PURE GUARD™
The pure and simple choice

Oxygen Removing Purifiers

Johnson Matthey OR series Oxygen Removing Purifiers catalytically combine hydrogen and oxygen to form water vapor. The water vapor passes off with the purified gas and can be removed, if necessary, with a desiccant or a Johnson Matthey HP series Hydrogen Purifier.

Theory

Johnson Matthey Oxygen Removing Purifiers contain a precious metal catalyst that promotes the reaction of hydrogen and oxygen gases to form water vapor, normally at ambient temperature. The two gases combine in a stoichiometric ratio of two units of hydrogen to one unit of oxygen. In order to completely eliminate hydrogen or oxygen, the other gas must be present in excess (roughly 110%) of the stoichiometric ratio to ensure the reaction is driven to completion.

Typical Applications

The Johnson Matthey OR series are most commonly used to remove oxygen from hydrogen gas streams. They provide excellent protection against local overheating of the palladium-alloy membrane in Johnson Matthey HP series Hydrogen Purifier. They are also ideal for purifying electrolytic hydrogen to be used in analytical or metallurgical applications.

In addition, Johnson Matthey OR series purifiers can also be used to remove hydrogen from oxygen or air streams. And either hydrogen or oxygen can be removed from other industrial gases, including nitrogen, argon, helium, and carbon dioxide, provided the other gas is present in the proper stoichiometric ratio.

Installation and Operation

The Johnson Matthey OR series must be installed vertically to prevent channeling of the gas after the catalyst has settled. The inlet gas should always enter through the top of the unit and flow downward. Up-flow may fluidize the catalyst bed and cause attrition of the catalyst.

Both connections to the OR should be purged and leak tested before placing the unit in service. Once the system has been purged, the gas flow can be turned on and the OR will begin to work immediately.

JM
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Gas Purification Technology

Oxygen Removing Purifiers

The OR generally operates at room temperature; however, it may be necessary to heat the gas stream if it is near its dewpoint, or if carbon monoxide is in the feed gas. The OR is designed to be operated continuously at a maximum pressure of 250 psig. Pressure drop across the OR is negligible.

The reaction of hydrogen and oxygen is an exothermic reaction (heat releasing). The temperature rise associated with the reaction is approximately 30ºF per 0.1% of oxygen removed from hydrogen or nitrogen and 40ºF per 0.1% of oxygen removed from argon or helium. The actual temperature rise depends upon the heat capacity of the gas being processed and on heat losses from the system.

The OR should be purged with an inert gas such as argon or nitrogen prior to shutting down the system. This will remove all water vapor so that it will not condense on the catalyst when the bed cools down.

Safety

To maintain a safe level below the explosive limit, the OR series *must not* be used to remove more than 1% oxygen or 2% hydrogen.

Purity

Johnson Matthey OR series Oxygen Removing Purifiers can be used to reduce 1% oxygen or 2% hydrogen to less than 1ppm.

Life Expectancy

Johnson Matthey OR's typically last at least 3-5 years. Factors that contribute to premature failure include attrition, excessively high temperature and poisoning of the catalyst.

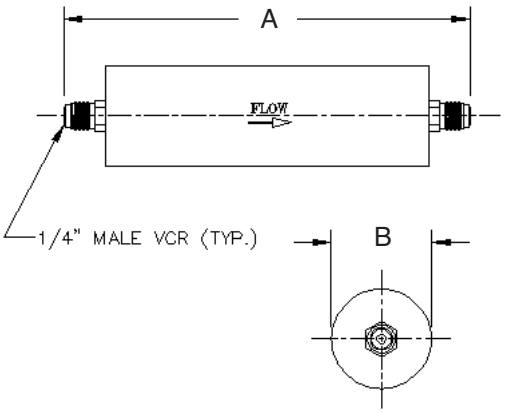
Excessive temperature (greater than 1300ºF) causes metal sintering and significantly reduces the catalyst activity. The catalyst will be poisoned by free carbon, oil, grease, sulfur compounds, phosphorous compounds, mercury, lead, iron and other metals. These elements have a cumulative effect, permanently poisoning the catalyst and diminishing its purifying activity. Poisoned catalyst cannot be regenerated.

The catalyst will not function if wet, so care must be taken to prevent condensation of water vapor by cooling. The formation of water shields the reacting surface but does not render the catalyst permanently inactive. The catalyst will operate satisfactorily when thoroughly dried-out. Carbon monoxide will also inhibit the oxygen-hydrogen reaction. This condition can be overcome by increasing the temperature of the gas stream.

Features

- Reduces 1% O_2 or 2% H_2 to less than 1ppm
- Flow rates from 10 SCFH to over 30,000 SCFM
- Safe, efficient, continuous operation
- Low operating cost
- Stainless steel construction
- Orbitally welded design
- High pressure capability
- Low pressure drop
- Ambient temperature operation
- Units available with VCR® fittings or tube stubs
- 1/4" VCR connections standard and 1/2" available upon request
- Large units are flanged for easy installation
- Custom designed units available
- High pressure units available upon request

Oxygen Removing Purifier



Dimensions* & Flow Rates

Model	A	B	Flow Rate
OR-10	7.00"	1.50"	5 slpm
OR-25	11.00"	1.50"	12 slpm
OR-50	15.25"	1.50"	24 slpm
OR-100	17.25"	2.00"	47 slpm
OR-200	13.25"	4.00"	94 slpm
OR-300	16.50"	4.00"	141 slpm
OR-400	17.50"	4.00"	188 slpm
OR-500	20.50"	4.00"	235 slpm
OR-600	23.50"	4.00"	282 slpm

*Larger units available upon request

Johnson Matthey
Gas Purification Technology

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