# Exacta 21
## Monitoring and Control System for Gas Compressors

**Pre-programmed and configurable to control virtually any engine or electric motor-driven reciprocating or screw compressor**

- — Pre-lube
- — Auto or manual crank
- — Warm-up
- — Loading and valving
- — Safety shutdown and alarm annunciation
- — Monitoring and data-logging
- — Fast or auto-cooldown stop
- — Auto-depressurization
- — Post-lube

**Virtually unlimited input/output (I/O) capability for comprehensive monitoring and control**

**Full PID control of up to 15 "loops" such as speed, suction valve, by-pass valve, slide valves, louver controls, etc.**

**Master Capacity Controller allows the control of four inputs simultaneously with four different outputs with one quick, easy setting for each**

**Optional AGA3 and AGA8 gas flow calculations plus other programmable functions such as rod-load calculations and alarms**

**Extensive memory and data-logging for trending and analysis of process variables, faults, or shutdown events**

- — 1400 records of operating data stored at all times and at selectable intervals
- — 40 records taken at 1-second intervals before each shutdown for analysis

**Local and remote communications utilizing the ModBus RTU protocol**

**Optional user-configurable graphical touch screen and data hub (MIDAS)**

**Combines the flexibility and capabilities of PLC controls with the factory support, ease of use, user configurability, and program continuity of dedicated compressor controls**

# HOERBIGER

*Altronic Controls, LLC – A Member of the HOERBIGER Group*

CERTIFIED
CLASS I, DIVISION 2,
GROUPS C and D

# Exacta 21 Features

## Sequential Control

The control system performs the sequence of starting, loading and stopping the compressor unit. The Exacta 21 can handle all the pre-lubes, purges, cranking sequences, warm up cycles, loading, stopping and post-lubes. In addition, it can control the valves associated with these functions. The sequenced steps can be programmed to work from both time and temperature data.

## Capacity Control

The Exacta 21 fully handles the loading and unloading of the compressor with up to 15 PID controllers that are built into the unit. This includes controlling the speed of the engine, the inlet suction valve, the auto and startup bypass valves, and a slide valve on a screw-type compressor.

The built-in Master Controller allows the control of four inputs simultaneous with four different outputs. This allows for control of suction pressure, discharge pressure and manifold pressure (or amperage on electric drives) with one quick and easy setting for each. The system will automatically control to the input closest to it's setpoint.

## Data Capture

The Exacta 21 automatically records all the temperatures, pressures and other analog inputs at regular intervals. The computer keeps a minimum of 1400 of these records in memory at any given time. If recorded at one-hour intervals, 52 day's worth of data can be stored.

The operator can view this data, and scroll back and forth through time, to determine how well the unit is operating. As mentioned previously, for diagnosing problems, the system continuously captures 40 records of data, usually at one second intervals, and can store data for 40 separate shutdowns in its memory. This data can be downloaded and put into a spreadsheet or SCADA system, and then graphed to do trending and performance calculations.

## Communications

The Exacta 21 has built-in RS232 and RS485/422 ports. All that is needed to communicate with the system is a simple terminal program like Procomm Plus™ or Microsoft Terminal™ or HyperTerminal™. The Exacta 21 can be linked to a SCADA system by using the Modbus Protocol. The transmission medium can be direct, modem, FM transmitter, MSat satellite, or any other comparable method.

## Programming

The Exacta 21 combines all the programming and flexibility of a programmable logic controller with the ease and simplicity of a dedicated controller. The object-oriented programming language and state engine allows programming of very complex processes. The parameter setting capabilities allow quick and easy programming of specific functions like shutdowns, alarms, pre-lube, post-lube, crank sequences, etc.
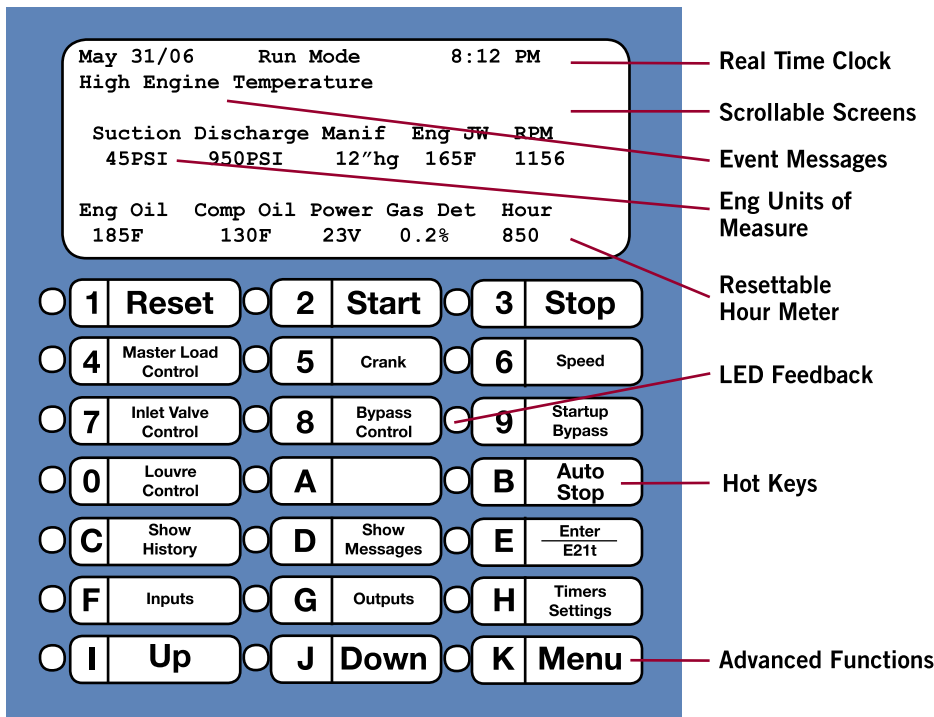


**Typical Panel Layout**

# An Overview of the Exacta 21 Controller

The Exacta 21 High Performance Compressor Controller is an "all-in-one" pre-programmed, dedicated controller optimized in all respects for controlling gas compressors and associated site equipment. Its functions and setpoints are easily configured from the keypad for a particular application. No knowledge of ladder logic or other programming languages is required, and program continuity is assured by Altronic's engineering department and its ISO 9001-approved design and change control system. Ideal for new or retrofit packages, the Exacta 21 performs all standard compressor control functions as well as incorporating numerous unique features:

## Monitoring

Exacta 21 monitors temperatures, pressures, levels and other signals, through Smart Analog and Discrete I/O boards. The system can handle a maximum of 192 I/Os. Each analog board contains 16 channels which can be individually configured to accept different input types, including:

**4 to 20 mA inputs/transducers**

**0 to 5 Volt inputs/transducers**

**Type J and K thermocouples**

**Digital inputs (switched)**

**Resistive temperature devices (RTDs)**

**Resistive inputs**

The controller has a 40 character by 8 line backlit display which allows simultaneous display of many of these values. <Up> and <Down> keys can be used to scroll between display screens if there are more inputs to be viewed than just one screen can handle.

## Shutdowns, Alarms and Annunciation

One of the main functions of any control system is to perform shutdowns and alarms. The Exacta 21 uses the industry standard Class A, B, C, and D designations, with individual timers on all Class B's (programmable default setting). In addition, a delay can be added to the shutdown or alarm to debounce and eliminate nuisance shutdowns. An unlimited number of shutdowns and alarms can be added on any channel, including the normal high and low shutdowns and alarms, plus:

**Differentials**

**Calculated shutdowns**

**Time delayed shutdowns**

**Out of range**

For example, a calculated shutdown would calculate the dew point of acid gas and then shutdown and purge the unit if the gas temperature ever goes below the calculated curve.

Exacta 21 annunciates the "First-in Shutdown" and lists all other shutdowns and alarms, which must be acknowledged by the operator by pushing <Reset>. The system records the date and time when any shutdown or alarm occurs and stores this for future reference. In addition, it takes a snapshot of all the temperatures, pressures and other analog values when a first-in shutdown occurs, and also records data for 39 intervals back in time (usually 1 second apart). If a compressor stalls, it is desirable to have historical data, so you can determine the real cause. The Exacta 21 saves 40 first-in shutdown data sets, ensuring a complete history.

# Special Functions



### Control Panel Software

Control Panel displays a combination of analog inputs, shutdowns, alarms, recorded history and events. It can be viewed on a laptop or PC computer using inexpensive software like Procomm Plus™, Microsoft Terminal™ or HyperTerminal™.



### AGA Calculations

As an optional feature, the Exacta 21 is capable of performing AGA3 and AGA8 flow calculations. The calculations are based on the latest editions of AGA Report No. 3, Part 3, Natural Gas Applications; and AGA Report No. 8, Compressibility Factors of Natural Gas & Other Related Hydrocarbon Gases. Parameters can be set either through a HMI interface or from the Exacta panel itself. The Exacta 21 is capable of performing five AGA calculations simultaneously.



### Program Revision Tracking

Available as an optional enhancement to the Exacta 21, the Program Revision Tracking System gives users the ability to automatically record any changes to the system configuration. By detailing the specifics of the change, including both the new and old values, the user gains both improved revision accountability and the ability to restore the program to pre-revision parameters should it be required.
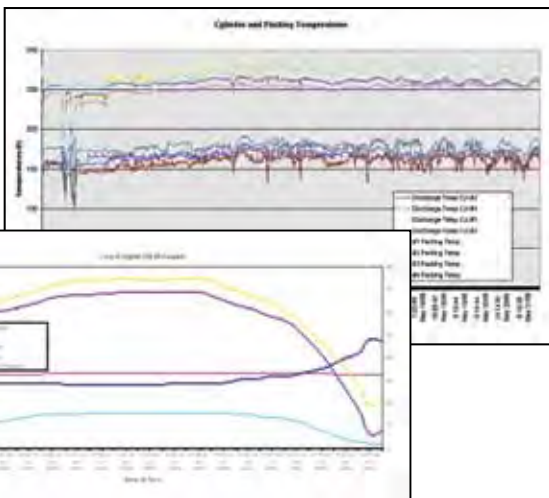


### Data Capture and Trending

The Exacta 21 controller captures data by taking a snapshot at regular intervals. This data can be transferred to a PC and loaded into any spreadsheet. The column headers on the spreadsheet are down loaded with the data. The sample data is shown to the left. Once loaded into a spreadsheet, the data can then be graphed to show trends. The cylinder temperature graph to the left was taken over a period of three weeks (spikes indicate daily temperature changes).

40 one-second intervals of data before a shutdown can be downloaded into a spreadsheet. The data can then be graphed to make it easy to diagnose the cause of the shutdown.

# Why an Exacta 21 instead of a PLC?

While programmable logic controllers (PLCs) are extremely flexible and capable control platforms, their use in a gas transmission or gas processing plant environment is not without its compromises.

Unlike many PLC-based control solutions, the Exacta 21 offers:

**Application stability — both the hardware and embedded application are based on a repeatable engineering and manufacturing standard**

**User and field configurable (password protected) with no required knowledge of ladder logic or other programming languages**

**Long-term access to field and factory-based technical support**

**A rugged set of system hardware designed specifically for use in hazardous environments**

**Available upgrade and service parts from Altronic Distributor outlets worldwide**

**On-board security and tracking for improved revision and parameter adjustment control**

The innovative Exacta 21 offers users the best of both worlds: a stable hardware and application platform that will be manufactured and supported in the long term and a highly expandable and flexible monitoring and control platform capable of servicing even the most demanding, control-intensive applications. While protected by a tiered security system insuring controlled access, this approach also gives the user the ability to make operational changes from the keypad without additional hardware and/or software, and without a detailed knowledge of ladder logic. Taken together, these capabilities offer flexibility, servicability, and expandability for virtually any gas compressor application.

## MIDAS (optional)

MIDAS (Monitored Information Devices And Systems) is a user-configurable graphical touch screen and data hub that delivers centralized access to critical information in parallel with the Exacta 21, which is mounted completely inside the panel. Unlike traditional PLC-based systems in which the only means of displaying system data is through the touch screen, the MIDAS offers an advanced, user-configurable, graphical data presentation capability, while preserving the high level of reliability and in-depth system configuration and access made possible by the Exacta 21. Essentially, the MIDAS incorporates the very best of both approaches by combining the advanced display capabilities of a PLC-based system with the reliability and serviceability of a control panel built around an independent, discrete device.


Exacta 21 on a reciprocating compressor


Exacta 21 on a screw compressor

# The Exacta 21 and Modbus Communications

## The Exacta 21 fully supports Modbus RTU

The following information can be read or written to the Exacta 21 Computer:

| | |
|---|---|
| Analog Inputs | Read Only |
| Analog Outputs | Read / Write |
| Discrete Inputs | Read / Write |
| Discrete Outputs | Read / Write |
| PID Setpoints | Read / Write |
| PID Auto/Manual | Read / Write |
| Shutdown Setpoints | Read / Write |
| Alarm Setpoints | Read / Write |
| Shutdown Status | Read Only |
| Alarm Status | Read Only |
| Engine RPM | Read Only |
| First In Shutdown | Read Only |
| Hour Meter | Read Only |
| State Engine | Read/Write |
| Timers | Read/Write |
| Counters | Read/Write |

The unit can be started, stopped, and reset remotely. Other functions can be performed by forcing discrete inputs ON.

## Data Format

The data can be formatted in any of the following forms, assuming that the data can fit in a specific format. For example, analog values cannot be formatted as bytes or bit mapped.

- **Bit Mapped (Discrete Inputs and Outputs Only)**
- **Byte**
- **Short Word (2 Bytes)**
- **Long Word (4 Bytes)**
- **IEEE Single Floating Point (4 Bytes)**
- **IEEE Double Floating Point (8 Bytes)**

## Communications

Modbus RTU can be connected to either communications port (RS232 or RS485). Selectable from 2400 to 19200 Baud, 8 Bit, No Parity (N 8 1).

**Exacta 21 Discrete Circuit Board**

**Exacta 21 Analog Circuit Board**

*altronic*

Altronic Controls
1410 North First Street, Garland, Texas 75040
Phone (972) 494-0522   FAX (972) 272-4017
sales@altroniccontrols.com
www.altroniccontrols.com