

# Quantum Technology

Hydrogen & Helium systems since 1981

## Product Catalogue





# Quantum Technology

Quantum Technology is a global leader in specialized industrial gas applications, specializing in Helium and Hydrogen technologies.

Founded in 1981, we design and manufacture premium Helium and Hydrogen liquefaction units, recovery systems, and Helium production plants. Our extensive portfolio includes standard and custom solutions for gas recovery, separation, purification, and liquefaction.





# Cryo Diffusion

[www.cryodiffusion.fr](http://www.cryodiffusion.fr)

In 2023, Cryo Diffusion Technology is a leading manufacturer of cryogenic equipment since 1965. Specializing in the production of:

- Cryogenic tanks, piping, valve boxes, and loading stations for air and helium gas liquefaction plants.
- Helium dewars and transfer rods for laboratories and nuclear magnetic resonance (NMR) applications.
- Cryogenic equipment for major scientific endeavors, including particle gas pedals and laboratories.



Key products include cryostats, super-insulated vacuum transfer lines and multilines, as well as cryogenic valve boxes and phase separators. We also offer tanks and transfer lines for hydrogen, along with custom liquid hydrogen products.

With a team of qualified technicians, Cryo Diffusion provides a comprehensive range of after-sales cryogenic services, including installations, on-site refurbishments, upgrades, and de-bottlenecking.

All products sold by Cryo Diffusion meet the highest quality and safety standards, earning recognition worldwide for their reliability and performance.





# ENVIRONMENTAL IMPACT OF QUANTUM'S PRODUCTS

At Quantum Technology, we make the recovery and reuse of helium, a non-renewable natural resource. Our process involves recovering helium from our customers' processes, purifying it, and returning it to the customer. In many cases, this includes liquefying the helium on-site to return it as cold liquid helium.

Moreover, in our helium production business, our Kansas project is focused on producing helium while also recovering energy from natural gas through the operation of generators, and subsequently selling the electricity generated. While the recovery of energy from natural gas is incidental to our main business of helium recovery, we adhere to Environmental, Social, and Governance (ESG) guidelines, and take measures to minimize CO2 equivalent emissions. Importantly, we do not vent methane.

In the hydrogen business, we contribute by providing materials, equipment, and expertise for projects that convert green electrical energy into hydrogen. We then purify and process the hydrogen. By enabling on-site production of hydrogen, our process reduces transportation CO2 emissions. This is what we refer to as "bright green hydrogen."



Quantum Technology



# PRODUCT CATALOGUE

## Table of Contents

<b>01</b>	<b>Hydrogen</b>	
—————	Hydrogen Liquefier.....	7
	Hydrogen Purifier .....	8
	Modular Hydrogen Generation .....	9
	Fueling Station .....	10
	UPS .....	11
	Helium and Hydrogen Liquefaction System .....	12
	Ortho to Para Conversion .....	14
	Cryostats .....	15
	Custom H2 Lab.....	16
	Hydrogen Training Course .....	18
<b>02</b>	<b>Helium</b>	
—————	Helium Liquefier.....	20
	Helium Recovery System .....	21
	Helium Production Plant .....	31
	Helium Recovery from Natural Gas Production .....	32
	Helium Recovery from Coldspay Applications .....	33
<b>03</b>	<b>Specialty Gases</b>	
—————	Helium and Neon Dual Purification Plant .....	36
	Krypton and Xenon Dual Purification Plant.....	37
	H2 Fuel Cell Grade Hydrogen from Ammonia Purifier.....	38
	Quantum Cooler™ N2-Zero.....	39
	Q1.3LN2-9000 Nitrogen Liquefier.....	40

# Hydrogen



## Q1.4-QLH2-7500 - Hydrogen Liquefier



### Features

- Rapid cool down
- Proven turbo expansion technology with high reliability and up time
- HMI touch screen + Ethernet connection
- Auto-control including computerized pressure control, safety protection unit
- Pressure, temperature, level PLC controls
- Electrically safe design
- Emergency Shut Down Interlock
- Turbine Speed Control for lower production
- Built-in analysis for purity monitoring and safety

### Options

- Hydrogen purification
- Raw hydrogen gas compressors
- Hydrogen recycle compressors with VFD
- LH2 storage tanks and filling stations
- Additional equipment available, including storage vessels and transfer lines

### Main Equipment Specifications

Liquefaction Rate	7,500 kg/day guaranteed at 20 bar feed H2
LN2 Consumption	Up to 4500 L/hr
LN2 Supply Pressure	3 bara
LN2 Supply Max Pressure	5 bara
Hydrogen Feed Pressure	20 bara (suitable for operation at 12-40 bara)
Heat Exchanger Pressure Rating and Cooling Rate	40 bara, max 2° C/min
Liquid Hydrogen Filling Pressure	> 1.5-2.5 bara
Power Requirement	2,000 kW
Cooling Water Temperature	< 30° C
Cooling Water Pressure	> 3 bara
Cooling Water Flow	240 m3/hr
H2 Gas Purity	> 99.999%
Instrument Air	30 Nm3/hr
Vacuum Requirement	10-3 mbar abs
Dimensions	4 x 4 x 5m 20,000 kg

If your bill is significant, QUANTUM may have a solution for you.  
Call +1 604 222 5539 to connect with our technical/sales staff.

## Q16.4-QPure-H2 - Hydrogen Purification System

Q16.4-QPure-H2



### Product Description

Introducing our state-of-the-art hydrogen purification system. With our customizable technology, tailored to your process, we are able to extract hydrogen from green, grey, or blue sources - producing saleable 99.7+% hydrogen. Trusted by clients worldwide, we have a proven track record of delivering tailored solutions, making us go-to experts in hydrogen purification technology. Unlock the full potential of your hydrogen resources with Quantum's reliable and efficient purification system.

### Features

- Fast start up and shut down
- Compact design
- Long design life for valves and vessels
- Suitable for outdoor operation
- Integrated inlet and discharge filters
- Integrated condensation disposal lines
- Pre-installed pressure safety system
- Pre-installed sampling ports

### Options

- H2 purity measurement
- Raw gas compressors
- Product gas booster compressor
- Storage tanks and filling stations
- Liquefaction system

### Specifications (Typical)

Hydrogen Product Purity	>99.97%
Feed Gas Flow Rate	100-3000 SCFM
Hydrogen Feed Pressure	1-40 bara
Typical H2 Recovery Rate	70-90%
Quantity of Vessels	4-12 based on system requirement
Contaminants to remove	N2, O2, H2O, CO2
Hazardous area classification	Class 1, Zone 2, Group B/ATEX Zone II
Code compliance	ASME, CRN, NEC
Electrical Requirement	480V / 60 Hz / 3ph 1 kW

If you have a source of hydrogen, QUANTUM may have a solution for you.  
Call +1 604 222 5539 to connect with our technical/sales staff.

## Q7.4-H2-MODGEN - Modular Hydrogen Generation, Purification, Compression and Distribution System



Q7.4 H2-MOD-GEN

Quantum Technology

### Product Description

This system combines state-of-the-art water electrolysis technology with efficient and compact hydrogen purification, compression, storage and distribution.

- Production at distribution site saves hydrogen (H<sub>2</sub>) transportation costs
- Modular design reduces unit cost and provides ease of installation
- Smaller-scale units break down barriers for small-to-medium sized companies to adopt

### Main Equipment Specifications

#### Electrolyser Stack

Electrolyser Capacity	900 kW DC
Type	Alkaline
Hydrogen rated flow	18 kg/hr
Operation Pressure	3.0 Mpa

#### Power Supply Unit

Frequency	60 Hz
Control Mode	CC / CV
Cooling	Water
IP Grade	IP2X
Operating temperature range	0-50 C
Operating humidity range	15%-85%

#### Controls System

PLC	Siemens S7-1200
HMI	Siemens KTO series touch screen

### Main System Components

- **Electrolyser Stack**
  - Utilizes green energy source and sustainable water supply to produce 18 kg/hr hydrogen
- **Hydrogen Purifier**
  - Proven technology, reliably produces fuel-cell grade hydrogen 99.999%
- **High Pressure Compressor**
  - Multiple stage compressor, boosts hydrogen pressure from 100 psig to up to 14,000 psig
- **High Pressure Storage**
  - high pressure storage vessels designed to store hydrogen gas up to 15,000 psig
- **H<sub>2</sub> Filling Station**
  - Can be customized for end user specifications

### Plant Specifications

Hydrogen Gas Generation Capacity	18 kg/ hr
Hydrogen Gas Pressure at final output	10,000 psi
Hydrogen Gas Purity at final output	99.999% v/v
Grade of hydrogen	fuel cell grade
Oxygen in final output Hydrogen Gas	<5 ppmv
Space required	40' container (prel.)
Turndown	40-100%
Plant Operation	Automatic
Construction	Containerized
Plant Design life	Minimum 25 years
Ambient Temperature	-40 C - 45 C

### Utilities Requirements

Power	Client to inform
<i>Make up Water for Cooling Tower</i>	
Consumption	approx. 1500 LPH
Inlet Temperature	38 C max
pH	6.5-8.5
TDS limit	500 ppmw
<i>Nitrogen Gas (for purging )</i>	
Purity	>99.5%
Inlet Pressure	5 to 6 kg/cm <sup>2</sup> (g)
<i>Make-up water for DM Unit</i>	
Quality	Potable
Flow	Max 6m <sup>3</sup> /hr
Pressure	1.0 to 1.5 kg/cm <sup>2</sup> (g)

## Q12.4-H2-FS - Hydrogen Fueling Station



### Product Description

This system dispenses hydrogen for fast, easy-to-operate refueling of hydrogen fuel-cell passenger vehicles and trucks.

- Fueling station for cars has a 700-bar (70-MPa) hose.
- Fueling station for trucks has a high flow rate to minimize delays for high capacity vehicles.

### Main System Components

- **Compressed Gas Storage**
  - Complex storage with multiple vessel trans-fill system
  - Carbon fibre high pressure cylinders
  - Additional external storage optional
- **User Interface**
  - Easy-to-use touchscreen interface
- **Safety Features**
  - Industry standard infrared vehicle communication
  - Flame- and gas-leak-detecting sensors
  - Emergency stop and automatic shutdown

Can be customized for end user specifications

### Filling Station Specifications

Fill Pressure	700 bar at 15°C
Max. Fill Rate	3.6 kg/min
Hydrogen Gas Storage Capacity	Customizable
Hydrogen Gas Purity	99.999%
Installation Requirements	Outdoors
Ambient Temperature	-20 to 50°C (-4 to 122°F)
Operation	Touchscreen interface
Service Life	Minimum 10 years

If you're looking to produce high grade hydrogen, QUANTUM may have a solution for you. Call +1 604 222 5539 to connect with our technical/sales staff.

## Q12.4 H2-UPS - Hydrogen Uninterruptible Power Supply (UPS)



### Product Description

The Hydrogen UPS is a hydrogen-fueled, zero-emission uninterruptible power supply for backup power.

- Replaces a diesel/gasoline backup generator
- Noiseless electrical power generation
- Emissions-free energy source

### Main System Components

- **Fuel Cell Stack**
  - Array of cells that combine hydrogen and oxygen in electrochemical reactions to produce zero-emission electricity.
- **Fuel Tank**
  - Customizable in capacity, it holds the hydrogen fuel until it is ready to be used.
- **Fuel Filler Receptacle**
  - Designed for maximum compatibility with standard vehicle fueling nozzles or bottled hydrogen.
- **Power Conditioner**
  - Adjusts current, voltage, frequency and other characteristics of the generated electricity to suit the application
- **User Interface**
  - Integrated computer controlled system with easy-to-use interface (HMI)

### Main Equipment Specifications

#### Fuel Cell Stack

Rated power	41 W/cell
Rated current	65 A
DC voltage	660 mV/cell
Coolant	Air

#### Fuel

Hydrogen	99.95% or better
Supply pressure	0.16 to 0.56 barg
Flow rate	0.5 slpm/cell

#### Major System Components:

#### Temperature

Operating	-40°C to 50°C (-40°F to 122°F)
Start up	-10°C to 50°C (14°F to 122°F)

### Customizable Output Specifications

Power Type	Up to 3 kW AC or DC
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If you're looking for a green power supply, QUANTUM may have a solution for you.  
Call +1 604 222 5539 to connect with our technical/sales staff.

## Q1.1.4-LHeH2 - Helium and Hydrogen Liquefaction System

Q1.1.4- QPure-H2He



QLHe100 Quantum Helium / Hydrogen Liquefier 100L/day

### Product Description

Introducing the Quantum Helium and Hydrogen Liquefaction System. Designed to liquefy and recycle helium and liquefy hydrogen, this system can be coupled with a custom-made cryostat to create a temperature controlled environment of 20K for hydrogen and between 5-30K for helium, +/- 1K. Our bespoke cryostats can be designed for materials testing, such as diffusion experiments or mechanical strength tests at a set cryogenic temperatures. Recover and reliquefy the helium boil-off for efficient waste reduction.

### Features

- Dual gas (Helium & Hydrogen) liquefaction capabilities
- Can liquefy gas either from cylinder or experimental equipment
- Hydrogen liquefaction to EU standards
- New safety features
- ATEX certified design

### Options

- Adjustable layouts to fit into most lab spaces.
- Manual to fully automatic options available.
- Dual bed purifier for around the clock operation.
- Mobile liquefier or extra long transfer line available for direct instrument transfers.
- Liquid nitrogen and cryogen free purifier options available.

### Specifications (Typical)

Liquefaction Rate	100L/day
Dewar size	350 liters
Cooldown Time	< 40hrs
Cooling Water	35l/min
Power @60Hz	39kW
Power @50Hz**	32kW
Weight	2,247 lbs (1,019 kg)
Maintenance Interval:	
Compressor	>3 Years
Coldhead	>2 Years

If you are looking to liquefy Helium or Hydrogen for your experiments, QUANTUM may have a solution for you. Call +1 604 222 5539 to connect with our technical/sales staff.

## Q8.1.4-QCS-HeH2 - Helium and Hydrogen Cryostat

Q1.1.4- QPure-H2He



Cryostat & cryostat internals

### Principles of Operation

Introducing the helium or hydrogen cryostats - these temperature controlled environments are ideal for cryogenic experiments using liquid helium or hydrogen to provide the cooling power. Our bespoke cryostats can be designed for materials testing, such as diffusion experiments or mechanical strength tests at a set cryogenic temperatures.

### Options

- Depending on the application, a variety of cryogenic liquids can be used for cooling, i.e. helium, hydrogen or nitrogen depending on the required temperature
- For inert gases, heaters can be used to adjust and fine tune the cryostat temperature
- For hydrogen applications, pressure control is used to maintain a stable cryostat temperature
- Various levels of automation
  - Manual
  - Automatic

### Specifications (typical)

Temperature Range	4 - 30K
Materials	Stainless steel and copper

### Features

- Vacuum pressure transducers provide pressure feedback on the vacuum space
- Cryogenic temperature sensors to provide accurate temperature readings at various locations
- Vacuum insulated dewar with super insulation to maintain stable temperatures
- Monitoring and controls system
- Independent safety system
- Vacuum port couple with vacuum pump for removing air from the system
- Mechanical supports for test apparatus
- Vacuum jacketed transfer lines

If you are interested in cryostats, QUANTUM may have a solution for you.  
Call +1 604 222 5539 to connect with our technical/sales staff.

## Q8.4-QCS - Cryostat



### Specifications (typical)

Temperature Range	20 - 120K
Materials	Stainless steel and copper
Cooling Water	2GPM at < 80F
Electrical Requirement	480V / 60 Hz / 3ph, 10 kW, (May vary with system specifics)

### PrMdauintc E Dqeusipcrmpipetniont S

Introducing the Quantum Technology bespoke cryostat - these temperature controlled environments are ideal for cryogenic experiments. Our custom made designs can be used for many cryogenic test-bed applications such as materials testing, or for precisely controlling process gas line temperatures. Our configurable designs allow for plug and play experiments and full customization.

### Options

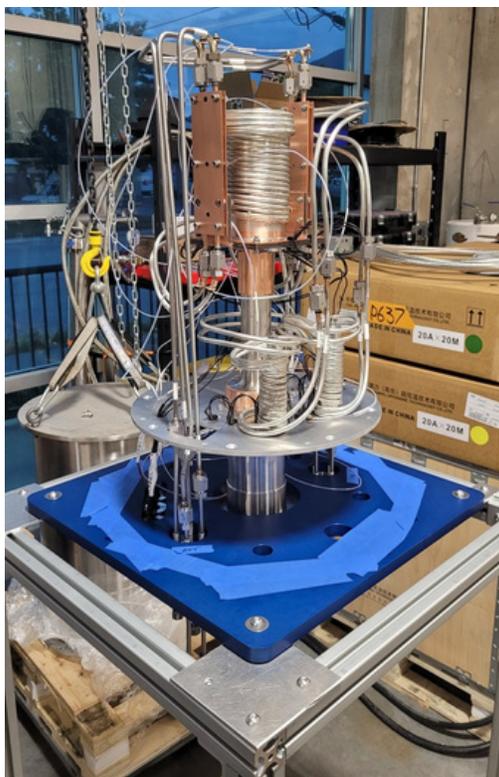
- Depending on the application, a variety of cooling methods are possible:
  - Cold head cooling with a helium refrigerant compressor
  - Cryogenic liquid, i.e. helium, hydrogen or nitrogen depending on the required temperature
  - Cryogenic fluid and cold head combination
- Various levels of automation
  - Manual
  - Automatic
  - Double cooling method

### Features

- Turbomolecular pump paired with a mechanical vacuum pump for high vacuum cryostats
- Vacuum pressure transducers provide pressure feedback on the vacuum space
- A cryocooler made up of a cold head and water cooled compressor assembly to provide cooling power, or cryogenic liquid cooling available
- Cryogenic temperature sensors to provide accurate temperature readings at various locations
- Heat shielding to reduce heat radiation losses
- Controls and monitoring system
- Independent safety system
- Thermal anchoring to cold heads at different temperatures in multiple cold head systems

If you are interested in cryostats, QUANTUM may have a solution for you.  
Call +1 604 222 5539 to connect with our technical/sales staff.

## Q8.4-QCS-20K-CH - Ortho-Para Hydrogen Conversion Cryostat



Example of cryostat internals

### Specifications (typical)

Temperature Range	20 - 120K
Maximum Gas Flow Rate	10 SLPM
Hydrogen Feed Pressure	1-30 barg
Materials of Construction	Stainless steel and copper
Cooling Water	2GPM at < 80F
Electrical Requirement	480V / 60 Hz / 3ph, 10 kW, may vary with specific system sizing

### Product Description

Quantum Technology provides custom systems to perform ortho-para hydrogen conversion research and experiments. The cryostat is a vacuum sealed chamber that provides a stable, temperature controlled environment for ortho-para conversion experiments. The full system can include temperature, pressure and flow rate monitoring and control and analysis equipment.

### Options

- Analysis of catalyst samples at our in-house laboratory
- Custom lab-scale systems made to your specifications to meet the needs of your facility
- Custom catalyst beds of different sizes and temperatures
- Cryostat inlet and outlet gas manifold
- Hydrogen vent stack
- Oven for catalyst bake out

### Features

- Turbomolecular pump paired with a mechanical vacuum pump to pull a high vacuum within the cryostat
- Vacuum pressure transducers provide pressure feedback on the vacuum space
- A cryocooler made up of a cold head and water cooled compressor assembly
- Cryogenic temperature sensors to provide accurate temperature readings at various locations
- A heat shield to reduce heat radiation losses
- Removable, configurable catalyst beds
- Analyzer to measure the ortho-para hydrogen ratio
- Controls and monitoring system
- Independent safety system
- Manifold for process gas monitoring and control
- Ortho-para hydrogen analyzers
- Optional hydrogen vent stack

If you're looking to perform hydrogen ortho-para research, QUANTUM may have a solution for you.

Call +1 604 222 5539 to connect with our technical/sales staff.

www.quantum-technology.com

## Q7.4 H2LAB - Custom Hydrogen Laboratory



*Lab setup for ammonia cracking and purification test setup*



*Lab setup for ortho to para hydrogen research*

### Product Description

Quantum Technology offers a set of complete laboratories for hydrogen research. All laboratories include:

- Vacuum pump
- Pressure transducers
- Full tool kit
- Voltmeters
- Power supply
- Electronics parts kit
- Soldering station
- Tubing fittings
- Valves and gauges
- Safety equipment - LEL detector & personal monitor
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### Experimental Setups

- Lab1 - setup for demonstration of hydrogen electrolyzer including water purification system
- Lab2 - setup for demonstration of hydrogen fuel cell
- Lab3 - setup for demonstration of hydrogen liquefier
- Lab 4- and orth-para conversion of hydrogen and analysis of ortho-para ratio
- Lab 5 - setup for high pressure storage of hydrogen including booster compressor to 700 bar
- Lab 6 - setup for detailed analysis of hydrogen purity including mass spectrometer gas analyzer
- Lab 7 - setup for hydrogen purification PSA from 98% to 99.999%
- Lab 8 - setup for ammonia cracking and purification to produce pure hydrogen
- Lab 9 - setup for ammonia synthesis from hydrogen and nitrogen
- Lab 10 - Customized laboratory setup
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If you're looking to perform hydrogen research or testing, QUANTUM may have a solution for you. Call +1 604 222 5539 to connect with our technical/sales staff.

www.quantum-technology.com

## Q7.4 H2LAB - Custom Hydrogen Laboratory

### Experimental Setups Details

- **Lab1 - setup for demonstration of hydrogen electrolyzer including water purification system**

- DC power supply
- Water purification system
- Water purity analysis, including conductivity and pH measurements
- Electrolyzer
- Purity measurement for hydrogen and oxygen produced from electrolyzer

- **Lab2 - setup for demonstration of hydrogen fuel cell**

- Fuel cell stack with multiple cells in series
- Voltage monitoring for each individual cell
- Nitrogen purge for safety
- Voltage current control and measurements for power output

- **Lab3 - setup for demonstration of hydrogen liquefier**

- Closed cycle helium refrigerator to liquefy hydrogen in a vacuum insulated vessel
- Vacuum insulated transfer line and vacuum insulated liquid hydrogen dewar

- **Lab 4- and orth-para conversion of hydrogen and analysis of ortho-para ratio**

- Hydrogen flow controller
- Ortho-para hydrogen meter
- Closed cycle refrigerator
- Ortho-para TCD meter or optional Ramen-spectrometer

- **Lab 5 - setup for high pressure storage of hydrogen including booster compressor to 700 bar**

- First stage compressor to go from atmospheric pressure to 350 bar
- Second stage booster compressor to go from 350 to 750 bar

- **Lab 6 - setup for detailed analysis of hydrogen purity including mass spectrometer gas analyzer**

- Gas chromatograph
- Mass spectrometer and gas analyzer
- Calibrated gases, sample gas cylinders, and sample gas mixing equipment

- **Lab 7 - setup for hydrogen purification PSA from 98% to 99.999%**

- Deoxo unit: heated catalyst to remove oxygen and convert to water
- Dehydration unit
- Pressure Swing Adsorption Unit (PSA) system to achieve 99.999% purity

- **Lab 8 - setup for ammonia cracking and purification to produce pure hydrogen**

- Heated catalyst
- Purification bed
- Ammonia analyzer

- **Lab 9 - setup for ammonia synthesis from hydrogen and nitrogen**

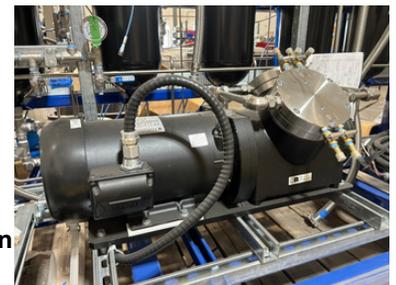
- Catalyst system for synthesizing ammonia from hydrogen and nitrogen

- **Lab 10 - Customized laboratory setup**

- Quantum is an expert in designing and building customized systems to suit your testing needs



*Gas chromatograph*



*Hydrogen explosion-proof compressor*

If you're looking to perform hydrogen research or testing, QUANTUM may have a solution for you. Call +1 604 222 5539 to connect with our technical/sales staff.

## Training Course for Technicians - Green Hydrogen



Introducing our Green Hydrogen Technician Training Program, tailored for high school graduates seeking practical skills in hydrogen systems. Informed by real-world experiences, this hands-on course features 6 units covering safety, piping, purification, electrolysis, compressors, and liquefaction, with specific equipment for each section. With a focus on practical training, including hands on experience on a 1kg per day scale, and comprehensive learning materials like notes, photos, videos, quizzes, exams, laboratory procedures, reports, and hands-on skill tests, graduates will emerge equipped with the expertise needed for success in the field.

### Course Overview

Prepare yourself for a career in the hydrogen industry with our comprehensive course designed for high school graduates. From safety protocols to hands-on practice, you'll gain the skills needed to work confidently in hydrogen and helium plants.

Course Highlights **Safety Laboratory:** Learn about personal protective equipment, gas detection, incident procedures, and witness demonstrations of hydrogen flames and explosions. **Hydrogen Piping Laboratory:** Gain practical experience with different classes of piping, pressure testing, leak detection, and repair techniques using advanced equipment. **Hydrogen Purification Laboratory:** Work hands-on with hydrogen purity meters, gas analyzers, and purification methods such as pressure swing adsorption. **Hydrogen Electrolysis and Fuel Cells Laboratory:** Explore electrolysis, fuel cell operation, and safety procedures for starting, testing, and shutting down systems. **Hydrogen Compressors Laboratory:** Master the operation, troubleshooting, and maintenance of hydrogen compressors essential for plant operations. **Hydrogen Liquefier Laboratory:** Utilize state-of-the-art equipment to produce, purify, and liquefy hydrogen, with a focus on safety and efficiency. Equipment Overview - Personal safety gear including monitors, eye protection, and non-flammable clothing. - Site safety equipment such as fixed gas monitors and ventilation systems. - Demonstration equipment for hands-on learning. - Various laboratory equipment for each specialized area, including piping, purification, electrolysis, compressors, and liquefaction.

*Join us and dive into the world of green hydrogen with practical training and hands-on experience to kickstart or enhance your career as a certified technician!*

# Helium



## Q1.1 - QLHeXX - Helium Liquefier Series

Q1.1-QLHeXX



QLHe20 Quantum Helium Liquefier 40L/day

### Features

- GM cold head: more cooling power/ less energy consumption
- Automated to operate with minimal user intervention
- Large HMI touch screen + Ethernet connection
- Comes with all required safety devices
- Easy to install, small footprint
- Can liquefy gas either from cylinder or experimental equipment
- 2 years warranty for cold head and compressors and one year for balance of equipment

### Options

- Manual or Automatic LHe transfer line
- Designed to be coupled with Quantum's complete Helium Recovery System
- **Custom solutions for large industrial applications up to 50,000L per day**

Specification/ Model	QLHe20	QLHe40 40L/day	QLHe60	QLHe80	QLHe100	QLHe200
Liquefaction Rate	20L/day	150 liters*	60L/day	80L/day	100L/day	200L/day
Dewar size	100 liters*	< 30hrs	150 liters*	250 liters*	350 liters*	500 liters*
Cooldown Time	< 30hrs	14 l/min	< 30hrs	< 30hrs	< 30hrs	< 30hrs
Cooling Water	7 l/min	15kW	21 l/min	28l/min	35l/min	70l/min
Power @60Hz	7.8kW	13kW	23kW	31kW	39kW	78kW
Power @50Hz**	6.5kW	1,074 lbs	19kW	26kW	32kW	64kW
Weight	582 lbs (254 kg)	(487 kg)	1,406 lbs (638 kg)	1,828 lbs (829 kg)	2,247 lbs (1,019 kg)	4,270 lbs (1,937 kg)
Maintenance Interval:						
Compressor	>3 Years >2	>3 Years >2	>3 Years >2	>3 Years >2	>3 Years >2	>3 Years >2
Coldhead	Years	Years	Years	Years	Years	Years
Dimensions (WxLxH)	60"x40"x80"	76"x46"x88"	76"x46"x88"	80"x48"x98"	80"x48"x98"	67"x90"x107"

\*Different dewar sizes are available upon request

\*\*Liquefaction rate is reduced by approximately 20% when running at at 50Hz

If your helium bill is significant, QUANTUM may have a solution for you.  
Call +1 604 222 5539 to connect with our technical/sales staff.

## HELIUM RECOVERY SYSTEM

A full closed-loop system that effectively recovers helium from a variety of scientific processes such as NMRs, cryostats and more. Quantum Technology's proprietary recovery systems remove contamination through purification, reliquefies and stores recycled helium; drastically reducing helium costs and creating a sustainable system.



<b>A</b>	Recovery Compressor	Medium or high-pressure recovery compressors varying in power and pressure.
<b>B</b>	Liquefier	Various liquefaction instruments reaching 4K temperature to produce 20LPD to 200LPD and greater.
<b>C</b>	QuantumPure™ Purifier	Automatic and manual cryogenic and cryo-free purifiers producing 99.995+% pure helium.
<b>D</b>	Transport Dewar	Allows for flexible floor layout with removable transfer line.
<b>E</b>	Accessories	Upgrade your system with a range of accessories.
<b>F</b>	Storage	Medium or high-pressure helium gas storage options to meet your sizing and volume requirements.
<b>G</b>	Customer Instrument	Integrates seamlessly with NMRs, Cryostats and other helium-based instruments.

\*Customization available

### COMPACT & RELIABLE

Our systems are compact and reliable with an overall recovery rate of >90% helium.



### SAFETY FEATURES

Equipped with a number of safety features to prevent any over- pressure and vacuum protection



### HIGH PURITY

Purity levels of 99.999%+ and higher are achieved by preventing air or H2O contamination.



## ALL METAL HELIUM RECOVERY SYSTEM

A full closed-loop system that effectively **recovers helium** from a variety of scientific processes such as NMRs, cryostats and more. Quantum Technology's proprietary **all-metal** recovery systems, purify, reliquefy and store recovered helium, drastically reducing helium cost and creating a more sustainable system.



*Quantum Technology ALL- METAL Helium Recovery System  
A – Helium Recovery Compressor; B – Helium Recovery Liquefier; C – QuantumPure™ Purifier*

### Features

- Integrates seamlessly with customer's instruments.
- Stable and adjustable recovery pressure of 0.1 to 0.3 psi.
- Minimal purification required due to all-metal design.
- • Real time parameter monitoring.
- Automatic recovery "start" and "stop" means less monitoring.
- • Due to eliminating plastic bags, the result being a more robust system with an overall recovery rate of >90%.

### Options

- Adjustable layouts to fit into most lab spaces.
- Manual to fully automatic options available.
- Dual bed purifier for around the clock operation.
- Mobile liquefier or extra long transfer line available for direct instrument transfers.
- Liquid nitrogen and cryogen free options available.

If you are tired of seeing your helium vented, QUANTUM TECHNOLOGY may have a solution.  
Call +1 604 222 5539 to connect with our technical/sales staff.

## GAS BAG HELIUM RECOVERY SYSTEM

A full closed-loop system that effectively **recovers helium** from a variety of scientific processes such as NMRs, cryostats and more. Quantum Technology's **gas bag** recovery system removes contamination through purification, reliquefies and stores recycled helium; drastically reducing helium costs and creating a sustainable system.



1- Purifier 2- Liquefier 3- Customer instrument  
4- gas bag 5- HP recovery compressor 6- Gas Storage

### Features

- Integrates seamlessly with customer's instruments. Atmospheric recovery pressure.
- Real time parameter monitoring.
- Automatic recovery "start" and "stop" means less monitoring.

### Options

- Adjustable layouts to fit into most lab spaces.
- Manual to fully automatic options available.
- Dual bed purifier for around the clock operation.
- Mobile liquefier or extra long transfer line available for direct instrument transfers.
- Liquid nitrogen and cryogen free options available.

If you are tired of seeing your helium vented, QUANTUM TECHNOLOGY may have a solution.

Call +1 604 222 5539 to connect with our technical/sales staff.

## A. Q9.1HR3-XX - Helium Recovery compressor 7.5/10/15 HP



HR3-XX Helium recovery compressor

### Features

- Full flow of recovered gas
- Different sizes to fit production needs.
- Fully automated and operates with no/minimal monitoring.
- Ideal for QuantumPure™ All Metal Recovery, Purification and Liquefaction System
- Recovers full boil-off (regular and flash) in a liquid system (helium, neon, etc.)
- Easy to install, small floor footprint
- Base Models are air-cooled. Quantum offers a water-cooled version as well.
- All models have coalescing and charcoal filters for purification.
- Pressure controller
- Low energy Solution
- When ordering, please specify power frequency (50/60Hz) and voltage (208/230/460).
- Model number is: HR3-7.5/10/15-50/60-208/230/460.

### Specifications

	HR3-7.5	HR3-10	HR3-15
<b>Power Consumption</b>	7.5 HP	10 HP	15 HP
<b>Flowrate @210psig</b>	19 cfm	28 cfm	36 cfm
<b>Dimensions (W H)</b>	29" x 41" x 76"	29" x 41" x 76"	29" x 41" x 76"
<b>Weight</b>	1,100 lbs	1,150 lbs	1,150 lbs
<b>Noise Level</b>	65 dB	67 dB	68 dB

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## A. Q9.1HRHP-XX - High Pressure Helium Recovery Compressor 10/12/15/17 HP



HRHP-XX Helium recovery compressor

### Features

- High pressure Helium Recovery Compressor to take the full flow of recovered gas.
- High-purity recovery with room temperature purification.
- Ideal for high-purity recovery.
- Air cooling system.
- Different sizes to fit production needs.
- Fully automated and operates with no/minimal monitoring.
- Ideal for QuantumPure™ HP Recovery, Purification and Liquefaction System. Easy to install and operate, small floor footprint. 3-phase power, specifications of local power to be provided with order.

A.Q9.1HRHP-XX

		Specifications			
Model Number:	Q9.1HRHP-17	Q9.1HRHP-21	Q9.1HRHP-25	Q9.1HRHP-29	
Capacity	10.4 SCFM	12.4 SCFM	15.0 SCFM	16.9 SCFM	
Power	10 HP (7.5kW)	12 HP (9kW)	15 HP (11kW)	20 HP (15kW)	
MCA/MOP	33A/50A	39A/60A	48A/80A	65A/100A	
Type	4 stage 3 phase Squirrel Cage Motor				
Inlet Pressure	Atmospheric				
Cooling Method	Air Cooled				
Discharge Pressure	Adjustable to 3000 PSIG				
Inlet He Temp.	40°F - 115°F				
Oil Content	<1 ppm after outlet filtration				
Dimensions/Weight	935 x 1302 x 1735 mm / 445kg				
Protection Electrics	IP55 (TEFC)				
Oil Change Interval	230V/60Hz/3Φ				
Purification System	every year/ 1,000h 2 x HYPERFILTER				

If you are tired of seeing your helium vented, QUANTUM TECHNOLOGY may have a solution.  
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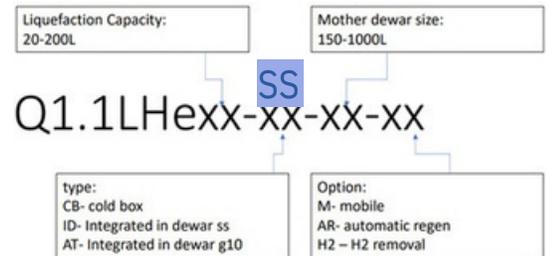
## B. Q1.1LHeXX-SS - Helium Liquefier Integrated Stainless Steel Dewar (SS)



QLHe20 Quantum Helium Liquefier 20L/day

### Features

- GM cold head: more cooling power/ less energy consumption Integrated stainless steel Dewar (SS). Fully automated and operates with no/minimal monitoring Large HMI touch screen + Ethernet connection Operates in a range of 1 to 10 PSI. Automatic Transfer Lines available. Easy to install, small floor footprint Can liquefy gas either from cylinder or experimental equipment <30 hours cooldown time
- 
- 



### Specifications

Specification/ Model	QLHe20	QLHe40
<b>Liquefaction Rate</b>	20L/day	40L/day
<b>Dewar size</b>	<ul style="list-style-type: none"> <li>• 100 liters*</li> <li>• 150 liters*</li> <li>• 200 liters*</li> <li>• 250 liters*</li> <li>• 350 liters*</li> </ul>	
<b>Options</b>	<ul style="list-style-type: none"> <li>• Mobile unit (MU)</li> <li>• Manual LHe transfer line (ML)</li> <li>• Automatic LHe transfer line (AT)</li> </ul>	
<b>Model Number</b>	Example: Q1.1LHe20-200-AT or Q1.1LHe40-350-ML	
<b>Cooling Water Requirement</b>	> 1.8 GPM (7 l/min)	> 3.6 GPM (14 l/min)
<b>Power Consumption</b>	13kW@50Hz	15kW@60Hz 13kW@50Hz
<b>Weight</b>	~582 lbs (254 kg)	~1,074 lbs (487 kg)
<b>Dimensions (WxLxH)</b>	76"x46"x100"	76"x46"x100"

Different Dewar sizes are available upon request.\*Dimensions are an estimate and depend on selections.

If you are tired of seeing your helium vented, QUANTUM TECHNOLOGY may have a solution.

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## B. Q1.1LHexx-G10 - Helium Liquefier Metal G10



QLHe40 Quantum Helium Liquefier 40L/day

### Features

- Features:
- GM cold head: more cooling power/ less energy consumption • Metal G10 (G10) cooling.
- Fully automated and operates with no/minimal monitoring Large HMI touch screen + Ethernet connection
- Operates in a range of 1 to 10 PSI.
- Automatic Transfer Lines available. Easy to install, small floor footprint
- Can liquefy gas either from cylinder or experimental equipment
- <30 hours cooldown time.

### Specifications

Liquefaction Rate	20L/day
Dewar size	30L
Options	<ul style="list-style-type: none"> <li>• Mobile unit (MU)</li> <li>• Manual LHe transfer line (ML)</li> <li>• Automatic LHe transfer line (AT)</li> </ul>
Model Number	Example: Q1.1LHe20-G10-30-AT
Cooling Water Requirement	> 1.8 GPM – 7 l/min
Power Consumption	7.8kW@60Hz 6.5kW@50Hz
Weight	~ 582 lbs (254 kg)  ~1,828 lbs (829 kg)
Dimensions (WxLxH)	76”x46”x100”

\*Different Dewar sizes are available upon request.

\*Dimensions are an estimate and depend on selections

If you are tired of seeing your helium vented, QUANTUM TECHNOLOGY may have a solution.  
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## B. Q1.1LHeXX-CB - Helium Liquefier Cold Box (CB)

B.Q1.1LHeXX-G10

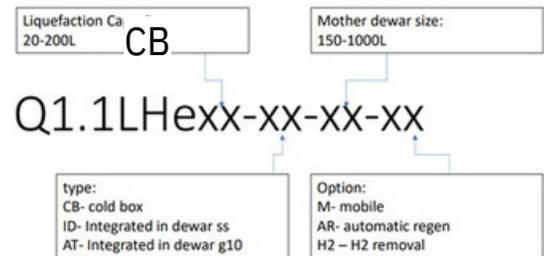


QLHe20 Quantum Helium Liquefier 20L/day

With Cold Box.

### Features

- GM cold head: more cooling power/ less energy consumption
- Cold Box cooled.
- Fully automated and operates with no/minimal monitoring Large HMI touch screen + Ethernet connection
- Operates in a range of 1 to 10 PSI.
- Automatic Transfer Lines available. Easy to install, small floor footprint
- Can liquefy gas either from cylinder or experimental equipment
- <30 hours cooldown time.



Specification/ Model	QLHe60	QLHe80	QLHe100	QLHe200
Liquefaction Rate	60L/day	80L/day	100L/day	200L/day
Dewar size	100 liters* 150 liters* 200 liters* 250 liters*		350 liters* 500 liters* Customized*	
Cooling Water Requirement	> 5.4 GPM - 21 l/min	> 7.2 GPM - 28l/min	> 9.0 GPM - 35l/min	> 18 GPM - 70l/min
Power Consumption	23kW@60Hz 19kW@50Hz	31kW@60Hz 26kW@50Hz	39kW@60Hz 32kW@50Hz	64kW@50Hz ~ 4,270 lbs (1,937 kg)
Weight	~ 1,406 lbs (638 kg)	~1,828 lbs (829 kg)	~ 2,247 lbs (1,019 kg)	67"x90"x110"
Dimensions (WxLxH)	76"x46"x100"	80"x48"x100"	80"x48"x100"	

\*Different Dewar sizes are available upon request.

\*Dimensions are an estimate and depend on selections.

If you are tired of seeing your helium vented, QUANTUM TECHNOLOGY may have a solution.  
Call +1 604 222 5539 to connect with our technical/sales staff.

## C. Q16.1QPure-CH - QuantumPure Cryogen-Free Purifier



*QuantumPure<sup>TM</sup> Cryogen-Free Purifier  
ideal for Quantum Recovery,  
Purification and Liquefaction Systems*

### Features

- Cryogen-Free Cryogenic Purifier for small and medium capacity systems (~60LPD helium).
- Cools gas to LN2 temperatures to remove air and moisture.
- Purifies gas to over 99.995%, sufficient for inlet of liquefier.
- Ideal for QuantumPure<sup>TM</sup> Recovery Purification and Liquefaction Systems.
- Easy to install, small floor footprint.

### Options

- Various footprints available
- Fully automatic option
- Dual bed for continuous operation
- Movable option
- LN2 purifier available

### Specifications

	12 psig (maximum 15 psig)
Operating Pressure	Proprietary mix
Type of Adsorbents	14 L
Volume of Adsorbents	2500 L
Volume of Adsorbed Impurities	
Regeneration at Ambient Temperature	~24 hrs
Cooling Power	200W at 70K
Power Required	7.5 kW @60Hz
Cooling Water	7 LPM @27C
Dimensions	26.5" x 33" x 90"

If you are tired of seeing your helium vented, QUANTUM TECHNOLOGY may have a solution.  
Call +1 604 222 5539 to connect with our technical/sales staff.

## C. Q16.1QPure - LN2 Cryogenic Purifier



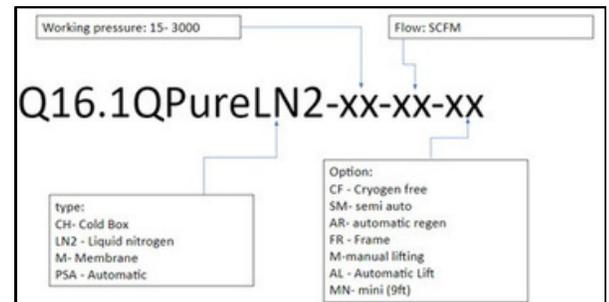
*QuantumPure™ Cryogenic Purifier ideal for Quantum Recovery, Purification and Liquefaction Systems*

### Features

- Cryogenic Purifier for small and medium capacity systems (~60LPD helium).
- Cools gas to using liquid nitrogen.
- Ideal for QuantumPure™ Recovery Purification and Liquefaction Systems. Easy to install, small floor footprint.
- No power required.

### Options

- Various footprints available
- Semi-automatic option
- Dual bed for continuous operation



### Specifications (typical)

Operating Pressure	12 psig (maximum 15 psig)
Type of Adsorbents	Proprietary mix
Volume of Adsorbents	19 L
Volume of Adsorbed Impurities	3600 L
Regeneration at Ambient Temperature	~12 hrs None None 35" x
Power Required	120" (Subject to change)
Cooling Water	90lbs
Dimensions	
Weight	

If you are tired of seeing your helium vented, QUANTUM TECHNOLOGY may have a solution. Call +1 604 222 5539 to connect with our technical/sales staff.

## Q18.1- He-PP - Helium Production Plant



### Main System Components

Quantum production plants use both room temperature and cryogenic purification processes to refine to desired purity.

Quantum plants integrate membrane technologies, PSA/VSA/TSA in proprietary combinations.

- **Upstream purification and liquid separation**
- **Pressure swing adsorption**
- **Membrane purification & compression**
- **High pressure compression & filling station**
- **PLC and controls system**
- **Plant Safety System**

### Options

- Helium liquefaction system
- Methane separation & enrichment

### Product Description

Quantum utilizes our own proprietary technologies to enable refinement of helium from different types of wells including Inert gas wells and Hydrocarbon-based wells.

- Quantum production plants are highly automated and remotely monitored
- Quantum can produce low-purity, high-purity gas or liquid products.
- Quantum owns its own fleet of tube trailers and delivers helium to its customers all across North America
- Range of plants between 1 and 200MMscfd raw gas with more than 1% He content.
- Quantum works with customers on a Build-Own-Operate (BOO) or Sale-of-Equipment (SOE) basis.

### Specifications

Feed Gas Flow (per train)	1-40 MMscfd
Helium Feed Pressure	10-150 bara
Helium Product Pressure	Up to 300 bara
Helium Product Purity	95-99.995%
Typical He Recovery Rate	70-95%
Contaminants to remove	N <sub>2</sub> , O <sub>2</sub> , H <sub>2</sub> O, CO <sub>2</sub> , C <sub>x</sub> H <sub>y</sub>
Material of Construction	Carbon or stainless steel
Hazardous area classification	Class 1, Zone 2, Group B/ATEX Zone II
Code compliance	ASME/CRN/ATEX/CE
Electrical Requirement	480V / 60 Hz / 3ph or 400V / 50 Hz / 3ph

If you have a helium-bearing source, QUANTUM may have a solution for you.  
Call +1 604 222 5539 to connect with our technical/sales staff.

# Q18.2-HePPNG - Helium Capture at Natural Gas Power Plant

Q18.2-He-PPNG



Quantum employs exclusive technologies to capture trace amounts of helium from natural gas sources within power plants. This process allows us to refine and sell the helium efficiently.

- Quantum capture and purification plants are fully automatic, unmanned/lightly manned
- Quantum will provide a plant tailored to your flow, helium concentration and gas composition.
- Quantum proprietary state-of-the-art technology allows economic recovery of helium at the ppm level.
- Quantum works with customers on a Build-Own-Operate (BOO) or Sale-of-Equipment (SOE) basis.

Quantum production plants use both room temperature and cryogenic purification processes to refine to desired purity.

Quantum plants integrate membrane technologies, PSA/VSA/TSA in proprietary combinations.

- **Upstream purification and liquid separation**
- **Pressure swing adsorption**
- **Membrane purification & compression**
- **High pressure compression & filling station**
- **PLC and controls system**
- **Plant Safety System**

- High pressure Helium tube trailer
- Liquid helium production and storage system
- High precision gas analysis system
- Local or integrated control system

## Components

## Specifications

Feed Gas Flow (per train)	1-40 MMscfd
Helium Feed Pressure	10-150 bara
Helium Product Pressure	Up to 300 bara
Helium Product Purity	95-99.995%
Typical He Recovery Rate	70-95%
Contaminants to remove	N <sub>2</sub> , O <sub>2</sub> , H <sub>2</sub> O, CO <sub>2</sub> , C <sub>x</sub> H <sub>y</sub>
Material of Construction	Carbon or stainless steel
Hazardous area classification	Class 1, Zone 2, Group B/ATEX Zone II
Code compliance	ASME/CRN/ATEX/CE
Electrical Requirement	480V / 60 Hz / 3ph or 400V / 50 Hz / 3ph

## Systems

If your bill is significant, QUANTUM may have a solution for you.  
 Call +1 604 222 5539 to connect with our technical/sales staff.

## QuantumPure QHRS.1-CS™ and QuantumPure QHRS.1-CS – TRI-GAS Helium Recovery and Purification Systems with Nitrogen Generation Applications PROVISIONAL APPLICATION PATENT APPLICATION # 63/635,979



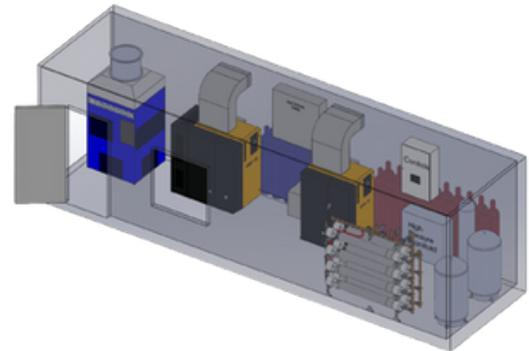
Helium Recovery and Nitrogen Generation System at North Eastern University

### Main System Components

- **Compressor Sets** with oil removal and bypass
- **QuantumPure CSTM Membrane system** equipped with automatic valves and precision flow controllers designed for 99% Helium outlet purity
- **Helium Purity Meters** measuring 0.0 -99.9% He
- **System sensors and transducers** including Pressure transducers, flow meters, and temperature sensors
- **Programmed Logic Controller** for automatic operation
- **High-Pressure Storage**
- **Patented Hermetic Spray Booth** equipped with a dry dust collector and heat exchanger for Spray Booth cooling
- **Gas Bag** and controls

### Product Description

Introducing QuantumPure CS™, the cutting-edge solution for cold spray applications. Deployed across the US, our next-generation QuantumPure CS – TriGas™ system not only recovers helium but also generates nitrogen and supplies air, all in one seamless operation. Tailored to meet diverse customer needs, QuantumPure systems offer both high and low-purity processes. Whether you prefer a Build-Own-Operate (BOO), Lease, or Sale-of-Equipment (SOE) arrangement, we collaborate with you to find the perfect solution.



30' containerized system as installed in the US.

### System Specifications

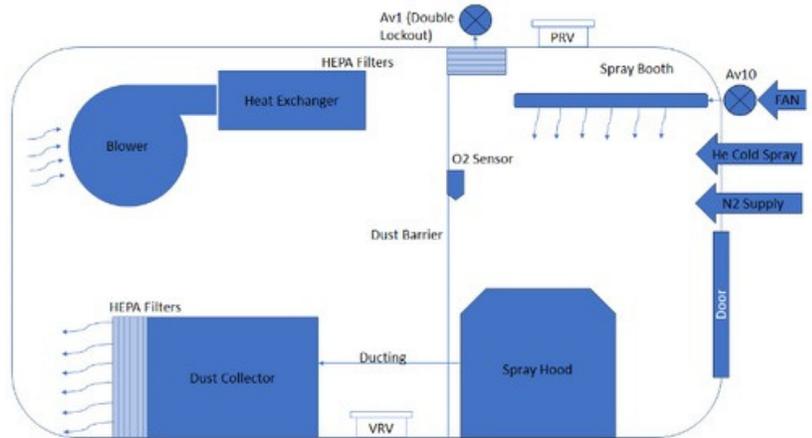
- Flowrate: 50-200 cfm
- Pressure; up to 3000 PSI
- Initial purity: ~3% Helium
- Final purity: >98.5% Helium and above
- Helium recovery rate: ~85-90%

If your industrial gas bill is significant, QUANTUM may have a solution for you.  
Call +1 604 222 5539 to connect with our technical/sales staff.

## QuantumPure QHRS.1-CS™ and QuantumPure QHRS.1-CS – TRI-GAS Helium Recovery and Purification Systems with Nitrogen Generation Applications PROVISIONAL APPLICATION PATENT APPLICATION # 63/635,979



Cold Spray Booth



Block Diagram of Cold Spray Booth System

### Leak-tight booth for Cold spray applications

Introducing our innovative leak-tight booth, maintaining precise pressure levels with minimal loss.

Divided into two compartments, it efficiently contains metal spray process powder. The main process area features powder injection under a spray hood, with excess powder directed to a dust collector for filtration and heat regulation before evacuation. Gas recirculation maintains optimal thermal conditions.

This compact solution, ideal for various processes like cold and thermal spray, 3-D printing, etc., conserves space and investment while ensuring efficient gas recovery (argon, nitrogen, helium, etc.). By reducing floor space and piping needs, it cuts installation costs by an estimated 25-50%."

### Booth Specifications

Sample Table (LxWxH)	1m x 0.5m x 0.6m
Lab Floor Weight restriction	2.5 metric tons per square meter
Six-axis robot arm inside of booth	ABB IRB2600-10/1.45
Robot weight	ABB mass: 250 kg
Forklift Capacity	7 tons
Laboratory Door Size (WxH)	2.5 x 2.8m (Can be enlarged)

If your industrial gas bill is significant, QUANTUM may have a solution for you.  
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**Specialty gases**

## Q16.1/9-QPure-He/Ne - Helium and Neon Dual Purification Plant



### Product Description

Quantum Technology's helium and neon dual purification plants produce high pressure and high purity helium and neon gas from a plant process stream.

The overall purification steps used are:

- Hydrogen removal
- Moisture removal
- Nitrogen gas removal
- Neon and helium cryogenic separation
- High pressure gas compression to product pressure

### Example System Specifications

Helium Product Purity	>99.999%	>99.999%	11
Neon Product Purity	Nm3/hr, other flow rates available on request		
Feed Gas Flow Rate	>95%		
Typical He Recovery Rate	>95% Nitrogen, hydrogen, water, residual impurity		
Typical Ne Recovery Rate	gases ASME, CRN, NEC 400V		
Contaminants to remove	/ 3ph, 120 kW, 50 or 60 Hz available		
Code compliance	50 LPM, 20 - 30 degrees C	30 LPM for cooling	0.2 Nm3/hr
Electrical Requirement	2Nm3/hr, dry, 10 bara 2.4m (W) x 12m (L) x 2.9m (H)		
Cooling Water	5000 kg		
Liquid Nitrogen			
Oxygen Gas for H2 Removal			
Instrument Air			
Approximate Size			
Approximate Weight			

### Main System Components

Quantum Technology's helium and neon dual purification plants use both room temperature and cryogenic purification processes to refine the helium and neon to the desired purity. Technologies used include:

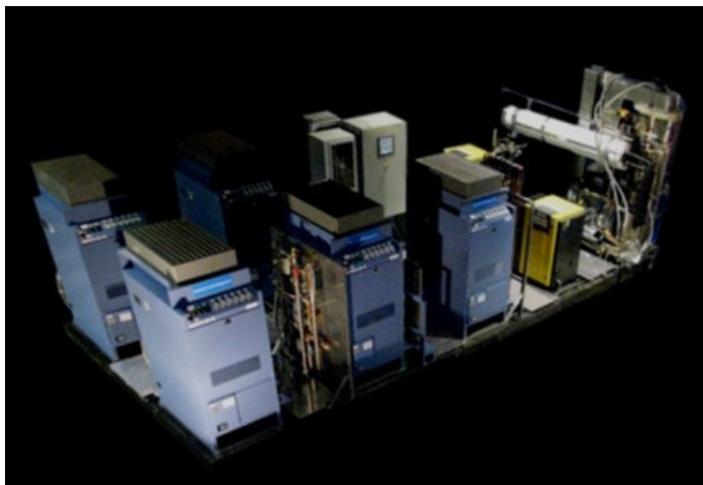
- Catalytic hydrogen removal system
- Twin tower regenerative drying system
- Liquid nitrogen cooled nitrogen gas removal
- Distillation column for neon purification
- Final stage helium purifier

### Options

- Recycle compressor to ensure high purity Gas
- purity analyzers to confirm the purity specifications are met
- Removal of additional or different impurities specific to each customer's process
- Liquid nitrogen system to compensate cooling capacity for the cryogenic separation and to provide purge gaseous nitrogen for system regeneration
- Product gas filling systems
- Centralized plant control and monitoring system
- 

If you're looking to recover neon or helium QUANTUM may have a solution for you.  
Call +1 604 222 5539 to connect with our technical/sales staff.

## Q16.10-QPure-Kr/Xe - Krypton and Xenon Dual Purification Plant



### Example System Specifications

Krypton Product Purity	>99.999%
Xenon Product Purity	>99.9995%
Feed Gas Flow Rate	142 Nm <sup>3</sup> /hr
Typical Recovery Rate	Around 90%, specific system dependent
Contaminants to remove	Oxygen, methane, water, carbon dioxide
Code compliance	ASME, CRN, NEC
Electrical Requirement	380V / 3ph, 100 kW, 50 or 60 Hz available
Cooling Water	3t/hr, 5bara
Liquid Nitrogen	270Nm <sup>3</sup> /hr
Gaseous Nitrogen	520 Nm <sup>3</sup> /hr
Instrument Air	100Nm <sup>3</sup> /hr, dried, 5-7bara
Approximate Size	60m x 24m (1440m <sup>2</sup> )

### Product Description

Quantum Technology's krypton and xenon dual purification plants produce high pressure and high purity krypton and xenon gas from liquified oxygen.

The overall purification steps used are:

- Hydrocarbon removal
- Moisture and carbon dioxide removal
- Krypton and xenon cryogenic separation
- High pressure gas compression to product pressure

### Main System Components

Quantum Technology's krypton and xenon dual purification plants use both room temperature and cryogenic purification processes to refine the krypton and xenon to the desired purity.

Technologies used include:

- Vaporizer to bring gas to ambient temperature
- Catalytic hydrocarbon removal system
- Molecular sieve purification bed
- Purification cold box with distillation columns
- Product compression and filling system

### Options

- Recycle compressor to assure high purity
- Gas purity analyzers to assure the purity specifications are met
- Removal of additional and different impurities specific to each customer's process
- Liquid nitrogen system to compensate cooling capacity for the cold box and to provide purge gaseous nitrogen for system regeneration
- Centralized plant control and monitoring system

If you're looking to recover krypton or xenon QUANTUM may have a solution for you.  
Call +1 604 222 5539 to connect with our technical/sales staff.

# Q16.4-QPure-H2 - Fuel Cell Grade Hydrogen from Ammonia Purifier



Q16.4-QPure-H2

Quantum Technology

## Product Description

Quantum Technology uses carbon adsorption, membrane and pressure swing adsorption technologies to extract fuel cell grade hydrogen from the product of ammonia decomposition.

- Hydrogen production at the distribution site saves hydrogen (H2) transportation costs
- Ammonia transportation is well defined and utilized commercially
- Pilot sized system for proof of concept to scale up to production size

## Options

- Recirculation of waste streams to increase hydrogen recovery
- Purity analysis of product down to ppm N2 and ppm NH3
- Couple with high pressure hydrogen compression and storage
- Hot water, vacuum or warm gas carbon filter regeneration

## Specifications (typical)

Hydrogen Product Purity	>99.99% (Fuel Cell Grade)
Feed Gas Flow Rate	3-10 SCFM 1-20 bara 70-
Hydrogen Feed Pressure	80% 4-12 based on
Typical H2 Recovery Rate	system requirement and
Quantity of PSA Vessels	size N2, NH3 Carbon or
	stainless steel Class 1,
Contaminants to remove	Division 2, Group B/ATEX
Material of Construction	Zone 1 Group IIC ASME,
Hazardous area	CRN, NEC 480V / 60 Hz /
classification	3ph, 10 kW Dependent
Code compliance	on system size
Electrical Requirement	

## Features

- Fast start up and shut down
- Compact design
- Long design life for valves and vessels
- Fully automatic during purification
- Some manual intervention required for carbon filter regeneration
- Pre-installed sampling ports
- Hydrogen leak detection, ammonia leak detection, and infrared flame detector included

If you're looking to produce high grade hydrogen, QUANTUM may have a solution for you. Call +1 604 222 5539 to connect with our technical/sales staff.

## Quantum Cooler™ N2-Zero



Quantum Cooler™ N2-Zero

### Need:

Need

- NMR magnets and other laboratory equipment consume liquid nitrogen.
- This costs time and money and is inconvenient as systems need to be filled on a regular schedule not allowing for holidays or supply issues.

### Solution

- Quantum's Quantum Cooler™ N2-Zero product eliminates the boiloff.
- Fill the NMR with liquid nitrogen once and let the Quantum Cooler™ N2-Zero keep it cold indefinitely by reliquefying the boiloff nitrogen.

### Components

- Q: Quantum Cooler™ N2-Zero cold head
- F: Flexible vacuum jacketed hose
- C: Quantum Cooler™ closed cycle compressor
- H: Hoses from compressor to Quantum Cooler™ N2-Zero cold head

Specification/ Model	N2-Zero Zero > 7.5
Boiloff	L/min (2 GPM)
Cooling Water Requirement	480V, 60Hz, 3ph, 7kW
Power Consumption	
Compressor	
Footprint	0.6mx0.9m (24" x 36")
Maintenance Interval:	
Compressor	> 3 years
Coldhead	> 2 years
Shipping Weight	~180kg (400 lbs)

Call +1 604 222 5539 or email sales@quantum-technology.com to connect with our technical/sales staff.  
Made in Canada.

## Q1.3LN2-9000 Nitrogen Liquefier

Quantum Technology Corp. offers a wide range of Nitrogen Liquefiers with liquefaction capacities between 10 litres/day to 15,000 liters/day, or larger customized sizes. The operating cycle for the larger units utilizes a cryogenic turbo expander to be extremely energy efficient. The QuantumCooler™ Nitrogen Liquefier Systems automatically start and stop as required to maintain liquid nitrogen level in the bulk tank.



### Product Description

- The QuantumCooler™ Q1.3 Nitrogen Liquefier is skid mounted for ease of installation.
- A cryogenic turbo expander and cycle compressor with electric motors provide the power required.
- Nitrogen gas is generated at high purity directly from air.

### Main System Components

1. Compressors  
Rotary Screw / 380V 50 Hz or 460 V 60 Hz AC 3 phase
2. Dryer: Regenerative desiccant
3. Nitrogen Generator: Included in QuantumCooler™ system
4. Liquefier  
Proprietary cryogenic cycle / 380 V 50 Hz or 460 V 60 Hz AC 3 phase / Automatic start/stop
5. Liquid Nitrogen Dewar  
Can directly fill customer's dewar – Quantum manufactures a wide range of dewar sizes

### Control System

Automatic start when customer's liquid nitrogen reservoir is low. Automatic stop when liquid reservoir is full.

### Technical Parameters Large Unit

Major System Components:		QuantumCooler™ Q1.2LN2-9000
Model	Production capacity:	9000 litres LN2/day; (7200 kg/day)
Product temperature	Cooling Cycle	82K (0.7 barg saturated liquid)
System	Electrical rating	250 kW
Liquid storage tank	N2 GAS PRODUCTION	380VAC/3ph/50Hz or 480VAC 3ph 60Hz
N2 gas purity	Dew point	Optional (Can connect directly to Customer's Liquid Nitrogen Tank)
Power Cooling	Shipping	7200 kg/day
		99.995%
		Less than -60C
		75 kW
		Cooling water or glycol is required to remove 325kW of heat (DN100 pipe)
		Ships to site as 3 sea containers

# Quantum Technology

Hydrogen & Helium systems since 1981



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