the Pedestal Voltage Modes, will.

Establishing the non-optimizing current and voltage levels can be achieved by setting the DIP Switches as shown in Table 4. This allows you to determine what power the motor would consume without EnviroStart for comparison with the power levels that it is consuming with EnviroStart. The relationship between the “before” and “after” readings giving the percentage savings being achieved at the time the measurements were taken. In this always be careful to establish the power levels over a period of time rather than spot checks, as these can be unreliable indicators or true power.

Faults

If the motor sounds as though it is running unevenly or appears to stall at any time during its operation then please see the instructions below, on backstop settings.

If the fault light comes on for more than a short period, switch off the unit for five minutes to allow the EnviroStart to cool and then switch on again. If the fault lamp comes back on straight after the unit has been switched off, the unit is faulty and should be replaced. (Please note there are no user serviceable parts within the EnviroStart).

Energy Saving Mode

The unit can be switched between DOL (Direct on Line) and Energy Saving mode by altering DIP Switch 1 as Table 1 below shows. This action should not be undertaken by anyone other than qualified electrical engineers.

Note the circuit board is live and at 240V/110V AC. Therefore, unless you are an experienced electrician, the unit should be switched off before the lid is removed and any settings changed, and the lid should be replaced and secured prior to switching on again.

Table 1

Switch 1	Energy Optimization
ON	OFF
OFF	ON (Default)

Energy Saving Mode Backstop Voltage Settings

Once the unit is operating in Energy Optimization Mode the following settings can be made. The settings correspond to limiting how far the voltage applied to the motor will drop. The lower the drop in voltage the more power savings will be achieved. The reason for the settings is that there are thousands of different types of motors on thousands of different applications. Some of these applications would benefit from not dropping the voltage as far as is possible as they may go into an unstable or stall condition. The unit should be tried with its default settings, (Automatic Mode – Level 2), which should work in the majority of cases. If the motor appears to be stopping and starting or stalling after a short period of operation, switch the unit off and change the settings to the next step towards minimum optimization and retry. This should improve matters, if it does not move to the next setting and try again.

Note the circuit board is live and at 240V/110V AC. Therefore, unless you are an experienced electrician, the unit should be switched off before the lid is removed and any settings changed, and the lid should be replaced and secured prior to switching on again.

Table 2 Automatic Mode of Operation

Switch 1	Switch 2	Switch 3	Switch 4	Energy Optimization
OFF	OFF	OFF	OFF	Max. Level 1
OFF	OFF	ON	OFF	Level 2 (Def)
OFF	OFF	OFF	ON	Level 3 ↓
OFF	OFF	ON	ON	Min. Level 4

Table 3 Pedestal Voltage Mode of Operation

Switch 1	Switch 2	Switch 3	Switch 4	Pedestal Voltage
OFF	ON	OFF	OFF	Level 1 (170V)
OFF	ON	ON	OFF	Level 2 (180V)
OFF	ON	OFF	ON	Level 3 (190V) ↓
OFF	ON	ON	ON	Level 4 (200V)

The voltages shown in Table 3 are not absolute but indications only. Input voltage and load conditions will cause the output voltage to change from that shown.

Table 4 Maximum Operating Voltage and Current Applied Mode

Switch 1	Switch 2	Switch 3	Switch 4
ON	OFF	N/A	N/A

Refrigeration Applications

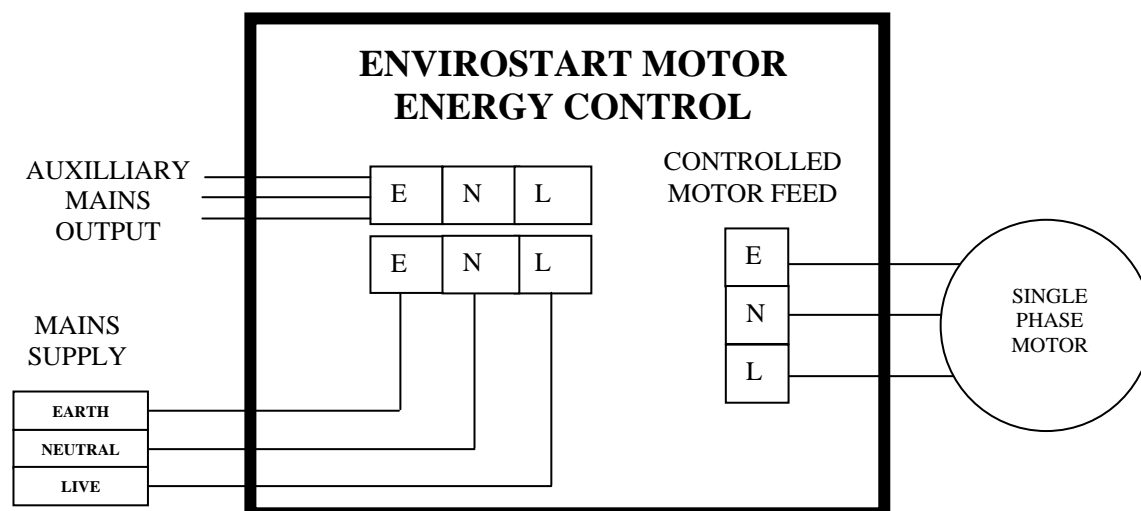
In all cases where EnviroStart is fitted to refrigeration compressors, a minimum period of two minutes should elapse between stopping and starting the compressor motor. This is to allow the system to shed its backpressure. In many systems such as those manufactured by Cornelius, you will find that the thermostat has a built in timer, in applications where such a timer does not exist, it is imperative that you observe the two minute rule especially during set up and commissioning when frequent stop-start cycles are undertaken.

Certain system compressors may stall in the event of a restart within the two-minute period with EnviroStart fitted. These are generally, but not always, systems with a mechanical thermostat fitted. If you experience problems with the unit re-starting in such conditions then use the inbuilt timer feature of EnviroStart by switching DIP 6 into the “ON” position. This will cause the unit to always wait two minutes before a restart is allowed ensuring backstop pressures are equalized within the compressor circuit. (Default value is “OFF”).

Table 5 Implementing Integrated Time Delay Function

Switch 1	Switch 2	Switch 3	Switch 4	Switch 5	Switch 6
N/A	N/A	N/A	N/A	N/A	ON

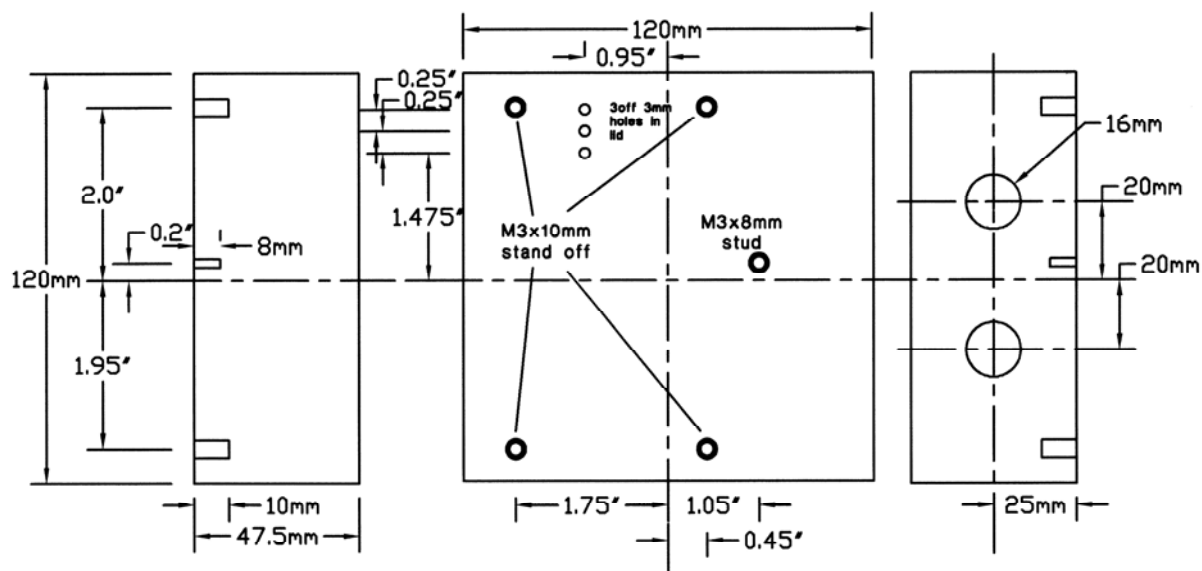
Single Phase Simplified Installation Connection Diagram



Technical Specification

Supply Voltage	Nominal 110 or 240V single phase AC (De-rate current for 110V)
Frequency	50 or 60Hz full automatic selection
Starts Per Hour	≥ 45 starts at T _{amb} +20°C
Start Duty	3 x continuous rating for 5s at T _{amb} +20°C
Kick Start	70% of maximum voltage for 3s
Soft Start	Fixed logarithmic ramp 1.5s
LED Indicators	Power-on / Run / Fault Condition
Cooling	Naturally cooled isolated “cold wall” back plane enclosure
Control Circuitry	12MHz clocked Atmel MPIC
Power Switching	1.5 x current over-rated, isolated base triac
Control Supply	Integrated isolating transformer derived from supply
Mechanical Rating	IP43, NEMA 1 galvanized powder coat metal enclosure
EU Directives	Meets all EMC and Low Voltage Directives
UL Directives	Complies with all UL requirements for power control electronic systems
Operating Humidity	Up to 95% non condensing
Operating Temperature	-15°C to +40°C (De-rate current by 20%/10°C)
Altitude	4000m above sea level. De-rate current by 1%/100m above 4000m

Mechanical Details





MANUFACTURERS DECLARATION OF CONFORMITY

This declaration covers all Single Phase **EnviroStart** units.

This product fulfils the following European Community Directives when applied as follows:

Low Voltage Directive

The above products fulfil the Low Voltage Directive 73/23/EEC and 93/68/EEC amendment for industrial equipment; however, they must be installed to general good electrical engineering practices and regulations by a suitably qualified person with strict reference to the instructions in the product's Technical Manual.

EMC Directive

The above products are intended to be a component in a system or a machine. They must be mounted into an appropriate enclosure and system designed to fulfill the CE directives plus IEC and local industrial standards. Units must be installed by a suitably qualified person to comply with general good electrical engineering practices and regulations with strict reference to the instructions in the product's Technical Manual. To meet all EMC directives, the above products are available with an optional RFI Filter.

The above is based on test results from an independent facility (Incotech Ltd.) to test specification EN50081-2, EN50082-1 and EN50082-2.

Dated: November 2003.