HC900 Purchasing Specification

1.0   GENERAL SPECIFICATIONS

1.1   **The system shall operate within the following environmental limits:**

Controller

Operating Temperature	0 to 60°C Ambient
Storage Temperature	-40° to 70°C
Relative Humidity	10 to 90% (non-condensing)

Operator Interface

Operating Temperature	0 to 45°C Ambient
	0 to 40°C (with ZIP drive)
Storage Temperature	-20° to 60°C
Relative Humidity	20 to 80% (non-condensing)

1.2   **The system shall operating within the following electrical limits:**

Power	**Controller:**	90 to 264 Vac
	Operator Interface:	24 Vdc
Controller Line Frequency		47 or 63 Hz

1.3   **All units shall be of a modular design with integral power supplies. All power supplies shall be equipped with fuses or circuit breakers for internal short circuit and overload protection. Exposed ribbon cables shall not be permitted. The system shall provide all special voltages required to operate every I/O card exclusive to the customers input and output power.**

1.4   **The system shall have been designed to meet or exceed the following minimum specifications or guidelines:**

- **CE Conformity to European Council Directives**
    - 73/23/EEC, The Low Voltage Directive
    - 89/336/EEC, The EMC Directive
- **General Purpose Safety**
    - EN61010-1
    - UL 3121-1
    - CSA C22.2 No. 1010-1
- **Hazardous Location Safety**
    - FM Class 1, Div. 2, Groups A, B, C, D
- **NEMA Type 4x Operator Interface**

1.5   **Controller shall have a maximum depth of 6 inches (151.7 mm)**

1.6   The system shall have internal diagnostics to determine:
- **A hardware check that verifies the correct I/O module configuration for the control strategy and controller database.**
- **That a valid configuration is present in memory**

Local fault annunciation via LED's on the controller and each I/O module are available.

Controller & I/O diagnostic information is available via the Operator Interface and a PC based configuration tool

2.0   GENERAL DESCRIPTION

2.1   The product to be supplied shall provide an integrated loop and logic controller, a local operator interface and configuration software. The product will consist of the following elements:

A multi-loop process controller, which also has data acquisition capability, setpoint programming capability and logic & sequencing control as a minimum. Refer to Section 3.0 & 7.0 for further specification details.

2.2   The controller will utilize a common processor for process loop and logic control. The processor will have on board battery back-up capability.

2.3   A local Operator Interface shall be shop floor panel mounted. It will provide a centralized operator interface and connect via a single cable to the multi-loop process controller. Refer to Section 5.0 for further specification details.

2.4   A single PC based engineering tool shall be capable of configuring the loop & logic control program, Operator Interface displays & alarms and trending & archiving.

3.0 PROCESSOR SPECIFICATIONS AND INSTRUCTION SET

The specifications detailed in this section are in addition to the requirements of Section 2.1.

3.1 The controller will be capable of processing up to 32 PID control loops.

3.2 The controller will be configured from a set of process, logic, math and sequencing control blocks. Up to 2000 of any combination of these control blocks will be soft-wired together to create control using the PC based graphical, object-oriented, engineering tool. This control diagram will be permanently stored in the processor and will be executed during each cycle of the processor.

3.3 The controller must store in memory up to 50 recipes of 50 variables each. These recipes must be configured with and executable at the Local Operator Interface.

3.4 The controller must store in memory up to 99 setpoint programs. A program may have a maximum of 50 segments. The controller must be able to run up to 8 independent programs simultaneously.

3.5 The controller must store in memory up to 20 sequencer sequences. A sequence may have a maximum of 50 states. The controller must be able to run up to 4 independent sequencers simultaneously.

3.6 The controller shall have the following function block types:

a/ Input / Output
    Analog
    Discrete (single point & 8 point)

b/ Loops
    PID, ON-OFF
    Time Proportioning, Three-Position Step
    Position Proportional, Carbon Potential
    Block Controls (Loop & Mode Switch, Etc)
    Tuning Constant write, Auto Manual calculation

c/ Setpoint Programmer & Scheduler
    Programmer, Scheduler & Recipe
    Event outputs
    Programmer Synchronization

d/ Logic

    AND Gates (2, 4 & 8 input)
    OR Gates   (2, 4 & 8 input)
    Exclusive OR & NOT Gates
    Switch, Trigger, Toggle Flip-flop & Latch Blocks
    Pushbutton & Four Position Selector
    Hand/Off/Auto control block
    Sequencer

e/ Counters & Timers

    ON & OFF Delay
    Resettable & Periodic
    UP/DOWN Counter

f/ Math

    Scale & Bias
    Add, Subtract, Multiply & Divide
    Four input Add, Subtract & Multiply
    Free Form Math

g/ Calculations

    Compare & Deviation Compare
    Absolute & Square Root
    Mass Flow
    Continuous Average & Min-max-avg-sum
    Relative Humidity & Dewpoint
    Totalize & Negate

h/ Signal selectors

    Function Generator
    Lead / Lag
    High-Low & Velocity Limiters
    Rate-of-change
    Read & Write constant
    Write Variables
    Track & Hold
    BCD Translator
    Alternator, Stage & Ramp
    Digital Encoder
    Pump & Motor Control

i/ Communications

    Peer-to-peer function blocks
    Modbus Slave function blocks

3.7 Each of the 32 PID control loops must have autotuning and Fuzzy Logic based overshoot protection, which can be initiated by an operator or as part of the control strategy. Must be a standard feature of the controller, not requiring a separate software package to configure/initiate.

3.8 The controller must store in the processor memory all display information for the Operator Interface (Section 5.0).

3.9 Controller shall have a "Fast Logic" option that permits execution of all logic in less than 100 ms. All process control (32 loops) will be executed in 500ms.

3.10 Controller Maximum Size Requirements:

Height	5.4"	(137mm)
Width	22.5"	(571.5mm)
Depth	6.0"	(151.7mm)

4.0 CONTROLLER INPUT/OUTPUT (I/O) STRUCTURE

4.1 All I/O's shall be rack mounted; either within the controller or in remote I/O racks. The controller and remote racks shall be available in 4, 6 or 12 I/O module capacity. Exposed ribbon cable connections or external DC logic power cables shall not be permitted. The system shall accept line voltages and frequencies as specified in 1.2.

4.2 The system shall be capable of accessing and processing up to 512 I/O points. I/O shall be able to be addressed by decimal numbers to ease understanding and reduce program design time.

4.3 I/O cards shall be removable while the controller/rack is powered. Additionally, I/O wiring shall be arranged to reduce wire bundle size at any working radius. I/O card terminal blocks shall be removable without having to disconnect any I/O wiring to facilitate replacement of I/O cards.

4.4 A choice of Lug Screw (Barrier), Cage Clamp (Euro) or Remote Termination Panel (RTP) terminal blocks shall be available for termination of field I/O wiring.

4.5 As a minimum, the following I/O types shall be available:

Voltage	Type	# of Points
80 to 240 Vac	Digital AC Input	16
10 Vdc to 32 Vdc	Digital DC Input	16
Dry Contact	Logic Input	16
85 Vac to 240 Vac	Digital AC Output	8
6.5 Vdc to 32 Vdc	Digital DC Output	16
4 form A & 4 form C	Relay Output	8
MV, V, mA, T/C, RTD, ohms (isolated)	Universal Analog Input Module	8
0 to 10 VDC, -5 to 5 VDC, -10 to 10 VDC, 4 to 20 mA (isolated)	Analog Output	4

5.0 OPERATOR INTERFACE SPECIFICATIONS

The specifications detailed in this section are in addition to the requirements of Section 1.2.

5.1 The Operator Interface will be a panel mounted NEMA type 4X rated, with a 10.4" (264.0 mm) LCD display.

5.2 The Operator Interface may be mounted up to 2000 feet (610 meters) from the Controller.

5.3 The Operation Interface will have preformatted displays configured by the controller configuration software.

5.4 The Operator Interface will have dedicated membrane keys for up to 80 preformatted displays.

5.5 The Operator Interface will have a membrane keypad for data entry.

5.6 The Operator Interface will have a configurable title display.

5.7 The Operator Interface will have an alarm indication, which can be configured to flash as long as unacknowledged alarms are present.

5.8 There will be multiple LOOPS displays allowing monitoring and control of the 32 PID loops resident in the Controller.

5.9 There will be multiple OVERVIEW displays allowing monitoring and changing of all analog or digital values resident in the controller.

5.10 The ALARM display will be a multi-page display for monitoring and acknowledging up to 240 alarms. A single keystroke will acknowledge all alarms on a page.

5.11 The DIGITAL STATUS display will be a multi-age display to monitor the status of up to 256 digital inputs resident in the controller.

5.12 Setpoint Programs and Recipes can be displayed, edited and downloaded from the Operator Interface.

5.13 The Operator Interface (OI) shall be capable of displaying analog variables depicting current value, and historical trending. The system shall allow analog trending for a minimum of 24 analog variables. Trend resolution shall be adjustable between 30 minutes and 24 hours per display window. The system capacity shall allow not less than 24 analog variables to be trended.

5.14 The OI shall be furnished with a 3.5" 1.44 MB floppy disk (100 MB ZIP option) removable memory storage device for field configuration down loads and data archiving. The controller shall download time and date stamped analog trending and system alarm and status information for removal and transfer to customer PC. Stored data shall be encrypted to prevent modification. Stored system data shall be viewable on customer PC using a vendor supplied Data Analysis software or, standard Windows based software utilizing Comma Separated Variable (CSV) or Data Interchange Formats (DIF) for use in report generation or historical data retention. The memory storage device shall accumulate data at the configured rate. The disk storage space shall be monitored and an alarm shall be indicated upon a user adjustable percent full setpoint giving advanced notice for memory disk replacement. The OI shall indicate if the memory disk is not installed or enabled. The system shall allow normal maintenance of the system including removal and replacement of the memory storage disk without loosing data. The system historical capacity shall allow 24 analog variables to be trended at 5-minute intervals for not less than 29 days before a disk change is required. The following analog and system status variables shall be historically archived:

> Tagged Analog Variable Parameters
> Tagged Digital Variable Parameters
> Alarms – up to 1000
> Events – up to 1000

5.15 The data analysis software shall allow viewing trend data in both horizontal and vertical trend graph formats, in tabular formats, X-Y plots, simultaneous display of multiple trend files, split screens to compare two trend displays, panning (scrolling), value and box zooming and compression. Historical alarms and events shall be displayed in a tabular format.

5.16 The Controller shall include system security to prevent unauthorized changes in system parameters. The security system shall allow a minimum of three levels of security in a hierarchical structure allowing different levels of access to the Controller for differentiation of desired assess levels for operator, Maintenance, & Supervisory access levels. The security system shall also have a calendar based factory backdoor utility allowing a means of bypassing a forgotten security code. The bypass code shall be data specific allowing bypass access for one day allowing restoration of a new user access code.

6.0   COMMUNICATIONS

6.1 The controller shall have a standard, built-in Ethernet multi-drop port for communications to host devices. The multi-drop port may be networked with other controllers and up to five host devices can be connected to each controller. The communication protocol will be Modbus TCP and permit read & writes operations to the data parameters of the controller, including analog and digital inputs & outputs, loop parameters, calculations, setpoint programs and schedules.

6.2 Controllers on this same network can also communicate to each other without the need for a host device. Each controller can obtain data (up to 1000 point's total) from up to eight other controllers. This peer data exchange shall use the standard Ethernet UDP protocol.

6.3 The controller shall have a second standard, built-in Ethernet communication port for connection of up to four remote I/O racks. Each remote I/O rack can be one of three versions: 4, 8, or 12 I/O module capacity.

6.4 The controller shall have Serial Modbus RTU Master/Slave communications as a standard feature. A minimum of two configurable serial ports shall be available.

7.0   CONFIGURATION SOFTWARE

7.1   There shall be a common PC based engineering tool for the development and monitoring of the process & logic control strategy. This tool shall also configure alarms & events as well as the operator interface graphic displays and archiving.

7.2   This tool shall be compatible with Windows NT, ME & 2000 operating systems.

7.3   This tool shall have the capability segmenting the control strategy into multiple worksheets. All worksheets can be connected using software connectors. A security mechanism shall be available to prevent viewing of individual worksheets.

7.4   Changes to the control strategy can be downloaded to the controller while remaining in the run mode without interruption of the process.

7.5   Communications to the controller shall be either direct via a standard dedicated RS232 port, or, as a host connection over the aforementioned Ethernet port.

7.6   This tool shall have an overview-monitoring window that can monitor all I/O points, signal tags, variables, and operator interface displays.

This tool shall also have the capability of monitoring parameters within multiple function blocks, across multiple worksheets.