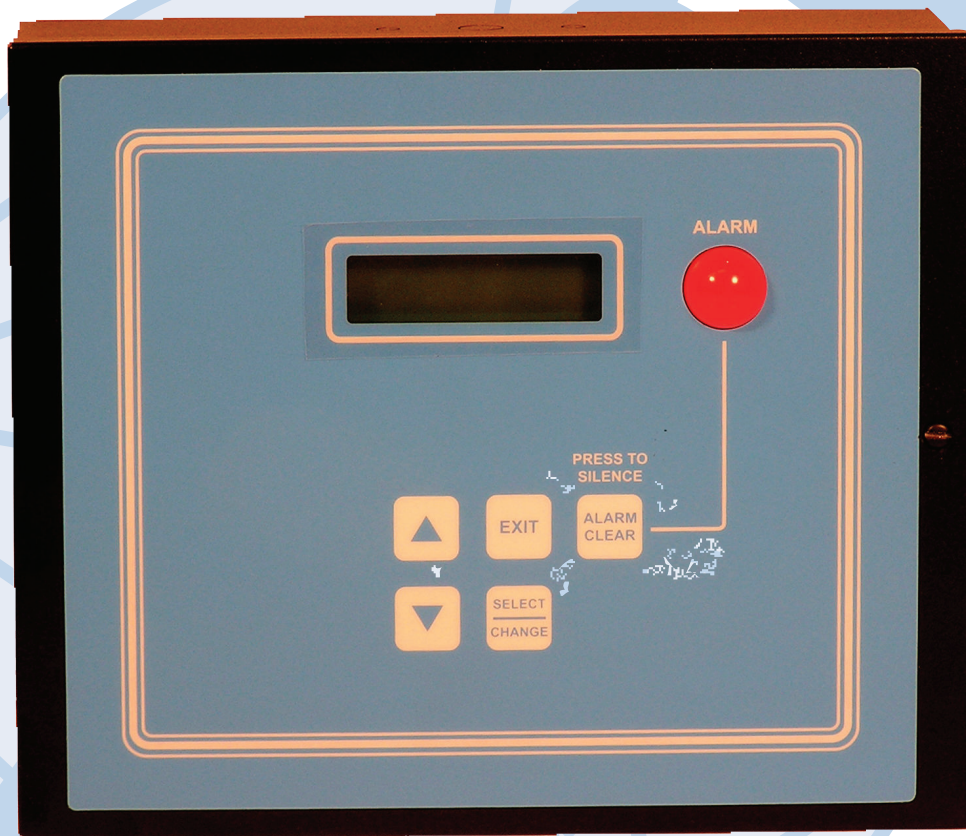


CES

Compressor / Condenser / Evaporator Control System



Compressor / Unloader Control
Time / Air & Electric Defrost Control
Condenser Fan Control
Communications
Dual Fail Safe Critical Products Control



GENESIS INTERNATIONAL, INC.

Compressor Condenser Evaporator System (CES)

PURPOSE

The Compressor / Condenser / Evaporator Control System (CES) is an ETL approved all electronic control system that controls two compressors or one compressor and one unloader, a maximum of three condenser fans, a single off-time/electric defrost circuit, the case temperature of a single system, and the monitoring and alarming of all monitored pressures and temperatures. The system is menu-driven, and the keypad allows the user to make changes quickly by answering the prompted questions.

Compressor Control - The CES can control two steps, either two compressor or one compressor and one unloader which can be controlled by suction pressure, case temperature, or suction pressure reset.

Condenser Control - The CES can control a condenser fan bank with up to 3 fan stages or speeds. The fans can be controlled based upon head pressure, liquid line temperature, or when the compressor is running

Defrost - The CES can operate a single defrost circuit in off-time or electric cycles. The defrost schedule can include up to 8 cycles, a pump-down cycle, a drip cycle and an evaporator fan on delay. Defrosts can be terminated by temperature or suction pressure

Dual Fail Safe Control - The CES can be installed on a dual system to provide fail safe control on systems where increased total system reliability and tighter temperature control is required. Using CAN Bus technology, both unit remain in constant communication with each other.

COMPRESSOR CONTROL

Compressors -- The **Compressor CES** is capable of controlling a small rack with up to two parallel fixed-speed compressors or one compressor and one unloader. The parallel compressors will be activated based upon a temperature setpoint and differential, a suction pressure setpoint, or a combination of both.

Staging -- The compressor staging method can be set for sequential staging or random (round-robin) staging.

Sequential The compressors will be activated and deactivated in a FILO format, the first compressor on will be the last compressor turned off.

Round-Robin The compressors will be activated and deactivated randomly in order to maintain even compressor run times over a 24 hour period. Each compressor will be activated at least once every two hours to prevent the lubrication oil from migrating out of the compressor.

Unloaders -- The CES can operate single unloader. The unloader will operate on an accelerated algorithm as compared to the compressor algorithm. When a compressor with an unloader is activated, the compressor will initially start unloaded.

Mechanical Back-Up -- Mechanical pressure controls can be installed on the rack and operate in two different methods:

Series Switchback The CES is configured to operate the compressors by de-energizing the control relays. The mechanical low pressure control is wired in series with the CES control relay. If the control fails, all compressor relays will be activated and the low pressure mechanical controllers will cut out the compressors when the suction goes below their settings. NOTE: This method is only possible with the addition of a timing relay in series with the compressor contactor coil voltage to prevent short cycling on start-up.

Parallel Switchback The CES is configured to operate the compressors by energizing the control relays. The mechanical low and high pressure controls are wired in parallel to the CES with the line voltage to the backup wire through an energized "Alarm" relay on the EPC. If the CES fails, all CES control relays are de-energized, the Alarm relay is de-energized and power is switched to the backups. The mechanical backup controls now operate the compressors based upon their Cut-In and Cut-Out settings. With this method, the backup settings can be set to run the rack as closely to the suction setpoint as possible.

CONDENSER CONTROL

The **Condenser CES** can operate a condenser with up to 3 independent fixed speed fan banks or one three speed fan. The CES can monitor the head pressure and a liquid drop leg temperature.

Sequential Staging -- The CES will sequentially stage the fan banks in the FILO format (first on last off). The fan bank closest to the condenser input manifold should always be assigned as the first, or primary, fan bank. The CES will keep the first fan bank running nearly constantly to prevent expansion

and contraction at the pipe and tube sheet joints.

Fan Bank Control -- The CES will operate the condenser fans based upon one of three methods.

Fixed Head Pressure Control

The CES can stage the condenser fan banks based upon a fixed head pressure setpoint.

Fan On When Compressor Active

The CES can be setup to only run the condenser fans when the compressor is running.

Parallel Mechanical Backups--Backup pressure controllers or thermostats are wired in parallel with the CES Condenser Control Relays with their power supply circuitry wired through the Alarm Relay. If the CES were to fail, the Alarm Relay will de-energize, supplying power to the backup controls. The backup controls may be set as closely to the Head Pressure Setpoint as possible.

DEFROST

The **Evaporator CES** is capable of operating a single defrost circuit. The defrost schedule has a maximum of 8 cycles per day. Each cycle can be programmed with a dump down, defrost cycle time, drip cycle delay and fan on delay.

Gas Defrost Solenoid/Electric Heater Relay - The CES has a defrost relay which can be utilized to control a gas solenoid or an electric heater.

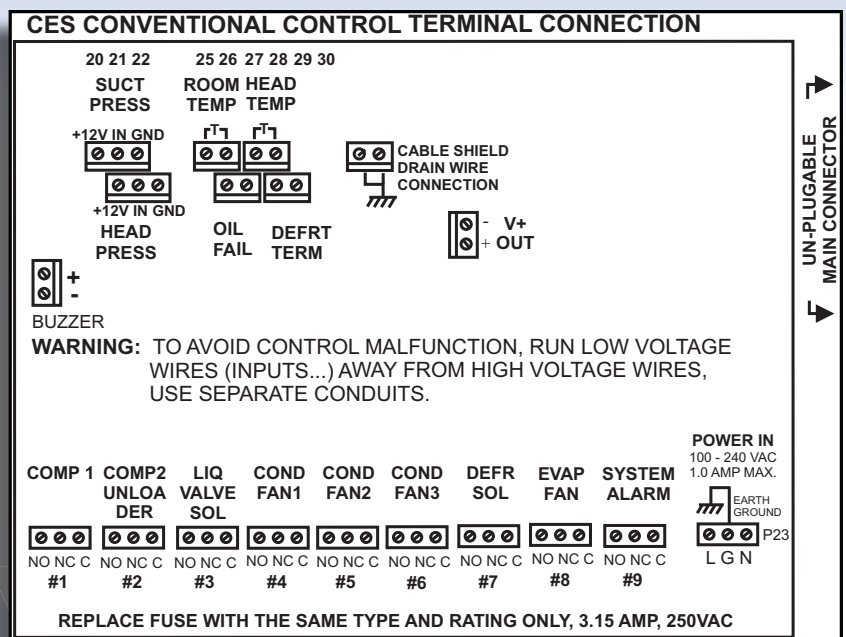
Defrost Schedule - The defrost circuit can be scheduled for up to 8 cycles per day, for up to 120 minutes per cycle. The defrost circuit can be assigned as an Off-time, Gas or Electric defrost.

Defrost Termination-- The CES can terminate its defrost cycle either by the closure of a digital ClicksOn Thermodisk or by a Suction Pressure Setpoint.

Fan Cycling -- The CES can cycle an evaporator fan once the temperature within the space is met. The CES will also restart the fans after a settable delay to prevent stratification of the air.

DUAL FAIL-SAFE SYSTEM

In applications where a temperature or a refrigerated storage box, contains a critical product, the system is sometimes controlled by two, completely identical



and redundant, refrigeration systems consisting of a condensing unit and evaporator(s) for each unit. Each refrigeration system will operate independently and alternate control. The systems may consist of a single compressor with or without an unloader. Defrost can be Off Time or Electric.

By combining two independent CES controls either mounted one to each compressor to facilitate easier wiring, side by side or mounted together in a specially designed housing, a CES Dual Fail Safe Control System will alternate in lead/lag fashion using a single communication connection that transmits each controls' operational status to the other.

Temperature Control Requirements. Each unit will control the temperature of the room by one of the following methods:

- a. Cycling the Compressor based upon room temperature.
- b. Cycling the liquid solenoid valve based upon room temperature. The compressor is controlled by pressure "stats" and is independent from the control.
- c. Cycling the liquid solenoid valve based upon room temperature. The compressor is controlled suction pressure control.

Defrost and Alarm Requirements. Should one of the systems go into a defrost cycle or fail in any way, the second will take control and operate the box. If there is an alarm situation, an alarm signal will be broadcasted to a monitoring system.

CONTROL SYSTEM

Control

Microprocessor based
Program logic stored within non-volatile EPROM memory. Set points and system configuration stored within EEPROM with at least 10 years storage life. Logged Data stored on the memory chip with backup power.

Menu driven controls with all operating sequences and control algorithms included. The control has non-volatile program memory and a capacitor backed clock in the event of power outage. All programmable options are installed via a "Yes" or "No" question.

Keypad

Front panel accessible with 5 tactile key switches.

Key assignments -- UP, DOWN, SELECT/ENTER, EXIT, ALARM CLEAR.

Display

2 x 16 character LCD Back Lit Display. Six control status lights and two alarm lights.

Power

Input -- 100-250 VAC, 50/60 HZ, 0.8 Amp.

Housing

Metal Cabinet, NEMA 1, Enclosure
Option 1 - Metal Cabinet, NEMA 1, Door Mountable
Option 2 - Metal Cabinet, NEMA 4, Enclosure, Locked Handle

INPUTS

Suction Pressure Transducer, 0-200 PSIG
Head Pressure Transducer, 0-500 PSIG
Oil Pressure Clicks-on or Transducer
Room Temperature Sensor, 2-wire thermistor, -40 to 150 °F
Head Temperature Sensor, 2-wire thermistor, -40 to 150 °F
Defrost Termination Clicks-on or thermistor
All inputs use un-pluggable screw terminals

OUTPUTS

Control and Alarm Relays

Nine (9) total relays. These relay outputs are 1 Form C SPDT rated for 250 VAC and 3.15 Amp per circuit. Each relay circuit is fused with a 3.15 Amp slow blow fuse on the common leg. Outputs are screw terminal type.

LISTINGS ETL, Conforms to UL Std. 3111-1
Certified to CAN/CSA
C22.2 Std. No. 1010.1



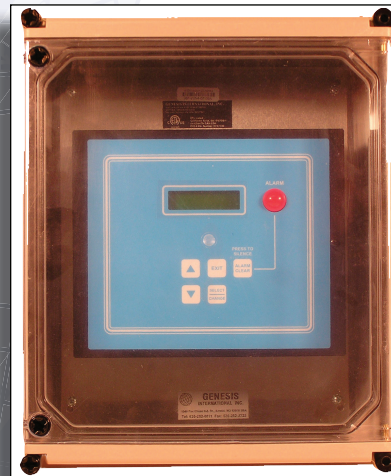
NEMA 1 Compliant Enclosure - This enclosure is intended for indoor use only primarily to provide a degree of protection against contact with the enclosed equipment. The enclosure is not designed to provide protection from water or to be placed in a hazardous environment.



Mount only in Pollution Level 2 environments, i.e.. Environmentally controlled offices, control rooms, or environmentally controlled machine rooms.

DIMENSIONS Inches (mm)
7.25 x 8.0 x 3.2 (184 x 203 x 76)

NEMA 4X Enclosure (IP67) - This enclosure is intended for either indoor or outdoor use, 0 to 50 °C, to provide a degree of protection against corrosion, windblown dust and rain, splashing water, and hose directed water.



DIMENSIONS
Inches (mm)
12.13 x 14.88 x 6.88
(308 x 378 x 175)



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