

SPECIFICATION
SHEET 114



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INSTRUMENT CORPORATION

H₂/N₂ H₂/Ar GAS MIXING SYSTEMS

MODELS
8300, 8350
8400, 8450
8600





Model 8400

FEATURES

- Continuous gas analysis of the gas mixture
- Infinite flowrate turndown
- Gas mixture may be easily adjusted to optimum setpoint
- Built-in alarms to alert personnel to improper conditions
- For multiple furnace applications, single station mixing improves safety and management control of the mixture
- The furnace atmosphere models meet the applicable sections of NFPA 86C, Chapter 7
- Available in standard capacities of 0-2000, 0-5000, and 0-10,000 SCFH

APPLICATION

Furnace Atmosphere

Mixtures of hydrogen and nitrogen are often required in the heat treating industry to create a special atmosphere in furnaces. The Thermco gas mixer can create gas mixtures from bulk sources to create a system that is economical and reliable. The Thermco surge tank based system has infinite flowrate turndown capability able to supply a single furnace or a multiple number of furnaces. Some of the common processes used with the gas mixer are:

- Annealing steel coils
- Annealing copper, brass
- Brazing
- Glass metal seals
- Oxide coating of steel
- Sintering

The Thermco furnace atmosphere gas mixer is designed to meet the applicable requirements of NFPA 86C, Standard for Industrial Furnaces Using a Special Processing Atmosphere.

Welding Gas

Gas mixers are available for mixing hydrogen and argon for welding purposes (usually plasma welding). The typical range of these gas mixers is 0-10% H₂ in Ar, which can produce a mixture of 5% H₂/95% Ar. The H₂/Ar gas mixers are designed the same as the furnace atmosphere gas mixers, except the argon flow is shut off during a power failure and manual reset is not required to restart hydrogen flow after an alarm.

PRINCIPLES OF OPERATION

Within the gas mixer, the major and minor gas streams are regulated to the same pressure. Downstream of the regulators, the major gas flows through a fixed orifice, and the minor gas flows through a metering valve which acts as an adjustable orifice. The two gas streams are mixed together under turbulent flow conditions and fed into a surge tank. Once the pressure in the surge tank reaches the upper setpoint on a pressure switch, the gas supplies are automatically shut off with solenoid valves. As mixed gas is required the pressure in the surge tank falls until it reaches its lower setpoint. At this point, the solenoid valves are opened and the cycle repeats.

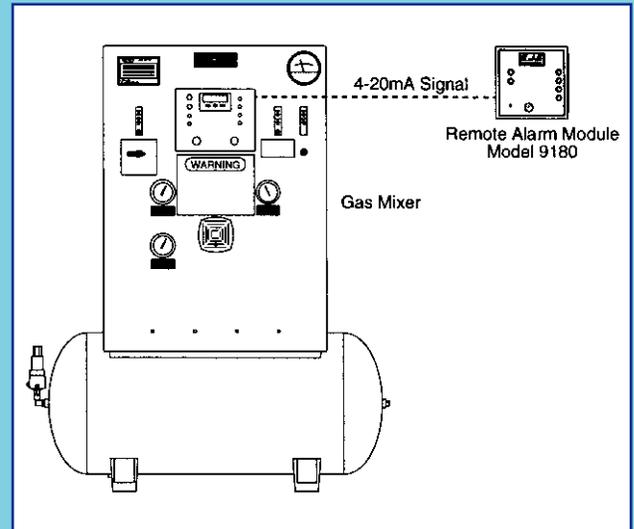
The gas analyzer continuously monitors the mixture in the surge tank. If a mixture adjustment is to be made, the operator turns the minor gas metering valve accordingly, and the gas analyzer reads out the resulting mixture. Once the desired mixture is obtained, the mixing system will maintain a constant mixture ratio.

With changing mixed gas flowrate, only the cycling frequency changes; the pressure drops across the orifices remain the same, producing a consistent mixture.

This design is simple and rugged; controllers or flowmeters on the process gas are not required.

Remote Alarm Module

A remote alarm module is available to monitor the alarms and the gas analysis at a distance from the mixer. The remote module duplicates the alarms and gas analysis readout which are on the gas mixer. A horn sounds at the remote module in the case of an alarm.



The remote alarm module may be installed up to 1000 feet from the gas mixer with the proper wiring. The remote alarm module must be mounted in an indoor, non-hazardous area.

Special Designs

Modifications of the standard gas mixers are frequently produced for special applications. Some of the special modifications available:

- Larger than 10,000 SCFH flowrate
- Special materials of construction
- Gas mixing at higher or lower than standard pressures





Model 9120 for
Hydrogen/Nitrogen

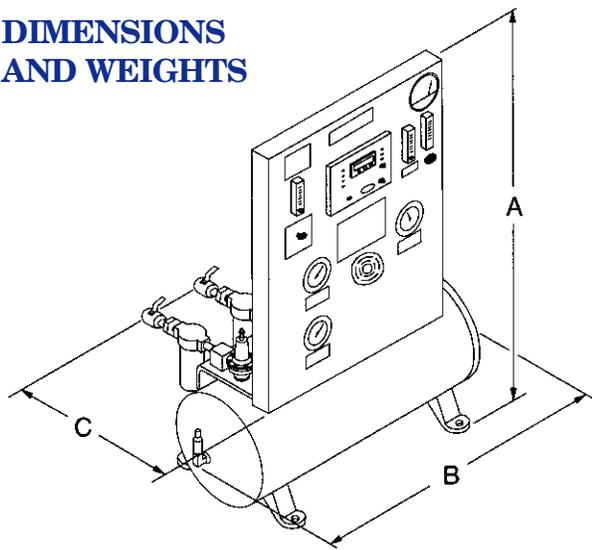
THERMCO GAS ANALYZER/ ALARM SYSTEM

The Thermco gas analyzer and the safety alarm system have been incorporated into a single unit.

The gas analyzer is a thermal conductivity type manufactured by Thermco. Thermal conductivity is the ideal method for measuring hydrogen/nitrogen or hydrogen/argon gas mixtures due to the high thermal conductivity difference between hydrogen and nitrogen/argon. The thermal conductivity gas analyzer does not contain any depleting chemicals. The Thermco hydrogen analyzer is exceptionally stable, with zero adjustment recommended once per month and calibration check recommended once per year. The hydrogen percent readout is digital, with a resolution of 0.1% hydrogen.

The gas analyzer uses a positive pressure purge to meet the explosion proofing code. Nitrogen or argon from the gas mixer is used as the purging gas.

DIMENSIONS AND WEIGHTS



MODEL	A	B	C	NET WEIGHT	CRATED WEIGHT
8300, 8350	59" (140cm)	41" (104cm)	31" (79cm)	282 lbs. (128 kg)	460 lbs. (209 kg)
8400, 8450	63" (160cm)	51" (130cm)	38" (97cm)	400 lbs. (181 kg)	620 lbs. (281 kg)
8600	72" (183cm)	75" (190cm)	42" (107cm)	655 lbs. (297 kg)	1010 lbs. (458 kg)

SAFETY ALARM SYSTEM FUNCTIONS

FURNACE ATMOSPHERE APPLICATION

Gas mixers for the furnace atmosphere application will contain the following alarms:

High Hydrogen Alarm. If the hydrogen level rises above the high alarm value on the gas analyzer, the hydrogen flow will be shut off and a light and horn will be energized.

Low Hydrogen Alarm. If the hydrogen level falls below the low alarm value on the gas analyzer, a light and horn will be energized.

Low Nitrogen Pressure. If the inlet nitrogen pressure falls below the minimum necessary for proper gas mixing, the hydrogen flow will be shut off and a light and horn will be energized.

Power Failure. If a power failure should occur, the hydrogen will be shut off and the nitrogen will continue to flow. A light and horn will be energized when the power resumes.

If high hydrogen, low nitrogen pressure or the power failure alarms continue for more than approximately 5 seconds, manual reset by the operator is required to restart hydrogen flow.

The gas mixing system constitutes part of a flow control system for furnace atmospheres; as such it meets the applicable sections of NFPA 86C, chapter 7. The gas mixing system should be installed in an overall system that meets NFPA 86C requirements.

WELDING GAS APPLICATION

For welding applications, the alarm functions are the same, except hydrogen flow will restart without manual reset. There is no argon flow on a power failure.

GENERAL SPECIFICATIONS

FLOWRATE	MODEL	STANDARD RANGES (Other Ranges Available)
0-2000 SCFH (0-53.6 Nm ³ /h)	8300	0-10% Hydrogen in Nitrogen 0-20% Hydrogen in Nitrogen 0-50% Hydrogen in Nitrogen 50-80% Hydrogen in Nitrogen
0-2000 SCFH (0-53.6 Nm ³ /h)	8350	0-10% Hydrogen in Argon
0-5000 SCFH (0-134 Nm ³ /h)	8400	Same as Model 8300
0-5000 SCFH (0-134 Nm ³ /h)	8450	0-10% Hydrogen in Argon
0-10,000 SCFH (0-268 Nm ³ /h)	8600	Same as Model 8300

GAS MIXING ACCURACY

± 3.0% of full range over 50° F to 90° F (10° C to 32° C) temperature range
± 5.0% of full range over 10° F to 104° F (-12° C to 40° C) temperature range
For the 50-80% H₂ in N₂ range, accuracy is ± 3.0% H₂ over 50° F to 90° F (10° C to 32° C) and ± 5.0% H₂ over 10° F to 104° F (-12° C to 40° C).

Stated accuracy assumes that the input temperature of the gases are equal.

Gas mixer accuracies depend upon many variables, including gas mixer maintenance, and environmental conditions around the gas mixer. These accuracies are presented as typical performance for these systems.

The gas analyzer accuracy is separate. Contact the Thermco sales engineer for details.

FLOW CAPACITY

Rated capacity of 0-2000, 0-5000, and 0-10,000 SCFH is at midrange setting. Less capacity is available below midrange setting and more capacity is available above midrange setting. Consult Thermco for details on available capacity. Midrange setting is the middle of the gas mixer adjustment range, i.e., a gas mixer with a range of 0-20% Hydrogen in Nitrogen has a midrange setting of 10% Hydrogen in Nitrogen.

TEMPERATURE RANGE - Ambient and Process Gas
10° F to 104° F (-12° C to 40° C)

NORMAL SUPPLY GAS INLET PRESSURE RANGE

100-125 PSIG (6.9 - 8.6 barg) for major and minor gases for all models. Input pressures do not have to be equal.

NORMAL MIXED GAS OUTPUT PRESSURE RANGE

10-40 PSIG (0.7 - 2.8 barg) for models 8300, 8400, 8600.
10-50 PSIG (0.7 - 3.4 barg) for models 8350, 8450. Mixed gas pressures are adjustable with a regulator on the gas mixer.

GAS CONNECTIONS and PIPING

For all models the nitrogen/argon input connection is 1 inch NPT female pipe and the hydrogen input connection is 1/2 inch NPT female pipe. For all models the mixed gas connection is 1 inch NPT female pipe, except the model 8600 which has a 1 1/2 inch NPT female connection.

SURGE TANK

30 gallon for Models 8300, 8350; 60 gallon for Models 8400, 8450; 120 gallon for model 8600; carbon steel, ASME coded, and CRN registered; pressure relief valve provided.

POWER REQUIREMENTS

115 VAC, ±10 VAC, 50/60 Hz., 0.9 Amps
(220 VAC, 50/60 Hz. available on request).

ELECTRICAL CONSTRUCTION

The gas mixer is designed to meet the National Electric Code for a hazardous area, classified as Class 1, Division 2, Group B. No other code requirements or approvals are claimed by Thermco.

GAS ANALYZER

PRINCIPLE OF OPERATION

Thermal conductivity, manufactured by Thermco.

READOUT

Digital readout, resolution 0.1%, direct readout in gas percent, built-in microprocessor based linearizer.

SIGNAL OUTPUT

4-20 mA, isolated, proportional to gas analyzer range.

ZERO, CALIBRATION FREQUENCY

Zeroing of the analyzer is recommended once per month. Zeroing is accomplished with the major gas supplied to the gas mixer with controls provided on the gas mixer panel. Checking the calibration is recommended once per year. Calibration requires a certified gas mixture. Large ambient temperature changes may require more frequent zeroing and calibration.

NOTICE CONCERNING SUPPLY SYSTEMS

Because these gas mixers operate by intermittently filling a surge tank in the gas mixer, the gas mixer will demand the supply gases at full gas mixer capacity for some period of time, even if the mixed gas demand is small. For this reason, bulk gas supply systems (not portable liquid cylinders) should be used for the major gas. Please contact the Thermco sales engineer for guidance.

INSTALLATION LOCATION

The mixing system must be located indoors. If the gas mixer can not be placed in the main building, it must be placed in a separate building designed to protect the gas mixer from rain, snow, and heated to maintain the temperature between 10° F and 104° F.

WARNING

Improper use of this product can cause death, serious injury, or property damage. Personnel dealing with this equipment should read and understand warning labels and instruction manuals provided by Thermco. Only personnel familiar with industrial gases should attempt to install or service this equipment. Gases used in this equipment are flammable and therefore constitute a fire and explosion hazard; gases are under pressure and therefore the hazards associated with pressurized systems exist. Gases from high pressure cylinders must be reduced to the specified pressure before entering the mixing system.

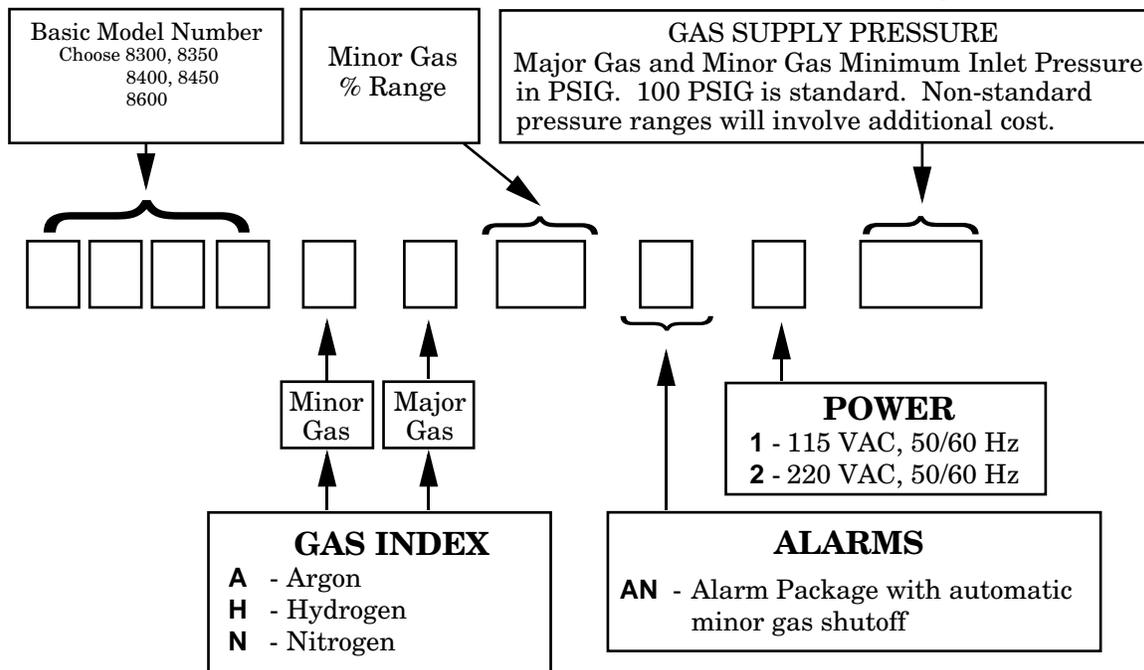
DOCUMENTATION

Each gas mixer is supplied with two instruction manuals which include complete wiring and flow diagrams. A complete data sheet is prepared for each gas mixer specifying major parts of the gas mixer and all pressure settings and orifices. A copy of the instruction manual is kept on file at Thermco, and engineering assistance is provided if required. Thermco has been providing service on gas mixers since 1964.

ORDERING INFORMATION

Thermco gas mixers are available through many local industrial gas suppliers. Thermco gas mixers may also be ordered directly from the factory. Before ordering please generate the proper model number by using the system on the rear page of this literature. It is especially important to order the correct pressure conditions for the application. If there are questions, please contact the Thermco sales engineer.

Gas Mixer Model Number System



Example

For a gas mixer with a flowrate of 0-2000 SCFH, with a range of 0-20% hydrogen in nitrogen, set up for 115 VAC, with an input pressure of 100-125 psig, the model number is: 8300HN20AN1100.

THE THERMCO® QUALITY ASSURANCE TEST

The gas mixer will be tested for 24 hours on the process gases at required pressure conditions to assure gas mixture accuracy and reliability.



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