



SPECIAL FURNACE CO INC

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H2 SERIES

APPLICATIONS

The H2 Series flow control system is designed for introducing and controlling hydrogen in a closed retort batch furnace. The safety systems used exceed the NFPA (National Fire Protection Association) recommendations. With this system hydrogen may be introduced into a furnace retort at any temperature. Hydrogen is used for bright annealing of stainless steel and copper alloys, chemical reductions, brazing and many other processes. Flow rates and ranges are engineered for specific systems.

FEATURES

THREE LINE ATMOSPHERE FLOW CONTROL

One line carries the hydrogen, one line the process/purge inert gas and one line the emergency inert purge.

HYDROGEN LINE FLOW CONTROL

Hydrogen line includes manual shut off ball valve, pressure regulator, relief valve, pressure gauge, solenoid for automatic shut off, flowmeter with regulating valve, low flow switch, flame arrestor and check valve.

INERT PROCESS AND PURGE LINE FLOW CONTROL

Inert gas purge line includes manual shut off ball valve, pressure regulator, pressure relief valve, pressure gauge, flowmeter with regulating valve, solenoid for automatic actuation, and check valve. Purge gas may be nitrogen, argon or helium.

EMERGENCY INERT PURGE

A totally separate emergency inert gas purge line includes manual shut off ball valve, pressure regulator, pressure relief valve, pressure gauge, flowmeter with regulating valve, normally open solenoid for automatic actuation, and check valve. This must be connected to a separate tank of inert gas.

INERT PURGE AROUND ELEMENT CHAMBER

The furnace has a separate inert atmosphere purge between the outside of the retort and the elements. This has its own flowmeter with regulating valve and branches off the inert process gas purge. This protects the system in case of a leak in the retort. It is especially important when operating with hydrogen below 1400°F (760°C).

HYDROGEN FLOW CONTROL PANEL FOR BATCH RETORT FURNACES

ATMOSPHERE SAMPLE PORT

An alloy sample port is provided. There is a ball valve to close this off when not in use. This is used to sample the atmosphere for oxygen and hydrogen content.

ELECTRIC BURN OFF IGNITOR

An electric ignitor made of silicon carbide maintains a positive ignition source at the gas exit. This includes an electronic sensor which signals an alarm to shut off hydrogen if the ignition source is lost. As an option, two ignitors can be provided.

WATER COOLING SYSTEM

On retorts that have water cooled seals a manual ball valve shut off, flowmeter and regulating valve, relief valve and low flow switch are included plus hook ups for the inlet and outlet.

VISUAL AND AUDIBLE ALARMS

A piezo buzzer with push button silencer is provided to indicate any alarm condition. In addition, specific pilot lights indicate precisely which alarm conditions are activated. Silencer does not turn off pilot light indicator.

VISUAL INDICATION OF GASES

There are pilot lights which indicate which gases are flowing.

HYDROGEN LOW FLOW SWITCH

Hydrogen line has a low flow switch to shut it off if hydrogen flow is not sufficient to maintain positive retort pressure. There is a delay timer to temporarily bypass the switch for hydrogen introduction.

DOOR INTERLOCK

There is typically a door interlock switch which prevents hydrogen from flowing unless the door is closed.

POWER FAILURE

Emergency purge is activated if there is a power failure. (There is a normally open solenoid to do this.)

EXTERNAL MUFFLE PURGE FLOW ALARM

A low flow switch shall initiate emergency purge if there is a low flow of purge gas around the retort.

NITROGEN PURGE CAPABILITY ALARM

A pressure switch on both the process and back up emergency nitrogen supply monitors the ability of the nitrogen to flow in case of an alarm condition. Low pressure opens solenoids from both lines.

LOSS OF BURN OFF FLAME IGNITION SOURCE

Turns off hydrogen and initiates inert purge.

WATER COOLING ALARM

On furnaces equipped with a water cooling system (typically for a door seal), there is a low flow switch alarm which turns off element power and hydrogen, and initiates a purge.

PURGED CONTROL PANEL

The main electrical control panel is purged with either instrument air or nitrogen. A differential switch must be activated for the control system to operate.

LOW TEMPERATURE ALARM

The control has a temperature based alarm which can be set at any temperature (normally 1400°F - 760°C) below which hydrogen shuts off. This is not strictly necessary when using the purge in / purge out method of hydrogen introduction / removal; however, it is an extra level of safety that can be used when desired.

ELECTRICAL ATMOSPHERE CONTROL SYSTEM

All electrical components that are in the hydrogen flow area are either explosion proof, intrinsically safe or rendered safe as per N.E.C. Articles 500 and 501.

FITTINGS AND PIPING

Pipe is normally copper throughout the flow panel. Fittings are brass flare type NPT fittings where possible. These are easy to disassemble for maintenance work and are extremely tight.

BACK PRESSURE CONTROL

The outlet from the retort has a needle valve which allows control of the back pressure of the furnace. There is a pressure relief valve before the needle valve to prevent over pressurization of the retort. There is a pressure gauge calibrated for between 0 and 90" W.C. pressure.

FLOW CONTROL PANEL

A floor standing flow control panel contains all the flow train components. This panel is constructed of 10 gauge steel from the floor to the top of the panel. The panel has an open back for easy maintenance and 12" deep side panels for protection of the components and good appearance.

LOSS OF EXHAUST VENTILATION

Specific alarm contacts and differential pressure switch to be installed in the ventilation system are provided. This initiates inert purge and shuts off power in the case of low ventilation flow.

SAFETY REGULATIONS

This atmosphere system is designed to meet or exceed the regulations of the National Fire Protection Agency for controlled atmosphere furnaces (NFPA-86C.)

IRI OR FM APPROVAL

L&L will provide all necessary information to customer's insurance carrier for approval purposes.

ATMOSPHERE INSTRUCTIONS

A very complete instruction manual is included. This includes theory of operation of all major systems and subsystems, full maintenance instructions and schedules, component lists, component instructions, data sheets, emergency procedures, cautions, start up and shut down procedures, and a complete flow schematic of the atmosphere system.

NOTE CONCERNING INTRODUCTION OF HYDROGEN

The hydrogen must be introduced into the furnace manually by activating a switch on the control panel. This is according to the NFPA-86C regulations. An automatic purge cycle with automatic introduction of hydrogen is not allowed. Using the "purge in" method the operator must confirm that the oxygen content inside the furnace is below 1% before introducing hydrogen.

OPTIONS

- **GAS MIXING CAPABILITY:** The system can be designed to mix hydrogen and process inert gas (nitrogen, argon or helium) in various percentages.
- **HYDROGEN BUBBLER FOR WET HYDROGEN:** A manual or event driven bypass allows the hydrogen to be piped through a bubbler to make it wet hydrogen. Automatic PID control is also optional.
- **MASS FLOWMETERS:** One or more of the atmosphere lines can have a mass flowmeter to control the flow rates very precisely. Can be recorded.
- **NOVA OXYGEN / HYDROGEN ANALYZER:** Portable combination oxygen and hydrogen analyzer. This meets the NFPA requirements for gas analysis when doing the purge in/purge out method of gas introduction and removal. Includes power supply and pump.
- **DELTA F OXYGEN ANALYZER:** Model PA 31525 A-Plus with 0-1/5/25% ranges, five year sensor warranty, local analog display, 0-10 VDC analog output, integral rotometer with flow control adjustment and NEMA 1 enclosure. Optional is an alarm condition preventing hydrogen from flowing and initiating a nitrogen purge at any time if oxygen level rises above 1%.
- **SIERRA MONITORS HYDROGEN LEAK MONITOR:** Calibrated for 1/4 of the LEL (1% hydrogen). An alarm output from this sensor shuts off hydrogen, initiates purge, and rings an alarm buzzer.
- **TIMED PURGE SYSTEM:** Purge timers prevent the introduction of hydrogen until the "purge in" is performed. A piezo buzzer indicates the end of a purge cycle. The furnace atmosphere still needs to be manually analyzed with a gas analyzer; however, this system adds an extra measure of safety to the operation.
- **HYDROGEN HIGH FLOW SWITCH:** A high flow switch shall initiate purge when 150% of process requirements are exceeded.
- **STAINLESS STEEL PIPING FOR HYDROGEN:** All flow components in the hydrogen line and all piping and fittings can be made of stainless steel. All welded connections can be used. Also piping and components can be cleaned for oxygen service.
- **INSTRUMENT AIR FILTERS FOR PANEL PURGE:** Two special Balston filters convert compressed air into instrument quality air for the panel purge.
- **START UP SERVICE:** An L&L factory technician will review and check out customer's installation, start up and burn in furnace, and train operators.