

EnviroStart™ Single Phase Demonstration Case Operational Guide

Version 4 April 2010



EnviroStart Single Phase Demonstration Case

IMPORTANT WARNING

Failure to read and comply with this manual may result in damage to the EnviroStart Unit and driven equipment and may render the warranty invalid.

1. The Demonstration Case is for short tests only and should not be permanently wired into any application.
2. The Demonstration Case should be earthed via the supply plug, failure to do so may, in the event of a fault, cause parts of the metalwork to become live.
3. Do not connect the Demonstration Case to a motor with an FLC (running current), of greater than 10A.
4. Internal components and areas of the control circuit boards, (except the isolated I/O terminals), can be at mains potential when the EnviroStart is connected to a supply. The voltage is extremely dangerous and may cause death or severe injury if you come into contact with it.
5. When the EnviroStart is connected to the mains, the output connections should be treated as being live even if the load is not being driven.
6. Do not make any connections to the Demonstration Case when the EnviroStart is connected to a live supply.
7. Do not make voltage withstand tests on any part of the Demonstration Case.
8. Do not touch IC-circuits on the PCB. Certain items are static-sensitive and static voltage discharge may destroy the components.
9. Do not at any time operate the Demonstration Case with the top cover removed.
10. Updated and current Operational Guides are maintained on the EMS (European) web site at <http://www.EnviroStart.com>; always check the web site for latest issue documents.



MANUFACTURERS DECLARATION OF CONFORMITY

This declaration covers the EnviroStart Single Phase Demonstration Case.

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, 89/336/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 fulfil 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.

IEC-1000-4-2 Level 3; IEC-1000-4-3 Level 3; IEC-1000-4-4 Level 4; IEC-1000-4-5 Level 3; IEC-1000-4-12 Level 3.

The above is based on test results from an independent test laboratory (Steatite Group Ltd.) to test specification EN 50081-2, EN 50082-1 and EN 50082-2.

Harmonised Standards Applicable

BS EN 6094.4.4 (which calls on EN 56011); EN 55022; EN 51000.4.2;
EN 61000.4.3; EN 51000.4.4; EN 61000.4.5; EN 61000.4.6; EN 61000.4.8;
EN 61000.4.11; BS EN 50081.1; BS EN 50081.2; BS EN 50082.2; EN 6094.4.2;
IEC-947-4-1; IEC-68-2-6, (NFC2076; BV1); IEC-947-4-2.

Electrical Requirements Specification G5/4 - 2 (2008)

Dated: April 2010

TECHNICAL SPECIFICATION

SUPPLY VOLTAGE	Nominal 110V or 220V Single Phase AC (Non Floating Neutral) (Defined at Time of Order)
FREQUENCY	50Hz or 60Hz (Defined at Time of Order)
STARTS PER HOUR	≤45 starts at T _{amb} +20°C
START DUTY	3 x Unit FLA for 5s at T _{amb} +20°C
FULL POWER START	2.5s
SOFT START TIME	Selectable Logarithmic Ramp 3s
LED INDICATORS	Power-on (Green) / Yellow (Optimize) / Over Current (Red)
COOLING	Naturally Cooled Isolated “Cold Wall” Back Plane Enclosure
CONTROL CIRCUIT	12MHz Atmel MCS-51 Microcontroller
POWER SWITCHING	Isolated Base Triac
CONTROL SUPPLY	Integrated Transformer Providing PCB Supply from Mains Supply
MECHANICAL RATING	IP54, NEMA 1 ABS 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 (Conformally Coated Systems Can Be Provided)
OPERATING TEMP	-15°C to +40°C (De-rate current by 20%/10°C above +40°C)
ALTITUDE	4000m Above Sea Level. De-rate Current by 1%/100m Above 4000m

GENERAL CONSIDERATIONS

1. The installer and demonstrator 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 Demonstration Case is suitable are 110V and 220V AC single-phase induction motors. (Also known as “Cage” or “Squirrel Cage” motors). EnviroStart Demonstration Cases cannot be used on DC Motors, Switched Reluctance Motors or any form of Three Phase Motor.
4. Check that the current rating (FLA) of the motor being used for the demonstration is no more than 10A. If in doubt contact the motor manufacturer or supplier.
5. Use only the supplied cables.
6. If a motor other than that supplied with the Demonstration Case is being used for the demonstration then the EnviroStart must be installed as the last piece of equipment before the motor.

This Operational Manual should be read in conjunction with the Single Phase Installation and Commissioning Guide. This Guide can be found on the EnviroStart web site at <http://www.envirostart.com>

EnviroStart Single Phase Demonstration Case

The Demonstration Case contains a standard 220-SPMECG6-10A single-phase EnviroStart unit but with the control DIP switches bought out to the front panel and internal meters showing Current Drawn, Percentage Relative Power and Voltage to Motor

The Demonstration Case is supplied with a motor which should be used in preference to any other motor

Setting up the Demonstration Case

It is recommended that when you use the motor provided with the Demonstration Case that you set the EnviroStart switches to the “factory ship” default settings. This has all DIP switches in the “OFF” position except for DIP switch 3 which will be in the “ON” position.

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 does not hang or corrupt because of switch induced spikes. (In this, familiarize yourself with the Demonstration Case and its operation before you make a presentation that way there will be no surprises for either yourself or your Customer).

As power is applied the green **POWER ON** LED should light up on the PCB, 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 and stabilized. Depending upon the operational mode selected, Variable Hold Off, (fully automatic energy saving operation), or Constant Hold Off (fixed voltage operation). The optimization routine will take approximately fifteen seconds to fully establish itself, during this time the amber **RUN** and the red **OVER CURRENT** LED's may flicker on and off, at which point the amber **RUN** LED will come on. Depending upon mode and the level of savings being achieved the amber **RUN** LED may be constantly on or flicker on and off; either condition is perfectly normal.

During the course of normal operation, the red **OVER CURRENT** LED may flicker on and off occasionally as the optimization process establishes the torque limits for the motor – load combination, this is not a problem and is perfectly normal for this control.

Using the Unit

It is necessary to establish the “safe operating level” mode for the EnviroStart with the given motor-load combination. The motor supplied with the system is known to work effectively with the default settings for the EnviroStart MEC however this may not be the case if another motor is connected to the output of the Demonstration Case.

In the first instance, unless otherwise directed, always try the default setting for the unit; this is Variable Hold Off – Level 2, as indicated within Table 2 below. If the motor runs up, EnviroStart goes into saving mode, (as indicated by the amber **RUN** LED being on 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 Variable Hold Off – 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 on the other hand the motor becomes unstable at Level 2 and is unable to maintain the

Default Switch Conditions

ADJUSTMENT	FUNCTION	DEFAULT SETTING	RESULT
Switch 1	Full Power or Optimize Selection	OFF	Energy Savings Enabled
Switch 2	Control Mode	OFF	Dynamic Control
Switch 3 & 4	Energy Saving Level	ON OFF	Level 2 Energy Savings
Switch 5	Soft Start	OFF	Soft Start Disabled
Switch 6	Two Minute Time Delay	OFF	Time Not Enabled

After making sure all the connections are correct, the unit can be switched on.

NOTE: It is essential that any switching of the motor be carried out by switching the supply to the Demonstration Case and not by switching the load

As power is applied the green Power-on LED 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 2.5s after the motor has reached its top of ramp speed before the energy saving routine is initiated. Depending upon the operational mode selected, Variable Hold Off or Constant Hold Off, the optimization routine will then take approximately fifteen seconds to fully establish itself at which point the amber Energy Save LED will come on. (during this time it is likely that the red Fault LED may flicker, this indicates only that the unit is establishing the parameters for an acceptable energy saving level for the motor). Depending upon mode and the level of savings being achieved the amber Energy Save LED may be on constantly or flicker on and off; either condition is perfectly normal.

During the course of normal operation, the red Fault LED may flicker on and off occasionally as the optimization process establishes the torque limits for the motor and load combination; this is perfectly normal.

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 Variable Hold Off – 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 LED 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 Variable Hold Off – 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 Variable Hold Off – Level 3, and so on to Level 4. If the Variable Hold Off levels do not provide a capability to maintain the motor load demands then move to the Constant Hold Off modes, shown in Table 3. This mode provides four operating levels. If Variable Hold Off – Level 4 has not worked then move to Constant Hold Off mode Level 1 and work through to Level 4. If none of the Variable Hold Offs works then one of the Constant Hold Off modes will.

Establishing Energy Savings

Establishing the current and voltage levels without energy savings can be achieved by setting DIP Switch 1 into the Full Power position thereby disabling energy savings. The motor will be supplied with full current and full voltage as though the EnviroStart was not in circuit. Reviewing the Percentage Relative Power meter will allow you to establish the relative power, (independent of voltage or current level), in both saving and non saving mode, the difference between the two being the percentage saving that is being achieved. 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.

Fault Conditions

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 Modes

Automatic Saving Mode

The unit can be switched between DOL (Full Power) 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.

Table 1 Energy Save Mode Selection

SWITCH 1	ENERGY SAVING MODE
ON	Energy Saving Disabled – Full Power
OFF	Energy Saving Enabled (Default)

Once the unit is operating in Energy Saving 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, (Variable Hold Off – 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 Saving Level Selection

SWITCH 2	SWITCH 3	SWITCH 4	ENERGY SAVING
OFF	OFF	OFF	Max. Saving. Level 1
OFF	ON	OFF	Level 2 (Default)
OFF	OFF	ON	Level 3
OFF	ON	ON	Min. Saving. Level 4

Constant Hold Off Saving Mode

In the event that the Variable Hold Off of energy savings is not satisfactory then you can place the unit into a “fixed backstop voltage” condition however this should be done in very controlled environments as the system will not then operate dynamically and should full power be required on the motor it will not be available. See Table 3 below.

Table 3 Pedestal Voltage Saving Level Selection

SWITCH 2	SWITCH 3	SWITCH 4	PEDESTAL VOLTAGE
ON	OFF	OFF	≈ 70% Supply Voltage (≈30% Savings)
ON	ON	OFF	≈ 80% Supply Voltage (≈20% Savings)
ON	OFF	ON	≈ 85% Supply Voltage (≈15% Savings)
ON	ON	ON	≈ 90% Supply Voltage (≈10% Savings)

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 based on a supply voltage of 220V.

Soft Start

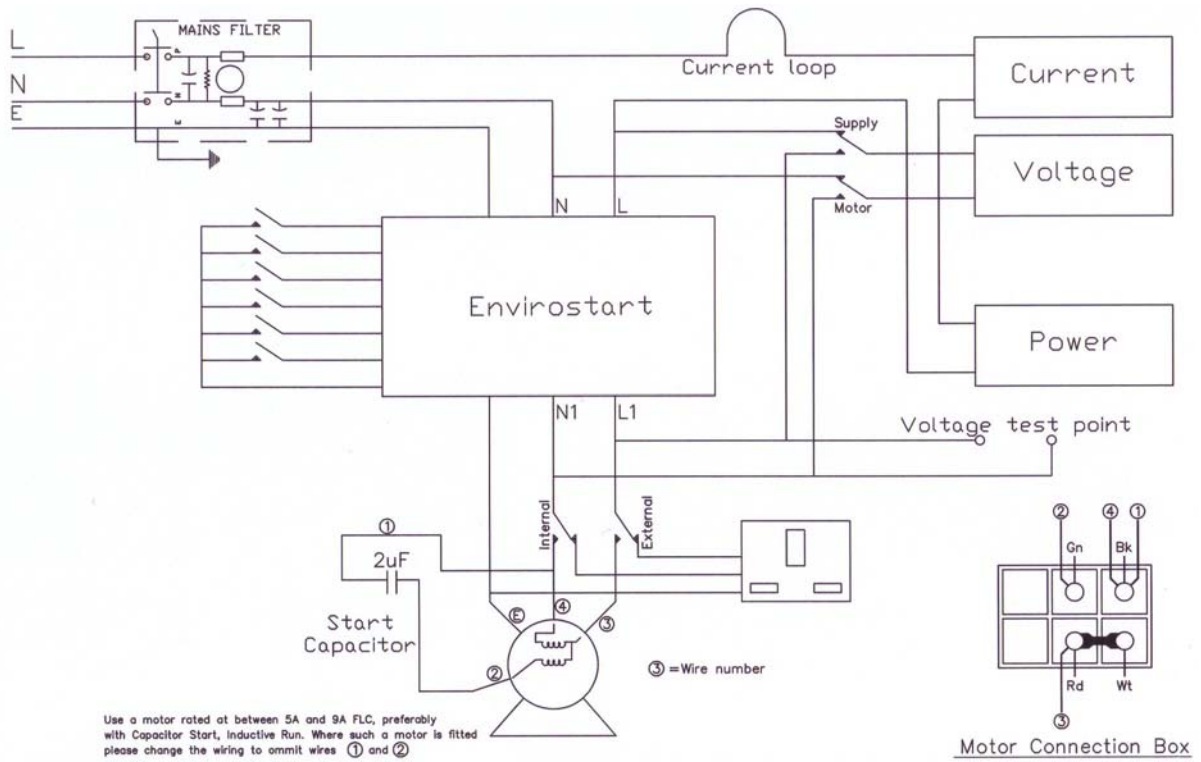
In the event that you want a soft start function, for example, with a water pumping application, then this can be enabled by putting DIP Switch 5 into the ON position. This switch will enable a 3s ramp start prior to a 2.5s DOL period after which time the system will go into energy save mode.

Refrigeration Application Settings

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”).

Demo Case Wiring and Motor Installation Diagram



OPERATING GUIDE END