altronic

SAVEAIR™

Electronic Air Start System for Air-in-Head-Equipped Integral Compressor Engines

- **Replaces existing air-in-head starting systems with solid-state microprocessor-based control technology**
- **Reduces starting air consumption by as much as 70% per start**
- **Eliminates "dead spots"**
- **Eliminates manual barring of engine – increases operator safety**
- **Provides more reliable remote starting**
- **Eliminates failure prone mechanical air start distributor and cam actuated valves**
- **Less costly and complex than ring-gear based starting conversion systems**
- **"Universal" system can be installed on virtually any suitable engine**
- **CSA certified for use in Class I, Division 2, Groups C and D hazardous areas**

The SaveAir™ Electronic Air Start System brings solid-state electronic control to the starting function on air-in-head starter-equipped integral compressor engines. Eliminating many of the mechanical air-start related components, the solid-state SaveAir system introduces significant operational advantages, including a substantial reduction in the required starting air (up to 70%) and the elimination of starting "dead spots".

The SaveAir system replaces the existing OEM or pneumatic air distributor system with an innovative position sensing device (the SaveAir Distributor) to determine the precise angular location of the engine crankshaft. Given accurate radial position data, the SaveAir system electrically actuates air-starting solenoid valves which precisely control both the turn-on time of the in-head valves as well as the duration of the air admission events during startup. These unique capabilities enable the SaveAir system to deliver starting air to those cylinders which are most appropriate given the angular position of the crankshaft — virtually eliminating engine starting "dead spots" — and to dramatically reduce the amount of air ultimately required for the engine start. The net effect of the SaveAir™ system is more reliable remote starting, improved operator safety (no mechanical barring), reduced air consumption, and more efficient compressor station operation.

All SaveAir control electronics are "universal" in their design and common to all air-in-head starting applications. The SaveAir Distributor fits a standard SAE ignition drive (camshaft speed) and engine-specific adapters are available (see note* on last page). Please refer to page 3 of this brochure and the SaveAir Application Guide for additional details. Configuration and monitoring of the SaveAir system is accomplished through the use of the system Display Module or via the PC-based terminal program supplied with every system (see page 3).

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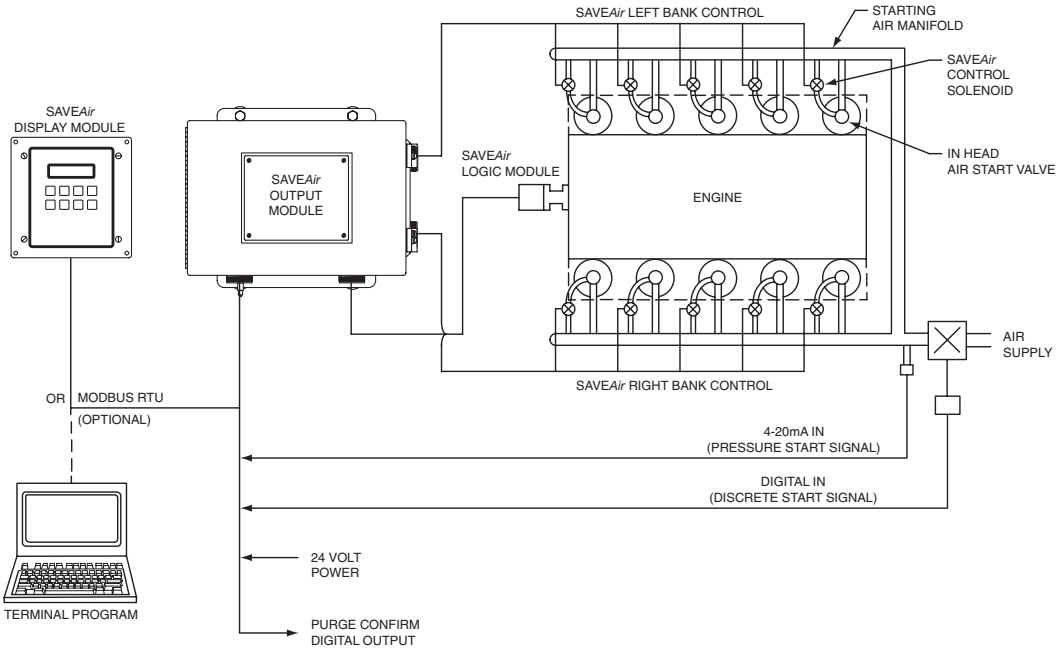
CERTIFIED
CLASS I, DIVISION 2,
GROUPS C and D



The SaveAir Electronic Air Start System is designed to be retrofit to almost any engine utilizing the air-in-head starting method. A description of the function of the major components and their integrated operation appears below:

- The SaveAir Distributor may be installed in place of the existing pneumatic or mechanical distributor, or to another shaft turning at camshaft speed. This innovative device provides a highly accurate source of crankshaft position data, both while the engine is at a stop and while running.
- The SaveAir Output Module accepts the angular position data derived by the Logic/Distribution Module and electronically actuates the start air solenoid valves to admit high pressure starting air into the appropriate cylinder(s).
- Monitoring and system troubleshooting is made simpler and more convenient by the operator Display Module. This interface device gives the user access to all of the setup, monitoring, and diagnostic capabilities of the system. An included SaveAir Terminal Program offers the same functionality for remote access and control.

In operation the starting sequence is begun in the normal way by manually or remotely actuating a valve which pressurizes the engine's air supply piping. The SaveAir system automatically senses the rising pressure (via a pressure transducer input) or else reacts to a contact closure from a pressure switch in the air piping. The SaveAir system knows the precise crank position of the engine at all times and automatically applies air to the cylinder(s) in optimum position to deliver the maximum torque to the engine. User configurable "maps" of air admission angle and duration of the air event versus engine speed allow the user to regulate the cranking speed to the optimum value without wasting air. Turning off the air before the intake and exhaust ports (valves) open eliminates both wasted air and starting air back pressure in the intake and exhaust manifolds. The user can also configure a purge cycle to purge the engine thoroughly without wasting starting air. The system outputs a "purge confirm" signal which can be utilized by the starting control system to energize ignition if so desired. When the user specified "running" rpm is reached and maintained for a user specified number of revolutions the starting air is automatically turned off and locked out until the system is reset.

Start Sequence

The sequence described below outlines the SaveAir system startup and associated screens that would appear through the process on the system Display Module and in the Terminal Program:

TRYING 220° 0 ON 110° RPM	**TRYING** – A system start has been initiated, but the engine has not yet begun to rotate.
ROLLING 220° 15 ON 110° RPM	**ROLLING** – The engine is rolling on starting air, but has not yet exceeded the user-defined purge RPM.
PURGING 40 ON 90° RPM	**PURGING** – The engine starting speed has exceeded the user-defined purge RPM, but has not yet completed the user-defined number of engine cycles.
STARTING 60 ON 80° RPM	**STARTING** – Purging has been completed and the purge confirm output has been activated.
FIRING 90 ON 0° RPM	**FIRING** – Indicates that the unit has reached a pre-configured RPM known to be associated with "light-off" or engine operation based upon in-cylinder combustion.
RUNNING 300 RPM	**RUNNING** – Final stage of the start cycle. The engine is now running and starting air is shutoff and locked out until system reset.

Typical System Configurations

Pneumatic air distributor with pilot-actuated air-in-head valve

Cam actuated start valves with pressure-actuated in-head check valves

Installation of the SaveAir system on engines with an existing pneumatic air distributor (OEM or aftermarket) and pilot actuated in-head starting valve represents the least complex installation requirements to the user.

Retrofit requires the removal of the mechanical/pneumatic air-start distributor, and all of the associated air tubing to the existing air-start valves. The SaveAir Distributor is mounted on the air distributor drive or other camshaft speed accessory drive, with the SaveAir Output and Display Modules mounted on the engine (the Display Module can also be mounted in the engine control panel). The electrically-actuated SaveAir solenoids are mounted near each engine air-starting valve, with their pilot air drawn from the high volume starting air pipe local to each cylinder or via a small diameter starting air manifold running the length of the engine. Each solenoid admits the high pressure air charge into the associated cylinder to begin and maintain engine rotation.

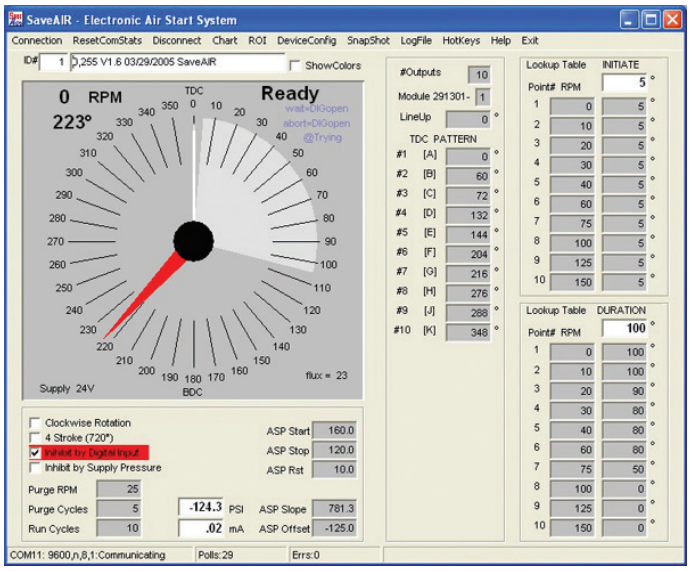
Some Clark engines (BA, HBA and TLA) utilize camshaft-actuated air starter valves for each cylinder, which in turn direct high volume starting air directly to in-head starting air check valves.

Mounting of the SaveAir Distributor to engine camshaft speed may be to a SAE ignition drive directly or by use of an engine-specific mounting adaptor. The OEM cam-actuated air start valves are no longer used (permanently eliminating camshaft lobe repairs), and are disabled during SaveAir installation. The SaveAir electrical solenoid pilot valve is supplemented with a pilot-actuated high volume "relay" valve. A high-capacity stainless steel flex-hose completes the installation by connecting to the in-head check valve on each cylinder. Thus, for these applications, the SaveAir air solenoid pilot valve trips the associated air handling relay valve which directly admits the high pressure air into the cylinder for starting. Refer to the SaveAir technical documentation for further installation details.

Terminal Program

- **Provides for simple system monitoring and configuration**
- **Graphical user interface (GUI)**
- **Remote operator interface (ROI) duplicates the system display for convenient remote access**
- **Built-in data logging and screen capture capability for system troubleshooting**

The SaveAir system includes a comprehensive ModBus-RTU-based Terminal Program for monitoring and configuration. As an alternative to the system Display Module, all system setup, including the angles between cylinders, air initiation and air duration maps, and engine-specific RPM settings for purge and engine run indication can be configured using this software. To assist in system installation and troubleshooting, the Terminal Program also enables the user to create a Microsoft Excel™ spreadsheet of all operating data associated with the SaveAir system from data logs taken and recorded three times per second. A unique screen capture option embedded into the system software also allows the user to acquire and save the monitored display and values for future reference or troubleshooting.



SPECIFICATIONS

INPUTS

(1) Integrated Angular Position Sensor
(1) Discrete Start Signal (Digital)
(1) Pressure Start Signal (4–20mA)

OUTPUTS

(10) or (20) Control Solenoid Outputs
(1) Purge Confirm Output (Digital)

DISPLAY

Alphanumeric 2x16 character backlit

POWER REQUIREMENT

No power supply upgrade is required for existing CPU-95 or CPU-2000 applications

24VDC, 5–10 Amps for applications operating without upgraded digital ignition systems:

TEMPERATURE

-40°F. to +158°F./-40°C. to +70°C.

COMMUNICATIONS

ModBus RTU Protocol (RS-485)
(Supports Display or PC communications)

ORDERING INFORMATION

SaveAir Distributor (A flange)	291310-A
SaveAir Distributor (GV flange)	291310-GV
Mounting Adapter	See below*
Output Module, 10 outputs	291301-1
Output Module, 20 outputs	291301-2
Display Module	291302-1
Harness, Output, 48”	293023-16
Harness, Output, 84”	293026-16
Harness, Output, 96”	293028-16
Harness, Output, 144”	293027-16
Harness, Logic to Output, 24” with 180° Connector	293031-24
Harness, Logic to Output, 48” with 180° Connector	293031-48
Harness, Logic to Output, 72” with 180° Connector	293031-72
Harness, Logic to Output, 24” with 90° Connector	293036-24
Harness, Logic to Output, 48” with 90° Connector	293036-48
Harness, Logic to Output, 72” with 90° Connector	293036-72
Harness, Display & I/O, 48”	293034-48
Solenoid Valve, standard	690017-1
Solenoid Valve Ass’y., Clark engine	690018-1
In-line Filter (690017-1)	615007
Hose Assembly, Clark engine, 24”	580035-24
Hose Assembly, Clark engine, 48”	580035-48

(*) If a camshaft speed SAE flange drive is not available, a mounting adapter is required; contact one of the following:

Advanced Gas Engine Solutions
616-B Beatty Road Monroeville, PA 15146

Exline Ignition and Automation
3256 Country Club Road, Salina, KS 67401

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HOERBIGER Engine Solutions
712 Trumbull Avenue, Girard, Ohio 44420
(330) 545-9768 / Fax: (330) 545-3231
www.altronic-llc.com

DIMENSIONS