altronic

DE-4000

Next-Generation Safety Shutdown and Control System

- **State-of-the-art control system specifically designed to protect, monitor and control critical rotating machinery, such as engine or motor-driven compressors, pumps and generators operating in harsh/hazardous areas**
- **Completely scalable and expandable system allowing for use across a range of low, medium, and high-spec applications**
- **Ethernet based communication structure, inclusive of on-board web-based configuration tool**
- **Automatically and continuously optimizes compressor efficiency and throughput via speed and capacity control**
- **Integral auto-start functionality for unmanned or highly-cyclic applications**
- **All system inputs can be individually configured for:**
  - **Sensor Type: Analog transducer input, thermocouple input (type J or K) or digital (switch) input**
  - **Sensor Class: Class A, B or C logic**
  - **Digital Input Sensor Run/Fault Status: Normally-open or Normally-closed**
- **Wi-Fi enabled**
- **On-board cool down timer allows for proper engine unloading during scheduled shutdown**
- **Integrated lube proximity switch inputs allow easy configuration for dedicated lube monitoring**
- **Built-in linear speed control allows for linear suction pressure vs engine speed control**
- **Dedicated timer outputs with delay functionality for battery saving or like operations**
- **Alternative control strategy for simplified and reliable interface to popular OEM-provided engine controls**
- **Configurable starting sequence**
- **Selectable number of auto-start attempts. Safety warning and countdown timer visible on the Touchscreen display between start attempts.**

The DE-4000 Configurable Safety Shutdown and Control System uses state-of-the-art microcontrollers and surface-mount PCB assembly technology to provide users of compressors and other critical rotating equipment with a sophisticated, yet reliable, means of protecting and controlling both the prime mover and the load machine (compressor, pump, etc.). Incorporating an "intelligent" add-on board system, the DE-4000 system is fully scalable, allowing users to incorporate a single control system technology across a wide range of applications.

The base DE-4000 configuration offers 12 digital and 4 analog outputs, as well as 32 inputs that can be individually configured for use with switch contacts, thermocouples, or analog transducers. A maximized DE-4000 configuration provides 44 digital and 20 analog outputs and 160 configurable inputs. This approach also allows for a single control system to be used across a fleet of units, thus simplifying maintenance and part stocking requirements, along with system training requirements for operating personnel.

Ease of system setup and configuration sets the DE-4000 apart from other PLC-style or competitive controllers. Ethernet-based connectivity to the device and an intuitive, Web-based configuration tool for system configuration eliminates the need for any knowledge of ladder-logic or other functional programming languages. Ethernet communications are fully supported for remote monitoring and/or control applications.

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DE-4000 Description and Operation

The innovative, CSA-certified DE-4000 control system comprehensively starts, protects, monitors, and controls critical rotating equipment such as reciprocating engines, compressors, and pumps. This scalable and expandable microprocessor-based system includes an Touchscreen display, Controller Module and Terminal Module(s). Each device is typically mounted in an associated control panel, with the Touchscreen display installed for simple operator access, and the Controller Module and Terminal Module(s) DIN-rail mounted in the rear of the enclosure.

System Overview

Touchscreen Display — Input power requirement is 10-32VDC, 3 amps max. The display has a 5-button keypad with a sealed 8″ LCD Touchscreen with PCAP touch and LED back-light. The operating temperature range is -30 to +80°C.

The touchscreen display serves as the user interface enabling end-users to quickly navigate through setup menus, view process data, and edit application parameters. Additionally, the nature of detected alarms and shutdowns is available to aid in trouble shooting via the robust touchscreen display. Available communication ports are as follows:

- 1 each, 10/100 Ethernet port and RJ45, used to connect to the controller module
- 1 CAN port
- 1 RS485 port
- 2 USB Ports
- 1 USB OTG Port

Controller Module — Input power requirement are 10-32VDC, 5 amps max. Over-current protection is provided with an easy to replace 5 amp automotive blade fuse. The module has 4 isolated 52VDC, 1.2 amp discrete outputs. The discrete outputs can be used for on/off control of on-engine processes such as starting motors, fuel, and ignition firing. There are 4 state-indicating LEDs for the RUN state (green), TIMERS ACTIVE state (yellow), ALARM state (orange), and STOP state (red). Wi-Fi is available for on-site personnel to connect to the DE-4000 system remotely with a Wi-Fi enabled device. System configuration information is stored in non-volatile memory as are the associated system data logs. Available communication ports are as follows:

- 5 – Ethernet ports reserved to connect up to 5 Terminal Modules
- 1 – Ethernet port reserved to connect to the Touchscreen Display
- 1 – Ethernet port reserved to connect to an outside network
- 1 – CAN port
- 2 – RS485 ports

Terminal Module(s) — Input power requirement is 10-32VDC, 5 amps max. Over-current protection is provided with an easy-to-replace 5-amp automotive blade fuse. The operating temperature range is -40 to +85°C. Channel to channel isolation has been added to aid with trouble shooting. A base system with one (1) Terminal Module can be expanded substantially by adding up to 4 additional Terminal Modules. Each Terminal Module has the following I/O:

- 32 – inputs channels (individually configurable for use as NO/NC discrete inputs, J or K thermocouple inputs, or as analog inputs (0-5V or 4-20mA))
- 2 – speed inputs (0-10KHz)
- 4 – analog outputs (4-20mA)
- 8 – high or low side discrete outputs (45V, 2 amp max)
- 8 – 5V, 100mA supplies available to power field sensors

System Operation

The scalable and expandable nature of the DE-4000 allows it to be used on the simplest safety-shutdown-oriented applications, on mid-range applications with minimal or moderate auto-start or capacity control requirements, and on highly-complex units where a significant number of points must be monitored and functions controlled simultaneously.

Safety-Shutdown Functions — At its core, the DE-4000 is an annunciator which directly monitors parameters such as temperatures, pressures, speeds, and vibration levels against a set of pre-set alarm and shutdown thresholds. Once detected, the DE-4000 will take the necessary actions (as configured by the user) to alert the operator and/or shutdown the engine by interrupting the flow of fuel and disabling the ignition system.

Control Functions — Full auto-start capabilities, including crank-disconnect, are available in the DE-4000. On-board 4-20mA PID control outputs (up to 20) and digital outputs (up to 44) offer a range of sophisticated capacity control options.

In a typical operation, the DE-4000 starts and warms-up the engine/compressor, raises it to load-carrying speed, and then automatically applies the load by actuating compressor slide valves or other capacity control devices. Should the control setpoint not be met at the minimum load-carrying speed, the compressor speed is automatically raised in an effort to meet the desired process pressure setpoint. This control strategy is governed by a number of user-adjustable load and speed limits which can inhibit the application of additional load beyond what is deemed to be safe, can force the system to shed load, and can shut the engine/compressor down in the event that a maximum speed is exceeded.

DE Series Data Logging and Communications

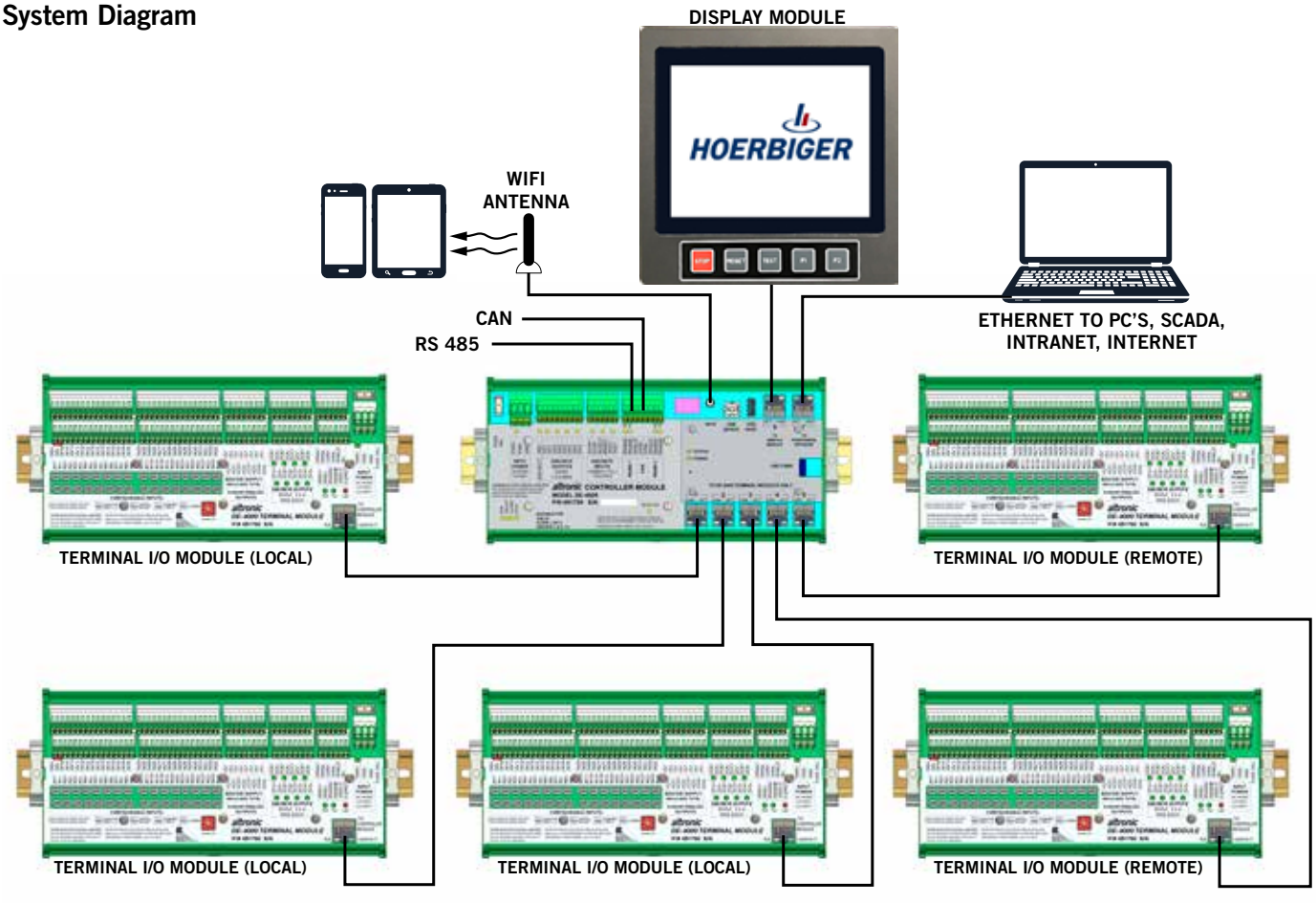
The multiple communication interfaces provide the user with flexibility when accessing critical data, both locally and remotely. The data can be used to scheduled preventive maintenance and/or dispatch of repair personnel with the correct parts. DE units can also initiate a call-out in the event of a fault.

Data logs are taken at user-defined intervals and are a compilation of the analog values being monitored by the DE, plus unit speed, status, and complete information on the first fault that caused a system shutdown (identity, value,date, time). Data log information can be downloaded locally or remotely. An integral data analysis/trending package that is included with the web interface can display and graph this data for inspection and analysis.

System Configuration

The intuitive system configuration web pages operates on a “fill-in-the-blanks” basis whereby the application is not programmed, but configured. Using an application template as a guide. The operator selects the appropriate operating parameters and setpoints for each input channel, defines the performance of the digital and analog control outputs, configures the service meters, and establishes the frequency of system datalog sampling and recording. This approach puts application configuration and adjustment into the hands of an educated user by eliminating any complex ladderlogic based programming and revision in the field.

System Diagram



To Order

TOUCHSCREEN DISPLAY

Touchscreen Display 691766

CONTROLLER MODULE

Controller Module 691759

TERMINAL MODULE

Terminal Module (32 input) 691760

RJ45 ETHERNET CABLE ASSEMBLIES

RJ45 Ethernet Cable Assembly 693221-1

Available Altronic Transducers

PRESSURE TRANSDUCERS

0-15	psia	691204-15
0-50	psia	691204-50
0-100	psia	691204-100
0-300	psia	691204-300
0-500	psia	691204-500
0-100	psig/0-680 Kpa	691201-100
0-300	psig/0-2040 Kpa	691201-300
0-500	psig/0-3400 Kpa	691201-500
0-1000	psig/0-6800 Kpa	691201-1000
0-2000	psig/0-136 bar	691201-2000
0-5000	psig/0-340 bar	691201-5000

TEMPERATURE TRANSDUCERS

Range: +5°F to 350°F / –15°C to 176°C (±3°F / ±2°C)

- 1.75" length 691202-300
- 5.75" length 691203-300

Range: –40°F to 450°F / –40°C to 232°C (±6°F / ±4°C)

- 1.75" length 691212-450
- 5.75" length 691213-450

TRANSDUCER CABLES

5 ft. length 693008-5
25 ft. length 693008-25
50 ft. length 693008-50

General Specifications

COMMUNICATIONS PORTS

- 5 - Ethernet ports reserved to connect up to 5 Terminal Modules
- 1 - Ethernet port reserved to connect to the Touchscreen Display
- 1 - Ethernet port reserved to connect to an outside network
- 1 - CAN port
- 2 - RS485 ports

DISPLAY

8" sealed LCD Touchscreen with PCAP touch and LED back light

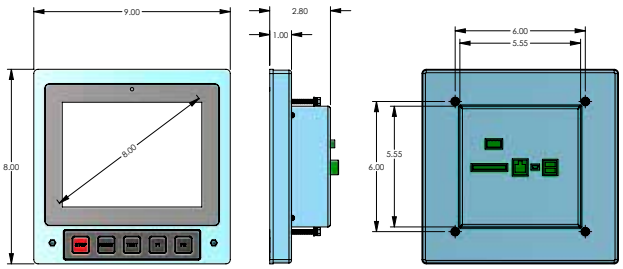
SCAN RATE ..... 160 mS

AMBIENT OPERATING TEMPERATURES

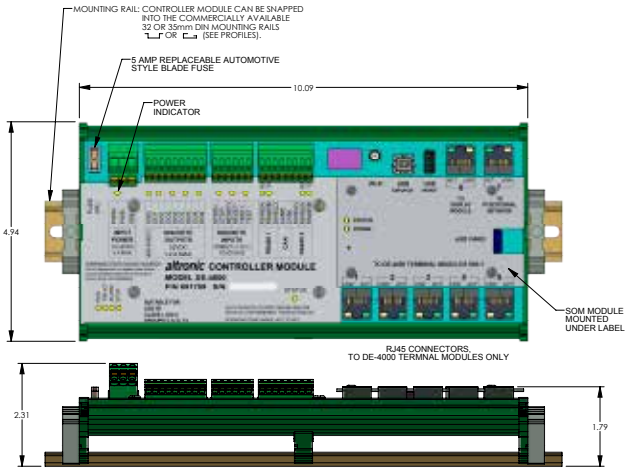
Touchscreen Display ..... –30°C to +80°C (–22°F to +175°F)
Controller & Terminal Modules ..... –40°C to +85°C (–40°F to +185°F)

POWER REQUIRED

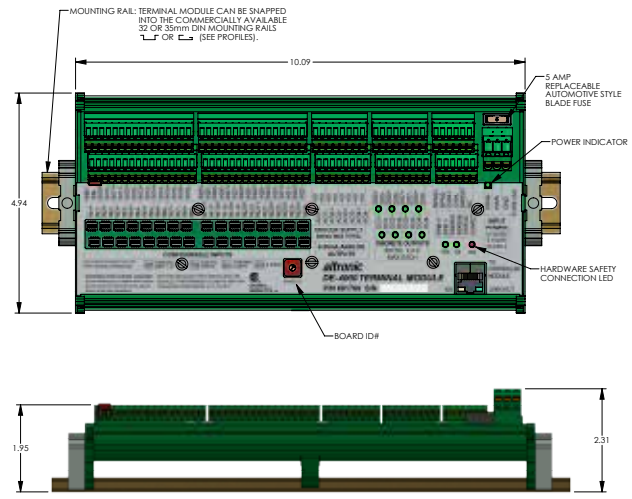
Touchscreen Display ..... 10-32VDC, 3 amps max
Controller & Terminal Modules ..... 10-32VDC, 5 amps max



TOUCHSCREEN DISPLAY



CONTROLLER MODULE



TERMINAL MODULE

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