

SPECIFICATION
SHEET 113



PHONE (219) 362-6258 FAX (219) 324-3568
P.O. Box 309
LA PORTE, INDIANA 46352 U.S.A.
www.thermco.com E-MAIL sales@thermco.com

— INSTRUMENT CORPORATION

BULK GAS MIXING SYSTEMS

MODELS
6105, 6205
6305, 6405
8105, 8205
8305, 8405





MODEL 6105, 6205, 6305, 6405 FOR INDOOR LOCATIONS

- 0-2000, 0-5000, 0-10,000, and 0-20,000 SCFH Flowrate Models
- Continuous gas analysis of the gas mixture, optional alarms available
- Surge tank design produces a constant gas mixture proportion from shutoff to full flow conditions



MODEL 8105, 8205, 8305, 8405 FOR OUTDOOR LOCATIONS

- Same benefits of indoor design plus a NEMA 4 enclosure for protection from weather or tampering
- The analysis has a heated cell chamber for functioning at outdoor temperatures

APPLICATION

The Thermco gas mixer is designed to mix two non-flammable and non-corrosive gases. The gas mixer is normally used with a process where the supply gases are drawn from bulk sources and the mixture is produced on-site where it is supplied to the process by a pipeline. The system is designed for applications that require a very reliable production for mixed gas on a continuous basis. Some of the common applications for the gas mixer are:

APPLICATIONS	
Carbon Dioxide/Argon Oxygen/Argon Helium/Argon	Welding Shield Gas
Carbon Dioxide/Nitrogen Oxygen/Carbon Dioxide	Food Packaging
Helium/Nitrogen Helium/Air	Leak Detection
Oxygen/Nitrogen	Blanketing Atmospheres
Nitrogen/Argon	Lamp Filling

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 shutoff with a solenoid valve. As mixed gas is required the pressure in the surge tank falls until it reaches its lower setpoint. At this point, the solenoid valve is 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.

SOLID-STATE SURGE TANK PRESSURE SWITCH



The gas mixer utilizes a solid-state pressure switch to control the surge tank pressure. A digital readout of the pressure is built into the switch. Both the sensing element and electrical switch are solid-state. An LED indicator shows when the surge tank is filling. Use of this pressure switch virtually eliminates the most common cause of gas mixer failure.

Special Designs

Customized designs are frequently manufactured for specific customer requirements.

Food Packaging - Stainless steel NEMA 4X enclosures and stainless steel surge tanks are available for harsh washdown environments in food processing areas. Higher than standard mixed gas outlet pressures are available.

Leak Detection - These systems often require high mixed gas outlet pressures (up to 400 PSIG). These applications should be discussed with the Thermco sales engineer to determine the best design based on available inlet pressure and required accuracy.

Blanketing Atmosphere - These applications require the creation of an oxygen/nitrogen mixture. The mixture may be created from air/nitrogen or oxygen/nitrogen supplies. Because the thermal conductivity of oxygen and nitrogen are very similar, the Thermco thermal conductivity gas analyzer can not be used in these applications. Instead, an oxygen specific analyzer is utilized, based on the electrochemical fuel cell or paramagnetic principle. Gas mixers for this application are frequently built for non-standard pressure conditions and flowrates higher than 5000 SCFH.

Lamp Filling - Precise mixture of nitrogen and argon are used for lamp filling. Special construction to minimize particulate and impurities in the gas mixture is available for this application.



Special Mixing System with 1060 Gallon Surge Tank



Gas analyzer calibrated for oxygen in argon, for indoor style gas mixer, with analog meter, no alarm package.

THERMCO GAS ANALYZER

The gas analyzer constantly monitors the mixture produced by the system. The analysis will immediately detect an improper gas mixture being created by conditions such as low pressure in one of the supply gases, a malfunction in the mixing system, or gross contamination in one of the supply gas streams.

The analyzer in the mixing system is a thermal conductivity type manufactured by Thermco. This analyzer is ideal for measurement of two gas mixtures. Calibration of the gas mixture with a known gas is recommended once a year. The weatherproof type gas mixers utilize a thermal conductivity gas analyzer with a temperature controlled detector chamber. For more details on the thermal conductivity analyzer refer to Specification Sheet 119.

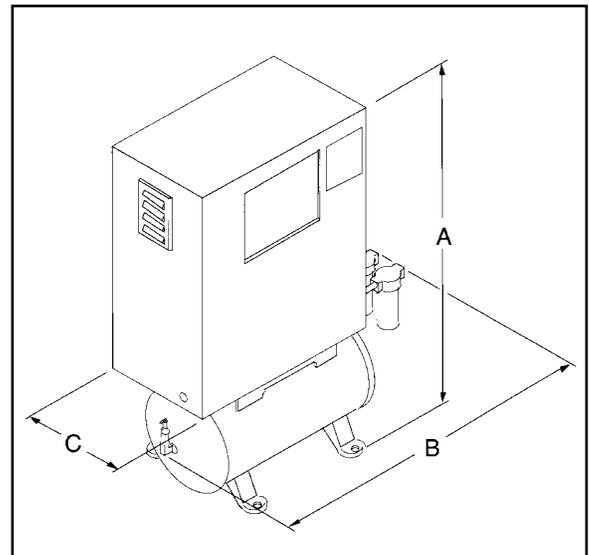
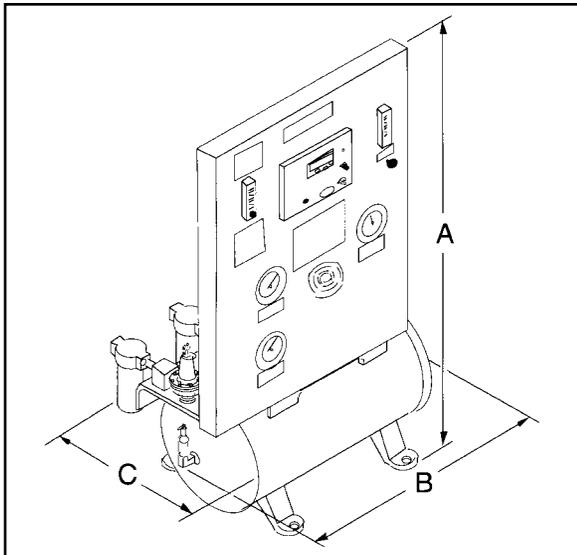


Gas analyzer calibrated for carbon dioxide in argon, for indoor style gas mixer with alarm package.

ALARM PACKAGE

A popular option with the gas mixers is automatic alarms to alert personnel when an improper gas mixture is being created. When alarms are ordered on the gas mixing system, the standard analog meter is replaced with a digital meter. This alarm option is described as the alarm package. The alarm package includes high and low alarm contacts on the digital meter, a warning light on the analyzer, a horn that is mounted on the panel (or weatherproof enclosure), and a horn silence button.

In certain situations it may be required that the minor gas, major gas, or mixed gas be shutoff on an alarm condition. This can be accomplished with the alarm package if the factory is notified at the time the order is placed.



MODEL	A	B	C	NET WEIGHT	CRATED WEIGHT*
6105	55"(140cm)	41"(104cm)	26"(66cm)	230 lbs.(104 kg)	350 lbs.(159 kg)
6205	59"(150cm)	51"(130cm)	29"(74cm)	350 lbs.(159 kg)	500 lbs.(227 kg)
6305	71"(180cm)	74"(188cm)	34"(86cm)	680 lbs.(308 kg)	1000 lbs.(454 kg)
6405	76"(193cm)	89"(226cm)	40"(102cm)	1180 lbs.(535 kg)	1600 lbs.(726 kg)
8105	57"(145cm)	48"(122cm)	24"(61cm)	325 lbs.(148 kg)	425 lbs.(193 kg)
8205	61"(155cm)	54"(137cm)	25"(64cm)	440 lbs.(220 kg)	700 lbs.(318 kg)
8305	66"(168cm)	74"(188cm)	25"(64cm)	730 lbs.(331 kg)	1065 lbs.(483 kg)
8405	75"(191cm)	97"(246cm)	31"(79cm)	1230 lbs.(558 kg)	1690 lbs.(767 kg)

*These are crated weights for shipments to North America. Crated weights to other locations will vary.

GENERAL SPECIFICATIONS

FLOWRATE	INDOOR MODEL	OUTDOOR MODEL	STANDARD RANGES (Other Ranges Available)
0-2000 SCFH (0-53.6 Nm ³ /h)	6105	8105	0-30% CO ₂ in Argon 0-10% Oxygen in Argon 0-50% Helium in Argon 0-50% Helium in Nitrogen 0-50% CO ₂ in Nitrogen
0-5000 SCFH (0-134 Nm ³ /h)	6205	8205	same as above
0-10,000 SCFH (0-268 Nm ³ /h)	6305	8305	
0-20,000 SCFH (0-536 Nm ³ /h)	6405	8405	

GAS MIXING ACCURACY

±2% of full range over 60°F to 80°F (15°C to 27°C)

temperature range

±4% of full range over 32°F to 104°F (0°C to 40°C)

temperature range

±8% of full range of -10°F to 104°F (-23°C to 40°C)

temperature range

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

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

FLOW CAPACITY

Rated capacity of 0-2000, 0-5000, 0-10,000, and 0-20,000 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 0-30% CO₂ in argon has a midrange setting of 15% CO₂ in argon.

TEMPERATURE RANGE - Ambient and Process Gas

Indoor Models: 32°F to 104°F (0°C to 40°C)

Outdoor Models: -10°F to 104°F (-23°C to 40°C)

Some large outdoor-style gas mixers (greater than 10,000 SCFH) will have higher minimum temperature ratings. Consult factory for details.

NORMAL SUPPLY GAS INLET PRESSURE RANGE

100-125 PSIG (6.9-8.6 barg) for major and minor gases for models 6105, 6205, 8105, 8205.

120-145 PSIG (8.3-10.0 barg) for major and minor gases for models 6305, 6405, 8305, 8405.

Input pressures do not have to be equal.

NORMAL MIXED GAS OUTLET PRESSURE RANGE

10-50 PSIG (0.7-3.4 barg) for models 6105, 6205, 8105, 8205.

30-50 PSIG (2.1-3.4 barg) for models 6305, 6405, 8305, 8405. Mixed gas pressures are adjustable with a regulator on the gas mixer.

GAS CONNECTIONS and PIPING

For models 6105, 6205, 8105, 8205, 1 inch female NPT pipe for major, minor, and mixed gas connections. For other models consult the factory. Piping is brass and copper material.

SURGE TANK

30 gallon for Models 6105, 8105; 60 gallon for Models 6205, 8205; 120 gallon for Models 6305, 8305; 240 gallon for Models 6405, 8405; carbon steel, ASME coded, and CRN registered; pressure safety relief valve provided.

POWER REQUIREMENTS

115 VAC, 50/60 Hz, 1.1 amp. Acceptable voltage range 104-126 VAC. Available on request, 220 VAC, 50/60 Hz, 0.55 amp. Acceptable voltage range 204-240 VAC.

GAS ANALYZER

PRINCIPLE OF OPERATION

Thermal conductivity, manufactured by Thermco.

RANGE

The range of the analyzer will be the same as the gas mixer, except for the 0-30% CO₂ in argon gas mixer, which has an analyzer range of 0-50% CO₂ in argon.

ANALYSIS INDICATION

Analog meter versions, 4.5 inch (11.4 cm) meter, non-linear direct reading scale. The analog meter is only available on CO₂/argon and oxygen/argon ranges. Digital meter versions, resolution 0.1%, direct readout in gas percent, built-in microprocessor-based linearizer.

SIGNAL OUTPUT

4-20 mA, proportional to gas analysis range selected. This output is isolated and self-powered with a compliance of 10 VDC. This output is not available on the analog meter versions.

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, and in some circumstances, the minor gas. Please contact the Thermco sales engineer for guidance.

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 from high pressure cylinders must be reduced to the specified pressure before entering the gas mixing system to prevent the possibility of equipment damage and personal injury.

Only use oxygen in gas mixers specifically designed for oxygen service. Gas mixers not designed for oxygen service can not be converted to oxygen service.

Flammable, liquid or corrosive gases should not enter these gas mixing systems.

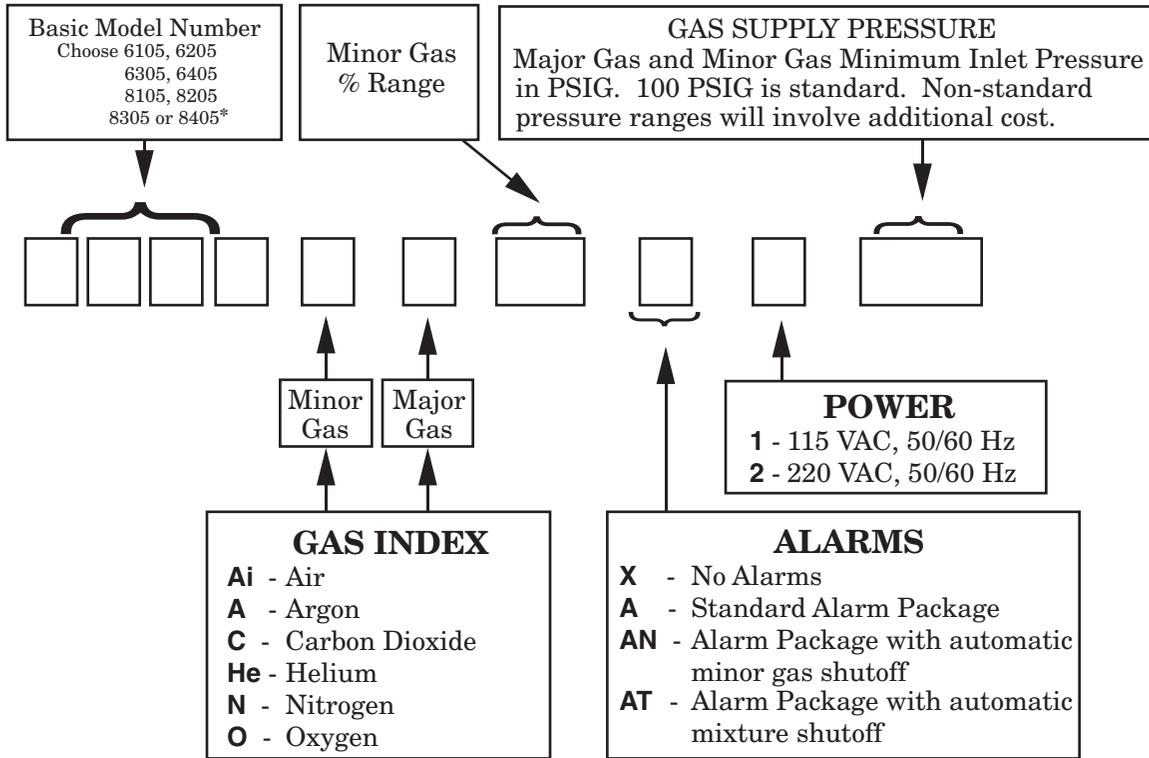
DOCUMENTATION

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 specially 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 an indoor gas mixer, 0-2,000 SCFH, with a range of 0-30% Carbon Dioxide in Argon, with the alarm package, setup for 115 VAC, with an inlet pressure range of 100-125 PSIG, the model number is: **6105CA30A1100**

* For mixtures of oxygen/nitrogen and air/nitrogen, consult the factory for proper model number designation.

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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