



**QUANTUM**  
TECHNOLOGIES

## Type 4 Cylinder Owner's Manual





## Forward

Thank you for purchasing your Quantum Type 4 Cylinder.

This manual contains information for the use of Quantum Fuel Cylinders. Read this manual from cover to cover and keep it for future reference.

Quantum's gaseous fuel cylinder must only be serviced by trained personnel who have read and understood this manual.

This manual contains Cautions and Notices that must be observed at all times to reduce the risk of personal injury during operation. Improper operation procedures may damage components or make the vehicle unsafe to operate. These Cautions and Notices are not all inclusive. Quantum Fuel Systems Technologies Worldwide, Inc. cannot possibly warn of all the potentially hazardous consequences caused by a failure to follow these instructions.

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## **How to Use This Manual**

This manual contains information pertaining to the gaseous fuel cylinder equipped on your vehicle. You must use this manual along with your vehicle owner's manual. Only then will you be able to properly operate and maintain your vehicle.

Please read this manual from beginning to end when you first receive your product. If you do this, it will help you learn about the special features of your fuel storage module. In this manual, you will find that words and pictures work together to make things easy to understand.

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## Introduction

Thank you for purchasing your Quantum Type 4 Cylinder. The concept behind Quantum's Type 4 Cylinder is simple: OEM quality, lightweight composite technology, and provide the highest capacity of gaseous fuel stored in a high-pressure vessel. The lightweight Type 4 technology has proven effective in several applications where payloads have increased and on-board weight savings is essential.

The Quantum Type 4 cylinder is part of your fuel storage system. It is important to locate and understand how to operate the manual shut off valve and the cylinder valve(s). If your system was designed by Quantum, then refer to the specific manual available for your system. It is possible that your configuration will not have been designed by Quantum. If so, then refer to the manufacturer and/or installer of your system to locate the manual shut off valve and the cylinder valve(s) which must be turned off in the event of an emergency.

## **Fuel Facts**

### **About Compressed Natural Gas**

#### **Where does natural gas come from?**

Natural gas is a by-product of oil drilling and coal mining, but it can also be harvested independently from natural gas fields. It can be used as a motor fuel in two forms, Compressed Natural Gas (CNG) and Liquefied Natural Gas (LNG).

#### **How does natural gas compare to gasoline?**

Natural gas is lighter than air. If a leak were to develop, the gas would rise and disperse through the atmosphere giving little chance for ignition. Compare that to gasoline and diesel fuel, both of which are dense liquids that tend to pool and are easily ignitable. When CNG is burned in the engine, it produces low emissions. This means less smog, less air pollution, and cleaner air. This makes CNG a promising motor fuel for the future.

#### **Does natural gas have an odor?**

Raw natural gas is odorless, so a distinctive odorant that smells very much like strong sulfur has been added for your safety prior to distribution. This strong odor makes the presence of a leak very easy to detect. If an odor is detected, please inspect the vehicle for the source of the concern, and repair as needed. When you first smell the odorant, the concentration is approximately at 1% by volume. However, the odorant does not get stronger as the concentration increases. That means if you smell the odorant, you are at least at a 1% concentration level.

#### **Is natural gas safe?**

Natural gas itself is a safer fuel than either gasoline or diesel fuel. The Type 4 cylinder is a much stronger and damage resistant fuel storage component than any liquid fuel container currently used in production vehicles.

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## About Hydrogen Gas

### Where does Hydrogen come from?

Hydrogen is the most abundant element in the universe, making up more than 90% of all matter. On Earth, it is the third most abundant element in the Earth's surface, found in water and all organic matter.

### Does hydrogen have an odor?

In its normal gaseous state, hydrogen is colorless, odorless, tasteless, and is nontoxic, which makes it different from every other common fuel we use. By comparison, all petroleum fuels are asphyxiants, and are poisonous to humans. No odorant is added to Hydrogen fuel.

### How does hydrogen compare to gasoline?

Hydrogen is the simplest known element, but its energy content is the highest per unit of weight of any fuel (52,000 BTUs/pound). Hydrogen is less flammable than gasoline. Hydrogen disperses quickly. Being the lightest element (fifteen times lighter than air), hydrogen rises and spreads out quickly in the atmosphere. So when a leak occurs, the hydrogen gas quickly becomes so sparse that it is difficult to ignite.

### What is the impact of hydrogen on the planet?

The self-ignition temperature of hydrogen is 550 degrees Celsius. Gasoline varies from 228-501 degrees Celsius, depending on the grade. Hydrogen burns readily with oxygen, releasing considerable energy and producing only water as exhaust. When hydrogen burns in air (which is mostly nitrogen), some oxides of nitrogen (NOx, contributors to smog and acid rain) can be formed, but much fewer pollutants are formed than when normal hydrocarbon fuels such as gasoline and diesel are burned. Because no carbon is involved, using hydrogen fuel eliminates carbon monoxide, carbon dioxide, and does not contribute to global warming.

In fact, when a hydrogen powered engine operates, it actually cleans the ambient air, by completing combustion of the unburned hydrocarbons that surround us.

## Frequently Asked Questions

- 1. Is it safe to drive a vehicle with a high pressure cylinder installed?**

**Answer:**

*The Quantum Type 4 cylinder has been rigorously tested for impact, fire, and even gunshot resistance. Your Type 4 cylinder is, in most ways, safer than a gasoline tank in a conventional vehicle.*

- 2. What should I do if I am in an accident?**

**Answer:**

*If you believe there is a leak in the fuel system after an accident:*

- *Verify there are no ignition sources in the area.*
- *If it is safe, close the vehicle ¼ turn manual shut off valve.*
- *If it is safe, close the cylinder manual shut off valve.*
- *Evacuate the immediate area.*

- 3. Do I need to do anything differently when driving a vehicle with a Type 4 cylinder?**

**Answer:**

*The addition of a cylinder(s) may reduce the load carrying capacity of your vehicle and may affect the handling dynamics of your vehicle.*

*Refer to you vehicle owner's information and any additional information provided by the fuel system installer for any guidance or precautions.*

- 4. Why is the fuel level (pressure) lower a few hours after a fast fill even if I don't drive the vehicle?**

**Answer:**

*The fuel is heated during the filling process, when the fuel is heated the fuel pressure in the cylinder increases. As the fuel in the cylinder cools, the pressure will decrease. This is called "settling".*

**5. Why do I occasionally smell natural gas but a leak is never found?**

**Answer:**

All Type 4 cylinders are permeable which means there is a very small amount of fuel that escapes through the shell of the cylinder. Occasionally this escaping fuel can accumulate in a trapped area in quantities that can sometimes be detected by smell.

**6. How do I know if I have a leak?**

**Answer:**

*Fuel leaks can be observed in a number of ways.*

**Visual:**

*If a leak exists in the high pressure side of the system there may be oil residue or ice present at the point of the leak.*

**Audible:**

*Depending on the size of the leak you may hear sounds ranging from a slight hissing to the sound of rushing air.*

**Smell:**

*CNG has a distinctive odor, the fuel in your CNG cylinder is the same fuel, and has the same odor as the gas from your natural gas stove at home.*

*It is important to note that just because a CNG odor is detected it does not mean there is an active leak. There could be odor due to a recent service of the system or an accumulation of the small amount of gas permeating from the cylinder.*

*For hydrogen cylinders the fuel is not odorized and you will not be able to detect a fuel leak by smell. Consult the vehicle's manual for more details.*

**7. Where can I find fuel for my vehicle?**

**Answer:**

*For CNG: Information for the nearest fueling station is posted on the United States Department of Energy website located at <http://www.afdc.energy.gov/fuels/>.*

**8. What fuel quality should be used in my fuel cylinder?****Answer:**

- Compressed Natural Gas - The CNG cylinder is designed for use only with dry compressed natural gas that meets SAE J1616 fuel quality. Do not use liquid natural gas, hydrogen, butane, LPG, or other gaseous fuels as a fuel source.
- Hydrogen – To ensure proper vehicle operation, it is recommended that the cylinder be filled with hydrogen that meets the following specifications:
  - Industrial grade 99.95% (“Three Nine”) pure hydrogen that has been verified or certified by the supplier.
  - Less than 5 ppm carbon monoxide.
  - No sulfur, phosphates, organic compounds, or trace metals.

**9. Where can I get my vehicle serviced?****Answer:**

- Contact the company that installed your CNG fuel system for a recommendation.
- Consult your local vehicle service provider.
- Contact your local Natural Gas provider for information on locations that may service natural gas vehicles.
- Contact Quantum Technologies.

**10. Are there any recommendations for cleaning the cylinder?****Answer:**

*In general, it would be safe to assume that anything that you would use to wash the painted surface of your vehicle should be safe for the cylinder if used in the same concentrations. The exterior of the cylinder can be cleaned using water alone or water and a mild detergent such as Simple Green®. If a detergent is used, rinse the cylinder thoroughly with clean water.*

## Operation

### Conditions Of Use

A gaseous fueled vehicle operates in the same manner as any standard vehicle. Be mindful of your cylinder pressure (fuel supply) so that you do not run out of fuel during operation.

Avoid running out of fuel because this situation may have an adverse effect on fuel system components. In addition to the effects noted in the vehicle owner's manual, you will also require the vehicle to be towed to the nearest fueling facility as gaseous fuels are not readily transportable.

A Quantum cylinder must only be filled with the gas or fuel indicated on the cylinder label.

All Type 4 Composite Cylinders produced by Quantum have a cylinder temperature range of -40°F (-40°C) to 185°F (85°C). The minimum working pressure is 290 psi (2 MPa).

The service pressure is indicated on the label of your cylinder. Quantum produces cylinders that are available for various service pressures.

- 3,600 psi (24.8 MPa) at 70°F (21°C).
- 5,076 psi (35.0 MPa) at 70°F (21°C).

A cylinder must never be filled above 125% of the rated service pressure, per ANSI/NFPA 52.

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## CNG Fuel Quality

 **DANGER**

Use of this cylinder for storing media other than the approved gas as indicated on the cylinder or exceeding the cylinder rated pressure, may damage the cylinder. Use the cylinder for storage of the approved gas only, if there is a question about the use of this cylinder, then contact Quantum Technologies.

Failure to follow these instructions will result in death or serious injury.

Use CNG that meets the specifications of SAE J1616. These specifications place limits on particulate contamination and moisture content. CNG that meets these specifications provides both improved driveability and emission control system performance.

CNG that does not meet these specifications may cause fuel system or engine contamination.

## Vehicle Filling

### **CAUTION**

Gaseous fuels are extremely flammable. If something ignites it, you could be severely burned. If you are refueling a vehicle, keep all sparks, flames, and ignition sources a minimum of 16 feet (5 meters) from any combustible gas.

- Do not smoke near gaseous fuels or while refueling a system.
- Verify the ignition is turned OFF before refueling.
- Refuel fuel cylinders in a well-ventilated area.
- Do not use a mobile phone within the immediate area.

A cylinder may be damaged if overfilled. A cylinder must never be filled above 125% of the rated service pressure.

Failure to observe these cautions could result in minor or moderate injury and/or damage.

The following instructions are written assuming industry standard practices and refueling devices are being used. It is strongly recommended that any operator filling the vehicle be properly trained on the specific fill equipment being used. Fill pressure and nozzle selection will vary depending on the type of system installation.

If pressure in the fuel storage cylinder falls below 300 psi (20.7 bar) the cylinder can be filled normally if the ambient temperature is above 0°F (-18°C).

If pressure in the fuel storage cylinder falls below 300 psi (20.7 bar) and ambient temperature is below 0°F (-18°C), please let the vehicle/cylinder warm up to room temperature (>60°F (15.5°C)) in a heated garage. Once the vehicle/cylinder has warmed up, the vehicle can be driven to a fill station, but must be filled within  $\frac{1}{2}$  hour after leaving the heated garage.

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## Refueling Problems

If the vehicle cannot be refueled, check for the following:

- Refueling nozzle not properly engaged on the fill valve.
  - Verify nozzle is fully engaged.
- Cylinder(s) is already full.
  - Verify compressed natural gas level in the cylinders using the instrument panel.
- Cylinder manual shut off valves were closed for long term storage.
  - Open the compressed natural gas storage cylinder manual shut off valves

If the items above have been checked and the vehicle still will not take fuel, the vehicle may require service. Contact your fleet administrator or your local repair facility.

If at any time during the refueling process you suspect the gaseous fuel may be leaking, immediately stop the refueling and contact your local repair facility.

## Roadside Emergency

### In The Event Your Fuel System Leaks

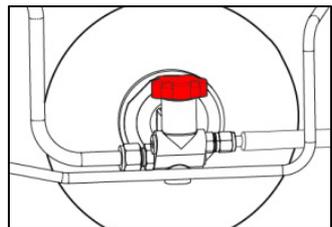
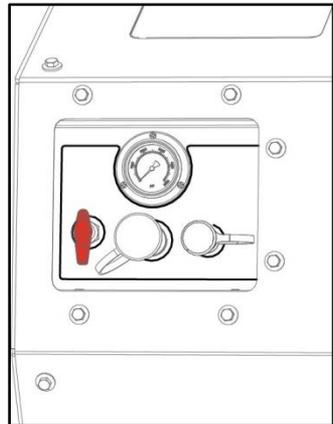
#### **WARNING**

**CNG is extremely flammable. If something ignites it, you could be severely burned and cause injury or damage. Keep sparks, flames, and ignition sources a minimum of 16 Feet (5 meters) from the gaseous fuel cylinder.**

The valve and instructions shown below are for a typical manual tank valve and ¼ turn valve. The valves installed in your cylinder or system may vary; it is recommended that you familiarize yourself with the location and type of valve(s) installed on your vehicle.

Steps:

1. Make sure there are no ignition sources near the fuel cylinder.
2. Locate and close the ¼-turn manual shut off valve. The valve handle will typically be red or yellow.
3. Locate and close the cylinder manual shut off valve. Turn the cylinder manual shut off valve clockwise until the valve is completely closed.
4. Move a safe distance from the vehicle, call your roadside assistance program and have the vehicle serviced.



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## In The Event Of An Equipment Fire

 **WARNING**

A vehicle fire may damage the cylinder or valves. Immediately remove from service any cylinder involved in a fire.

Failure to follow this warning could result in death or serious personal injury.

If a fire should occur in the vicinity of the cylinder system, the Thermal Pressure Relief Device (TPRD) located in the cylinder may be activated. If the pressure relief device activates, VERY rapid venting of gas will occur. If a fire caused the activation of the TPRD and the cylinder is full of flammable gas, it is possible that the gas exiting the pressure relief line will ignite and can be very dangerous. Even if the compressed natural gas does not ignite, debris blown about by the gas jet could be dangerous and the loud noise caused by the rapid venting could cause hearing damage.

If the pressure relief device activates, evacuate the area immediately and call the appropriate authorities. Once the pressure relief device has been activated for any reason, the cylinder must be thoroughly inspected by qualified personnel before being returned to service. Please visit [www.qtww.com](http://www.qtww.com) for more information.

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## Maintenance Schedule

These items are required *in addition to* the maintenance items listed in your vehicle Owner's Manual.

The services shown in this schedule should be performed at the listed intervals.

### Automotive and Light Duty Trucks:

**Check every 36 months or 36,000 miles / 60,000 km**

- Inspect The Fuel Cylinder And Cylinder Mounting Brackets.<sup>1</sup>

### Heavy Duty Trucks (Class 7 & 8):

**Check every 12 months or 100,000 miles / 160,000 km**

- Inspect The Fuel Cylinder And Cylinder Mounting Brackets.<sup>1</sup>

<sup>1</sup> Record the inspection information in the vehicle's permanent file and in the Appendix A – Cylinder Inspection Form in the back of this owner's manual. For additional information refer to the *CNG Cylinder Installation and Maintenance Manual* at [www.qttw.com](http://www.qttw.com).

## Limited Warranty For Composite Cylinders

Warranty and Product Return Information are located at [www.qtw.com](http://www.qtw.com).

Register your cylinder online at [www.qtw.com](http://www.qtw.com). By registering your cylinder, you will be informed of any news relevant only to your cylinder. Quantum respects the privacy of our customers and will not use or distribute any information received from your registration for any other purpose.

## Appendix A - Cylinder Inspection Form



Tank Serial Number \_\_\_\_\_

Tank Expiration Date \_\_\_\_\_

Vehicle VIN \_\_\_\_\_

Inspection Interval (Mileage or Years)	Inspection Date	Inspector	Inspector Initials	Type of Repair*

\* Record the type of repair as None, Level 1, Level 2, or Exchanged. See "Cylinder Inspection" in the Type 4 Cylinder Installation and Maintenance Manual applicable to your cylinder (available at [www.qtw.com](http://www.qtw.com)) for the inspection criteria.



## Revision History

Revision A – 5/18/16 Initial Release

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