



MATERIAL SAFETY DATA SHEET

Prepared to U.S. OSHA, CMA, ANSI and Canadian WHMIS Standards

1. PRODUCT AND COMPANY INFORMATION

CHEMICAL NAME; CLASS: OXYGEN

SYNONYMS: Oxygen USP, Aviator's Breathing Oxygen (ABO)

CHEMICAL FAMILY NAME: Oxidizing Gas

FORMULA: O₂

Document Number: 50100

Note: This Material Safety Data Sheet is for Oxygen supplied in cylinders with 33 cubic feet (935 liters) or less gas capacity (DOD - 39 cylinders). For Oxygen in large cylinders refer to Document Number 10065.

PRODUCT USE:

Calibration of Monitoring and
Research Equipment

MANUFACTURED/SUPPLIED FOR:

ADDRESS:

EMERGENCY PHONE:

BUSINESS PHONE:

General MSDS Information

Fax on Demand:



821 Chesapeake Drive

Cambridge, MD 21613

CHEMTREC: 1-800-424-9300

1-410-228-6400

1-713/868-0440

1-800/231-1366

2. HAZARD IDENTIFICATION

EMERGENCY OVERVIEW: Oxygen is a colorless, odorless gas. There are no significant health hazards related to overexposure to Oxygen, except in a hyperbaric environment, which is unlikely in an industrial setting. The main hazard associated with releases of this gas is its powerful oxidizing power. In high oxygen content atmospheres, common combustible materials can become highly flammable. Emergency responders must practice extreme caution when approaching oxygen releases because of the extreme fire potential.

SYMPTOMS OF OVER-EXPOSURE BY ROUTE OF EXPOSURE: The most significant route of over-exposure for this product is by inhalation.

INHALATION: Due to the small size of an individual cylinder of this product, no unusual health effects from exposure to the product are anticipated under routine circumstances of use. If this product is released in a small, poorly ventilated area (i.e. an enclosed or confined space), high concentrations of this gas can cause an oxygen-rich environment. Exposure to an oxygen-rich environment is only known to cause adverse health effects when the duration of exposure is in excess of 17 hours. An exposure of this duration is extremely unlikely from use of this product due to the small overall cylinder size and content.

HEALTH EFFECTS OR RISKS FROM EXPOSURE: An Explanation in Lay Terms. Over-exposure to Oxygen may cause the following health effects:

ACUTE: Due to the small size of the individual cylinder of this product, no unusual health effects from exposure to the product are anticipated under routine circumstances of use. The most significant hazard associated with this gas is inhalation of oxygen-rich atmospheres.

CHRONIC: There are currently no known adverse health effects associated with chronic exposure to this gas.

TARGET ORGANS: ACUTE: Respiratory system. CHRONIC: None known.

3. COMPOSITION and INFORMATION ON INGREDIENTS

CHEMICAL NAME	CAS #	mole %	EXPOSURE LIMITS IN AIR					
			ACGIH-TLV		OSHA-PEL		NIOSH IDLH ppm	OTHER ppm
			TWA ppm	STEL ppm	TWA ppm	STEL ppm		
Oxygen	7782-44-7	99.5%	There are no specific exposure limits for Oxygen. Oxygen levels should be maintained above 19.5% and below 23.5%					
Maximum Impurities		< 0.5%	None of the trace impurities in this product contribute significantly to the hazards associated with the product. All hazard information pertinent to this product has been provided in this Material Safety Data Sheet, per the requirements of the OSHA Hazard Communication Standard (29 CFR 1910.1200) and State equivalents standards.					

This material is classified as hazardous under OSHA regulations in the United States and the WHMIS in Canada.

NE = Not Established.

See Section 16 for Definitions of Terms Used.

NOTE (1): ALL WHMIS required information is included in appropriate sections based on the ANSI Z400.1-2004 format. This product has been classified in accordance with the hazard criteria of the CPR and the MSDS contains all the information required by the CPR.

4. FIRST-AID MEASURES

No unusual health effects are anticipated after exposure to this product, due to the small cylinder size. Supplemental oxygen is not normally appropriate. Victims tend to recover rapidly, when removed from the hypoxic exposure. Victim(s) who experience any adverse effect after over-exposure to this product must be taken for medical attention. Physicians should be advised of the victim's exposure to an oxygen-rich environment. Rescuers should be taken for medical attention, if necessary. Take copy of label and MSDS to physician or other health professional with victim(s).

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: None known.

RECOMMENDATIONS TO PHYSICIANS: Treat symptoms and reduce over-exposure.

ADDITIONAL NOTES TO PHYSICIANS: Animal studies suggest that the administration of certain drugs, including phenothiazine drugs and chloroquine, increase the susceptibility to toxicity from oxygen at high pressures. Animal studies also indicate that vitamin "E" deficiency may increase susceptibility to oxygen toxicity.

Airway obstruction during high oxygen tension may cause alveolar collapse following absorption of the oxygen. Similarly, occlusion of the Eustachian tubes may cause retraction of the eardrum and obstruction of the paranasal sinuses may produce "vacuum-type" headache. All individuals exposed for long periods to oxygen at high pressure and who exhibit overt oxygen toxicity should have ophthalmologic examinations.

5. FIRE-FIGHTING MEASURES

FLASH POINT: Not applicable.

AUTOIGNITION TEMPERATURE: Not applicable.

FLAMMABLE LIMITS (in air by volume, %):

Lower (LEL): Not applicable.

Upper (UEL): Not applicable.

UNUSUAL FIRE AND EXPLOSION HAZARDS: Oxygen does not burn; however, cylinders, when involved in fire, may rupture or burst in the heat of the fire. Oxygen will support and accelerate combustion. Common combustible materials will burn more readily in elevated oxygen environments, and some materials which are non-combustible in air will burn in an oxygen-enriched atmosphere. Direct water onto cylinders to keep cool. Shut-off the flow of oxygen or move cylinders from fire area if it can be done safely. Rescue personnel should be aware of the extreme fire hazards associated with oxygen-enriched atmospheres.

FIRE EXTINGUISHING MATERIALS: Non-flammable gas. Use extinguishing media appropriate for surrounding fire.

Explosion Sensitivity to Mechanical Impact: Not Sensitive.

Explosion Sensitivity to Static Discharge: Not Sensitive.

SPECIAL FIRE-FIGHTING PROCEDURES: Structural fire-fighters must wear Self-Contained Breathing Apparatus and full protective equipment. Other information for pre-planning can be found in the North American Emergency Response Guidebook.

6. ACCIDENTAL RELEASE MEASURES

LEAK RESPONSE: Due to the small size and content of the cylinder, an accidental release of this product presents significantly less risk and other safety hazards than a similar release from a larger cylinder. However, as with any chemical release, extreme caution must be used during emergency response procedures. In the event of a release in which the atmosphere is unknown, and in which other chemicals are potentially involved, evacuate immediate area. Uncontrolled releases should be responded to by trained personnel using pre-planned procedures. Proper protective equipment should be used. In case of a leak, clear the affected area, protect people, and respond with trained personnel. Clear area of release of combustible materials until gas has dissipated. Adequate fire protection must be provided.

In general, **DO NOT ENTER AN AREA IF THE OXYGEN CONTENT EXCEEDS 23.5%. USE VENTILATION TO REDUCE THE OXYGEN LEVELS.** For emergency disposal, secure the cylinder and slowly discharge the gas to the atmosphere in a well-ventilated area or outdoors. Allow the gas, which is lighter than air to dissipate. If necessary, monitor the surrounding area (and the original area of the release) for oxygen.

If leaking incidentally from the cylinder contact your supplier.

7. HANDLING AND STORAGE

STORAGE AND HANDLING PRACTICES: Cylinders should be firmly secured to prevent falling or being knocked-over. Cylinders must be protected from the environment, and preferably kept at room temperature approximately 21°C, (70°F). Cylinders should be stored in dry, well-ventilated areas away from sources of heat, ignition and direct sunlight. Protect cylinders against physical damage. Store containers away from heavily trafficked areas and emergency exits. Store away from process and production areas, away from elevators, building and room exits or main aisles leading to exits. Consider installation of leak detection and alarm for storage and use areas. Have appropriate extinguishing equipment in the storage area (i.e. sprinkler system, portable fire extinguishers).

Full and empty cylinders should be segregated. Use a first-in, first-out inventory system to prevent full containers from being stored for long periods of time. These cylinders are not refillable. **WARNING! Do not refill DOT 39 cylinders. To do so may cause personal injury or property damage.**

SPECIAL PRECAUTIONS FOR HANDLING GAS CYLINDERS: WARNING! Compressed gases can present significantly safety hazards. During cylinder use, use equipment designed for these specific cylinders. Ensure all lines and equipment are rated for proper service pressure.

PROTECTIVE PRACTICES DURING MAINTENANCE OF CONTAMINATED EQUIPMENT: Follow practices indicated in Section 6 (Accidental Release Measures). Make certain application equipment is locked and tagged-out safely. Purge gas handling equipment with inert gas (i.e. nitrogen) before attempting repairs. Always use product in areas where adequate ventilation is provided.

8. EXPOSURE CONTROLS - PERSONAL PROTECTION

VENTILATION AND ENGINEERING CONTROLS: No special ventilation systems or engineering controls are needed under normal circumstances of use. As with all chemicals, use this product in well-ventilated areas.

RESPIRATORY PROTECTION: No special respiratory protection is required under normal circumstances of use. DO NOT ENTER AN AREA IF THE OXYGEN CONTENT EXCEEDS 23.5%. If respiratory protection is needed, use only protection authorized in the U.S. Federal OSHA Standard (29 CFR 1910.134), applicable U.S. State regulations, or the Canadian CSA Standard Z94.4-93 and applicable standards of Canadian Provinces.

EYE PROTECTION: Safety glasses. If necessary, refer to U.S. OSHA 29 CFR 1910.133 or appropriate Canadian Standards.

HAND PROTECTION: No special protection is needed under normal circumstances of use. If necessary, refer to U.S. OSHA 29 CFR 1910.138 or appropriate Standards of Canada.

BODY PROTECTION: No special protection is needed under normal circumstances of use. If a hazard of injury to the feet exists due to falling objects, rolling objects, where objects may pierce the soles of the feet or where employee's feet may be exposed to electrical hazards, use foot protection, as described in U.S. OSHA 29 CFR 1910.136.

9. PHYSICAL and CHEMICAL PROPERTIES

GAS DENSITY @ 32°F (0°C) and 1 atm: 0.083 lb/cu ft (1.326 kg/m³)

BOILING POINT: -183.0°C (-297.4°F)

FREEZING/MELTING POINT @ 10 psig: -218.8°C (-361.8°F)

SPECIFIC GRAVITY (air = 1) @ 70°F (21.1°C): 1.105

SOLUBILITY IN WATER vol/vol at 32°F (0°C) and 1 atm: 0.04.91

EVAPORATION RATE (nBuAc = 1): Not applicable.

ODOR THRESHOLD: Not applicable.

VAPOR PRESSURE @ 70°F (21.1°C) psig: Not applicable.

COEFFICIENT WATER/OIL DISTRIBUTION: Not applicable.

APPEARANCE, ODOR AND COLOR: This product is a colorless, odorless gas at normal temperature and pressure.

HOW TO DETECT THIS SUBSTANCE (warning properties): There are no unusual warning properties associated with a release of this product. An oxygen monitor can be used to detect oxygen levels.

pH: Not applicable.

MOLECULAR WEIGHT: 32.00

EXPANSION RATIO: Not applicable.

VOLUME (ft³/lb): 12.1

10. STABILITY and REACTIVITY

STABILITY: stable under conditions of normal temperature and pressure.

DECOMPOSITION PRODUCTS: None.

MATERIALS WITH WHICH SUBSTANCE IS INCOMPATIBLE: Oxygen is incompatible with combustible and flammable materials, chlorinated hydrocarbons, hydrazine, reduced boron compounds, ethers, phosphine, phosphorous tribromide, phosphorous trioxide, tetrafluoroethylene, and compounds which readily form peroxides. Oxygen may form explosive compounds when exposed to combustible material, or oil, grease, and other hydrocarbon materials.

HAZARDOUS POLYMERIZATION: Will not occur.

CONDITIONS TO AVOID: Avoid contact with incompatible materials. Cylinders exposed to high temperatures or direct flame can rupture or burst.

11. TOXICOLOGICAL INFORMATION

TOXICITY DATA: Oxygen is the vital element in the atmosphere in which we live and breathe. The atmosphere contains approximately 21% oxygen. Breathing higher concentrations could lead to oxygen toxicity and pneumonia. Breathing lower oxygen concentrations could lead to hypoxia. There are toxicity data for Oxygen, but are from studies in a hyperbaric environment and so are not pertinent to exposure in an industrial setting.

SUSPECTED CANCER AGENT: Oxygen is not found on the following lists: FEDERAL OSHA Z LIST, NTP, CAL/OSHA, IARC; therefore it is not considered to be, nor suspected to be a cancer-causing agent by these agencies.

IRRITANCY OF PRODUCT: None.

SENSITIZATION OF PRODUCT: Oxygen is not a sensitizer.

REPRODUCTIVE TOXICITY INFORMATION: Listed below is information concerning the effects of Oxygen on the human reproductive system.

Mutagenicity: Mutation data have been reported for Oxygen, but are from studies in a hyperbaric environment.

Embryotoxicity: Oxygen has not been reported to cause embryotoxic effects in humans.

Teratogenicity: Human teratogenic effects by inhalation have been reported, with developmental abnormalities of the fetal cardiovascular system; however, these data are from studies or incidences in a hyperbaric environment and are not related to casual or industrial exposure.

Reproductive Toxicity: Oxygen has not been reported to cause adverse reproductive effects in humans.

A mutagen is a chemical which causes permanent changes to genetic material (DNA) such that the changes will propagate through generation lines. An embryotoxin is a chemical which causes damage to a developing embryo (i.e. within the first eight weeks of pregnancy in humans), but the damage does not propagate across generational lines. A teratogen is a chemical which causes damage to a developing fetus, but the damage does not propagate across generational lines. A reproductive toxin is any substance which interferes in any way with the reproductive process.

BIOLOGICAL EXPOSURE INDICES (BEIs): Currently, Biological Exposure Indices (BEIs) have not been determined for Oxygen.

12. ECOLOGICAL INFORMATION

ENVIRONMENTAL STABILITY: Oxygen occurs naturally in the atmosphere. The gas will be dissipated rapidly in well-ventilated areas.

EFFECT OF MATERIAL ON PLANTS or ANIMALS: Due to the small cylinder size, no adverse effect on animals or plants is anticipated if one cylinder of this product is released.

EFFECT OF CHEMICAL ON AQUATIC LIFE: No evidence is currently available on this product's effects on aquatic life.

13. DISPOSAL CONSIDERATIONS

PREPARING WASTES FOR DISPOSAL: Waste disposal must be in accordance with appropriate U.S. Federal, State, and local regulations and those of Canada and its Provinces. Cylinders with undesired residual product may be safely vented outdoors with the proper regulator. For further information, refer to Section 16 (Other Information).

14. TRANSPORTATION INFORMATION

THIS GAS IS HAZARDOUS AS DEFINED BY 49 CFR 172.101 BY THE U.S. DEPARTMENT OF TRANSPORTATION.

PROPER SHIPPING NAME: Oxygen, compressed

HAZARD CLASS NUMBER and DESCRIPTION: 2.2 (Non-Flammable Gas), 5.1 (Oxidizer)

UN IDENTIFICATION NUMBER: UN 1072

PACKING GROUP: Not applicable.

DOT LABEL(S) REQUIRED: Class 2.2 (Non-Flammable Gas) Class 5.1 (Oxidizer)

NORTH AMERICAN EMERGENCY RESPONSE GUIDEBOOK NUMBER (2000): 122

14. TRANSPORTATION INFORMATION (Continued)

MARINE POLLUTANT: Oxygen is not classified by the DOT as a Marine Pollutant (as defined by 49 CFR 172.101, Appendix B).

SPECIAL SHIPPING INFORMATION: Cylinders should be transported in a secure position, in a well-ventilated vehicle. The transportation of compressed gas cylinders in automobiles or in closed-body vehicles can present serious safety hazards. If transporting these cylinders in vehicles, ensure these cylinders are not exposed to extremely high temperatures (as may occur in an enclosed vehicle on a hot day). Additionally, the vehicle should be well-ventilated during transportation.

Note: DOT 39 Cylinders ship in a strong outer carton (overpack). Pertinent shipping information goes on the outside of the overpack. DOT 39 Cylinders do not have transportation information on the cylinder itself.

TRANSPORT CANADA TRANSPORTATION OF DANGEROUS GOODS REGULATIONS: This gas is considered as Dangerous Goods, per regulations of Transport Canada.

PROPER SHIPPING NAME: Oxygen, compressed
HAZARD CLASS NUMBER and DESCRIPTION: 2.2 (Non-Flammable Gas), 5.1 (Oxidizer)
UN IDENTIFICATION NUMBER: UN 1072
PACKING GROUP: Not Applicable
HAZARD LABEL: Class 2.2 (Non-Flammable Gas), Class 5.1 (Oxidizer)
SPECIAL PROVISIONS: 42
EXPLOSIVE LIMIT AND LIMITED QUANTITY INDEX: 0.12
ERAP INDEX: 3000
PASSENGER CARRYING SHIP INDEX: 50
PASSENGER CARRYING ROAD VEHICLE OR PASSENGER CARRYING RAILWAY VEHICLE INDEX: 75
NORTH AMERICAN EMERGENCY RESPONSE GUIDEBOOK NUMBER (2000): 122

NOTE: Shipment of compressed gas cylinders via Public Passenger Road Vehicle is a violation of Canadian law (Transport Canada Transportation of Dangerous Goods Act, 1992).

15. REGULATORY INFORMATION

ADDITIONAL U.S. REGULATIONS:

U.S. SARA REPORTING REQUIREMENTS: This gas is not subject to the reporting requirements of Sections 302, 304 and 313 of Title III of the Superfund Amendments and Reauthorization Act. This product is subject to the reporting requirements of Sections 311 and 312 of Title III of the Superfund Amendments and Reauthorization Act (40 CFR 370.21)

U.S. SARA THRESHOLD PLANNING QUANTITY: There are no specific Threshold Planning Quantities for this gas. The default Federal MSDS submission and inventory requirement filing threshold of 10,000 lb (4,540 kg) may apply, per 40 CFR 370.20.

U.S. TSCA INVENTORY STATUS: Oxygen is listed on the TSCA Inventory.

U.S. CERCLA REPORTABLE QUANTITIES (RQ): Not applicable.

U.S. STATE REGULATORY INFORMATION: Oxygen is covered under the following specific State regulations:

Alaska - Designated Toxic and Hazardous Substances: No.	Michigan - Critical Materials Register: No.	Pennsylvania - Hazardous Substance List: Oxygen.
California - Permissible Exposure Limits for Chemical Contaminants: No.	Minnesota - List of Hazardous Substances: No.	Rhode Island - Hazardous Substance List: Oxygen.
Florida - Substance List: Oxygen.	Missouri - Employer Information/Toxic Substance List: No.	Texas - Hazardous Substance List: No.
Illinois - Toxic Substance List: No.	New Jersey - Right to Know Hazardous Substance List: Oxygen.	West Virginia - Hazardous Substance List: No.
Kansas - Section 302/313 List: No.	North Dakota - List of Hazardous Chemicals, Reportable Quantities: No.	Wisconsin - Toxic and Hazardous Substances: No.
Massachusetts - Substance List: Oxygen.		

CALIFORNIA SAFE DRINKING WATER AND TOXIC ENFORCEMENT ACT (PROPOSITION 65): Oxygen is not on the California Proposition 65 lists.

OTHER U.S. FEDERAL REGULATIONS:

- Oxygen USP is regulated by the FDA as a prescription drug.
- Depending on specific operations involving the use of this product, the regulations of the Process Safety Management of Highly Hazardous Chemicals may be applicable (29 CFR 1910.119). Oxygen is not listed in Appendix A of this regulation.
- Oxygen does not contain any Class I or Class II ozone depleting chemicals (40 CFR part 82).
- Oxygen is not listed as a Regulated Substance, per 40 CFR, Part 68, of the Risk Management for Chemical Release Prevention.

15. REGULATORY INFORMATION (Continued)

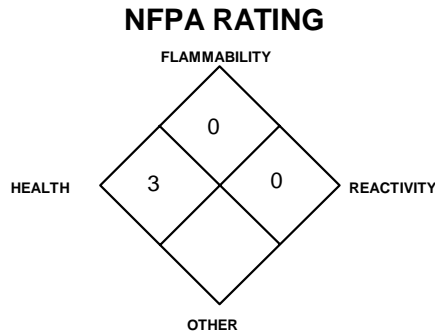
ADDITIONAL CANADIAN REGULATIONS:

CANADIAN DSL/NDL INVENTORY STATUS: Oxygen on the Canadian DSL Inventory.

CANADIAN ENVIRONMENTAL PROTECTION ACT (CEPA) PRIORITIES SUBSTANCES LISTS: Oxygen is not on the CEPA Priorities Substances List.

CANADIAN WHMIS CLASSIFICATION: Oxygen is categorized as a Controlled Product, Hazard Classes A and C, as per the Controlled Product Regulations.

16. OTHER INFORMATION



HAZARDOUS MATERIAL IDENTIFICATION SYSTEM			
HEALTH HAZARD	(BLUE)	3	
FLAMMABILITY HAZARD	(RED)	0	
PHYSICAL HAZARD	(YELLOW)	0	
PROTECTIVE EQUIPMENT			
EYES	RESPIRATORY	HANDS	BODY
See Section 8			
For Routine Industrial Use and Handling Applications			

MIXTURES: When two or more gases or liquefied gases are mixed, their hazardous properties may combine to create additional, unexpected hazards. Obtain and evaluate the safety information for each component before you produce the mixture. Consult an Industrial Hygienist or other trained person when you make your safety evaluation of the end product. Remember, gases and liquids have properties which can cause serious injury or death.

INFORMATION ABOUT DOT-39 NRC (Non-Refillable Cylinder) PRODUCTS

DOT 39 cylinders ship as hazardous materials when full. Once the cylinders are relieved of pressure (empty) they are not considered hazardous material or waste. Residual gas in this type of cylinder is not an issue because toxic gas mixtures are prohibited. Calibration gas mixtures typically packaged in these cylinders are Nonflammable n.o.s., UN 1956. A small percentage of calibration gases packaged in DOT 39 cylinders are flammable gas mixtures.

For disposal of used DOT-39 cylinders, it is acceptable to place them in a landfill if local laws permit. Their disposal is no different than that employed with other DOT containers such as spray paint cans, household aerosols, or disposable cylinders of propane (for camping, torch etc.). When feasible, we recommended recycling for scrap metal content. Air Liquide America will do this for any customer that wishes to return cylinders to us prepaid. All that is required is a phone call to make arrangements so we may anticipate arrival. Scrapping cylinders involves some preparation before the metal dealer may accept them. We perform this operation as a service to valued customers who want to participate.

16. OTHER INFORMATION (Continued)

Further information about oxygen can be found in the following pamphlets published by: Compressed Gas Association Inc. (CGA), 4221 Walney Road 5th floor, Chantilly, VA 20151-2923. Telephone: (703) 788 - 2700.

G-4	"Oxygen"
G-4.1	"Cleaning Equipment of Oxygen Service"
G-4.3	"Commodity Specification for Oxygen"
G-4.4	"Industrial Practices for Gaseous Oxygen Transmission and Distribution Piping Systems"
G-4.6	"Oxygen Compressor Installation Guide"
P-1	"Safe Handling of Compressed Gases in Containers"
P-14	"Accident Prevention in Oxygen-Rich and Oxygen Deficient Atmospheres"
SB-2	"Oxygen Deficient Atmospheres"
SB-7	"Rupture of Oxygen Cylinders in the Diving Industry"
SB-8	"Use of Oxy-fuel Gas Welding and Cutting Apparatus"
AV-1	"Safe Handling and Storage of Compressed Gases"
AV-8	"Characteristics and Safe Handling of Cryogenic Liquid and Gaseous Oxygen"
	"Handbook of Compressed Gases"

PREPARED BY:

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PO Box 3519, La Mesa, CA 91944-3519
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This Material Safety Data Sheet is offered pursuant to OSHA's Hazard Communication Standard, 29 CFR, 1910.1200. Other government regulations must be reviewed for applicability to this product. To the best of Air Liquide's knowledge, the information contained herein is reliable and accurate as of this date; however, accuracy, suitability or completeness are not guaranteed and no warranties of any type, either express or implied, are provided. The information contained herein relates only to this specific product. If this product is combined with other materials, all component properties must be considered. Data may be changed from time to time. Be sure to consult the latest edition.