



★ **Testing times at
CRYOSTAR**

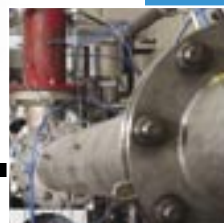
*Being at the cutting
edge of equipment test
technology*

★ **CRYOSTAR turbines
on the SLEIPNER gas
platforms**

*Successful technological
challenge turns into
industry standard*

★ **CRYOSTAR in
clean fuel trials**

*CRYOSTAR Automation expertise
serving a cleaner environment*





Welcome to the second edition of The CRYOSTAR Magazine. In this issue we take a look at the importance of testing equipment. I especially hope you will enjoy the reports describing 'live' witness-testing at CRYOSTAR.

It has always been CRYOSTAR's policy to thoroughly test all our products and over the years, in line with demand for increased performance and reliability, we have seen an impressive evolution in our technological capabilities. In 1998, CRYOSTAR decided that equipment testing – as one of our core competencies – would be expanded, both technically and physically, to reflect and complement our strategy for growth. This resulted in a € 4million development programme. Investment included state-of-the-art test stands and new pump and turbine/compressor test facilities, fully equipped with the latest data acquisition devices and software.

These diagnostic and test facilities have since confirmed CRYOSTAR's position as market leader in performance and reliability technology.

Beyond the typical equipment tests, customers also benefit from CRYOSTAR's enhanced engineering through different R&D programmes, supported by extensive and intensive in-house testing. Reflecting our spirit of partnership – another core competency – we often use our facilities to provide specific testing, replicating real customers' operating conditions or simulating different processes and applications. We are willing to work with customers in just about any area to help meet their needs.

Finally, I would like to take this opportunity to reinforce CRYOSTAR's ethos that accurate testing definitively makes the difference!

Daniel MEYER



★ Testing times at Cryostar ——— p 03

★ Cryostar in clean fuels trials ——— p 06

★ Local service brings China success ——— p 07

★ Cryostar turbines on the Sleipner gas platforms ——— p 08

★ News ——— p 09

★ MRP – the cutting edge of technology ——— p 10

★ Events ——— p 11

★ Tools and datas ——— p 11





Testing times at Cryostar

For CRYOSTAR, leadership of the global cryogenic equipment market is synonymous with being at the cutting edge of equipment test technology. Every product – be it fresh off the assembly line or recently refurbished – is subject to stringent testing before delivery. When it comes to its products CRYOSTAR's ethos is simple: equipment reliability and guaranteed performance!

CRYOSTAR has made major investments in test equipment technology, including a unique LN2 test stand, allowing different simulations, and a turbine / compressor test site, complete with data capture facilities.

Now CRYOSTAR customers can witness-test the equipment they have ordered. Here, The CRYOSTAR magazine reports on two typical witness-tests at its Hesingue facility, in France – one, a series of pumps for Linde, of Germany, and the other a test of a TP 120 turbine for Air Products, of the United States.

Mutual confidence and trust

Linde's pumps test – Over the years, Klaus Fertig, Linde's

Project Manager, Plant Design, and CRYOSTAR have built a strong, tried and tested, working relationship based on mutual confidence and trust.

When it comes to important and technically difficult projects, Linde's representative is there to witness tests in real time. CRYOSTAR's engineers deal with any customer query on the spot. Michèle Mendes, CRYOSTAR's Project Manager, Pumps, has the overview of the Linde account. She takes Klaus Fertig through the testing programme, step-by-step, to ensure CRYOSTAR's preparations are in line with Linde's expectations.

One of the principles applied by CRYOSTAR is to rigorously post-production test all products.

This guarantees every piece of equipment meets CRYOSTAR's stringent standards.

This also allows CRYOSTAR to provide the customer with pre witness-test results performed with liquid nitrogen and original motor. Such was the detail provided by CRYOSTAR on the 15 pumps tested post-production for Linde's project in the Middle East, that Klaus Fertig was confident enough to only wish to witness-test two.

The two chosen were the most critical for the project, a VP 3/310 and a VP 2/310. These vertical, multi-stage pumps were developed by CRYOSTAR in the course of the 1990's to face the growing demand for higher efficiency of

liquefaction plants.

For this project, the following tests were done:

- > Performance test at the specific duty points (nominal, maximal, minimum and slow roll);
- > Noise and vibration measurements;
- > Temperature curve of front bearings;
- > Curve for lantern seal leak surveillance via temperature sensor (PT100); and
- > NPSH test at the nominal duty point.

While the CRYOSTAR technicians prepared and installed the



pumps on the test racks, Klaus Fertig inspected the parts of a dismantled pump that had undergone testing the previous day.

A very thorough visual check of the pump shaft, the impellers, the labyrinths and the diffusers followed. All parts were found to be in excellent shape and didn't show any unusual wear – a condition noted by Linde's representative.

By now, the suction and discharge lines on the VP 3/310 were connected to the 53,000 litres nitrogen tank and the pump started. Two hours was needed to cycle through the test programme.

This specific data acquisition programme was developed by CRYOSTAR to start and stop the pumps, and to activate the valves for flow and pressure regulation. All parameters are monitored visually and recorded via computer in the test centre's control room.

The tests were 100 per cent successful and Klaus Fertig signed off Linde's acceptance report. He mentioned: "Testing is one of the strengths of CRYOSTAR. The great and broad testing facility is very impressive."

Turbomachinery Test Facility

Features
 2 test platforms total surface of 1000 m2
 1 control room
 1 cooling tower and associated circuit

LNG tankers compressors tests
 Possibility of testing 8 units simultaneously
 Low voltage power supply with variable frequency drive : 690V / 1,5MW / 60Hz
 High voltage power supply with variable frequency drive : 6600V / 1,5MW / 60Hz LN2 cold test @ - 160°C

Turboexpanders tests

	pressure	flow
Low flow test line :	0 - 10 barg	0 - 10000 m3/h
High flow test line :	0 - 6 barg	0 - 4500 m3/h

Built to exacting standards

Air Products' turbine test

The oil brake-loaded TP 120 is a small-frame turbine designed and built to exacting standards determined by Air Products and CRYOSTAR.

To be used in Air Products project in Brazil, an interesting aspect of the turbine's standard is related to the documentation and data exchange in electronic format.

Pump Test Facility	Centrifugal pumps	Reciprocating pumps
Tank capacity (N2)	53 000 l (4 bars maxi) (58 psi max)	116 000 l (15 bars maxi) (218 psi max)
Maximum flow	15 000 l/min (4 000 gallons/min)	100 l/min (27 gallons/min)
Pump maximum operating pressure	80 bars (1 116 psi)	600 bars (8 700 psi)
Maximum power (at 400V)	500 kW (680 HP)	150 kW (204 HP)
Voltage	230 to 660 V	230 to 660 V

This allows easy access to test data and quick onward communication by CRYOSTAR's Quality Assurance Department of the Quality Data Book, complete with all certificates and test documents.

For the TP 120, Air Products was looking for a high, specific refrigeration load, namely 133.4 kW cold power obtained with an 87 per cent overall isentropic efficiency at a flow rate of 9321 Nm³/hour.

Air Products' Colin Thomas, inspection engineer, was welcomed to witness-test the turbine by CRYOSTAR project manager Brice Wuyam.

In line with CRYOSTAR's equipment guarantee and testing policy, the TP 120 had already been put through its paces and emerged with flying colours.

Now it was under the scrutiny of Air Products' representative Colin Thomas, who first checked the piping and instrumentation diagram.

He then ensured the test procedures were understood, namely

the aerodynamic performance followed by test running three hours at nominal speed (25 900rpm), then one hour at maximum continuous speed (27 195rpm), followed by three minutes at trip speed (28 355rpm).

Overlooking the test rig from inside the noise-insulated control room, Colin Thomas was able to track the main running parameters of the turbine. This is possible because the turbine test stand is equipped with the latest in supervision and data acquisition systems, the Delta V (Emerson Process Management).

This allows engineers in real time to:

- > Assess the performances of the machines and their transfer to the engineers of the aero-design department;
- > Monitor the tests from the control room; and
- > Supervise the entire test stand, e.g. the air compressors to drive the turbine, the cooling tower, etc.

With the test in progress, the Air Products representative was able to conduct further checks, review the Quality Data Book, as well as

leave the control room and walk by the turbine to physically gauge its performance.

Once testing ended, all data was transferred to engineer Frank Haensel, of CRYOSTAR's Aero-Design Department. In less than 30 minutes, Frank met with Colin Thomas to show and explain the results and compare them with the predicted data. There was total customer satisfaction.

Meanwhile, CRYOSTAR engineers dismantled the turbine cartridge, and within the hour, the parts were shown to Colin Thomas for a visual check, mainly of the shaft, the seals, the bearings and the wheel.

The Air Products representative signed the release note for the TP 120. After the turbine cartridge reassembly and installation on the skid, the machine was packed and released for shipment to Brazil – just one week after the test.

These two test days demonstrate CRYOSTAR's commitment to customer satisfaction and a transparent working relationship between the company's engineers and the customer.



Cryostar in clean fuels trials

Cryostar Automation has joined haulage firm the Hardstaff Group and cryogenic equipment manufacturer M1 Engineering to develop new gas filling station using 'no gas loss technology'.

For the project a combined LCNG (liquid and compressed natural gas) automated filling station has been installed at Hardstaff's Nottinghamshire site. Not only is it the first time that an English firm has invested in a twin LCNG filling station of this nature, but the project is the first to receive funding from the UK government's alternative fuels PowerShift programme.

Hardstaff managing director Trevor Fletcher said: "Natural gas is the cheapest fossil-based fuel on the market – and then there's the environmental benefits and value that 'going green' adds to our customer proposition."

Cryostar and M1

M1Engineering has been involved in supplying first generation LNG fuelling equipment to other companies in the UK, while Cryostar Automation's process control experience and expertise in fully automatic gas filling stations for industrial use were key.

M1's managing director Peter Fox said: "This was an opportunity to bring together two companies with complementary strengths to design, build and install an innovative solution that would meet a client's very specific needs."

Cryostar contributed the buffer tank, pumps, vaporisers, interconnecting pipe work, electrical cables and automatic control cabinets for the LCNG dispensing while M1 Engineering provided the LNG tank, pumping and metering systems, pipe work and electrical equipment for the LNG dispensing.

Technology

The result of that partnership is a technologically advanced, yet easy to operate gas refuelling station, comprised of:

- > One 44,000 litres tank, capable of storing up to 17,000 kgs of LNG;
- > Two LNG cryogenic pumps 22 kW type Fillesafe 41.3/40 with two automatic valves;
- > Two atmospheric vaporisers 64 tubes, 750 Nm³/h for 420 barg design, the station being rated for continuous



direct fill for four vehicles per hour at 840 water litres per vehicle, but has design capacity for expansion to six vehicles per hour;

- > One automatic buffer skid to control CH₄ vaporisation, the automatic fuelling and decanting of 2,400 litres (water capacity) of gas at 300 barg, and the vessel truck fuelling. An integrated flow meter allowing to measure and record the mass of CNG filled in the truck;
- > An ex-proof operator interface allowing the operator to make a request to the system which will automatically launch the fuelling procedure; and
- > A Triscan operator identification module by means of magnetic disc. The fuelling system has a permanent communication with this interface giving access to the fuelling system and providing in real time the mass filled by the driver to record and print the bill receipt.

Beside the CNG filling capability, LNG can be filled at the rate of maximum 150 litres per minute, completing a tank fill in less than five minutes.

Technical and safety considerations, such as explosive atmosphere areas, number of trucks to fuel, risk assessment, HAZOP, pressure and temperature control, and fuelling time, have been integrated in the station.

Technical data

Trucks CNG fuelling capacity per day	30
Trucks filled per hour CNG	4
Trucks LNG fuelling capacity per day	100
Trucks filled per hour LNG	8 to 10
Fillesafe pumps flow rate (l/min)	2x17=34
Buffer pressure (Barg)	300
Volume of buffer (capacity)	2400 water litres
Truck fuelling pressure (Barg)	250
Truck vessel volume (capacity)	800 water litres

Local service brings China success

China is the most populous country in the world and already has the seventh largest economy. Reforms started in the late 1970s have transformed the economy from agricultural to industrial.

The upturn, which has occurred since, has opened up the economy to the world. For CRYOSTAR, the leading provider of cryogenic equipment and technology, China has been a success story driven by customer service and engineering expertise.

With operations now based in Hangzhou, two hours drive from Shanghai, the initial decision to expand into China was a simple case of meeting customer needs.

The operation in Zhejiang province enables CRYOSTAR to deliver international expertise at a local level – an approach so successful that the business has been forced to expand its force of service engineers.

CRYOSTAR now offers China customers a full range of total solutions in terms of cryogenic pumps and turbines supplies, as well as engineers dedicated to delivering best customer support in process and distribution applications, locally. Customers also benefited from clear communications and quicker response times. As a result, an increasing number are endowing CRYOSTAR with 'preferred supplier' status.

After sales service and the expertise of the local engineering team remains crucial to CRYOSTAR's continued success in China. As part of this customers



enjoy access to CRYOSTAR's complete range of services, including spare parts supplies, technical, commissioning and repairs assistance.

This dedication to engineering technology and service was instrumental in CRYOSTAR being commissioned to provide China's first-ever liquid expansion turbines.

These new turbines are for use in air separation units and natural gas liquefaction plants. The attraction of the CRYOSTAR technology is significant savings in energy costs or, alternatively, an ability to raise production levels.

As the world leader in distribution pump technology, CRYOSTAR has also supplied more than 30 trailer pumping systems to customers in China. The systems vary from the basic plug-in type, to the Mixtran system, a combination of alternator and plug-in, and the Hytran system, which utilises an hydraulic drive.

For CRYOSTAR, China is a success story. Combine rising demand for cryogenic equipment with international expertise and services delivered locally, and one begins to see why CRYOSTAR is going from strength to strength in one of the world's fastest growing economies.



Cryostar turbines on the Sleipner gas platforms



Harald Underbakke

STATOIL

Lead engineer : conceptual development of rotating mechanical equipment

SLEIPNER, a gas platform in the North Sea went on stream 1st October 1993. It was the first-ever platform equipped with magnetic bearing turbo expanders. For the 10th anniversary of this event, we spoke to Harald Underbakke, the lead engineer responsible for the conceptual development of all rotating mechanical equipment at STATOIL. He was also part of the commissioning team for the SLEIPNER project.

The CRYOSTAR magazine: First please tell us about the SLEIPNER project.

Harald Underbakke: The SLEIPNER project is a natural gas and condensate field development consisting of two fields producing 45 million Sm³/day gas and 25,000 Sm³/day condensate (equivalent of 160,000 barrels/day). The SLEIPNER A platform is a fully integrated platform with drilling, living quarters and gas production plant. It is the first direct gas production platform for STATOIL.

How strategic was it to be on stream 1st October 1993?

HU: It was vital. It was the first test for STATOIL as a large-scale gas supplier. SLEIPNER is part of the TROLL (see @ a glance panel) gas sales agreement and the SLEIPNER A platform was the sole producer during the first three years. Any delay would have resulted in penalties in addition to the lost production income.

Why did STATOIL chose, what at that time was new technology, in magnetic bearing turbo expanders and CRYOSTAR for such a vital and strategic project?

HU: CRYOSTAR wasn't readily associated with turbo expander manufacturing for hydrocarbon applications. However, the company and its expertise were well known to STATOIL through its operating record on cryogenic pumps. So CRYOSTAR was already a qualified supplier. STATOIL is a leader in new technology development, as is CRYOSTAR, so we took the decision to invite CRYOSTAR to participate. The potential of magnetic bearing technology

How did it work out?

HU: Today we can say that it was the right choice. There were some issues both mechanical and electrical the first operating year, but these have now been resolved by design upgrades. The operation has been stable for the last nine years and the availability of these machines is amongst the very best of all rotating machinery we have.

What is the main advantage of these machines today?

HU: Availability. SLEIPNER needs to run continuously. That means planned shutdowns are almost as bad and costly as unplanned shutdowns. The level of availability reached with CRYOSTAR machines is higher than average.

Do you believe that the availability could be further increased?

HU: This would be difficult, since there is not much improvement potential left. The availability of all the vital spare parts is the enabling factor to reach this level.

STATOIL Group profile

- STATOIL is an integrated oil and gas company with a strong focus on exploration and production; Represented in 25 countries with 17,115 employees Head office is in Stavanger;
- The leading operator on the Norwegian continental shelf and one of the world's largest offshore oil operators;
- Participant in a number of international oil and gas finds and in rising production from fields in Azerbaijan, Angola and Venezuela; The largest supplier of natural gas in Norway to a growing European market;
- One of the world's largest net sellers of crude, including sales on behalf of the Norwegian state. Extensive sales of oil products and natural gas liquids; and
- Has 1,883 gas service stations in nine countries.



What about performance?

HU: There has been no decline of the good performance over time. We have operated at 110 per cent of the design conditions since 1994. After 10 years of operation there is no significant wear on the wheels, the labyrinths or the nozzles. We had erosion on the compressor diffusor in an early stage, maybe due to particles remaining in the piping, but nothing else since.

In summer of 1993 STATOIL purchased four CRYOSTAR turbo expanders for the SLEIPNER T platform, even though there was not much operating experience on the first 4 units. Why?

HU: At that stage, due to the good co-operation with CRYOSTAR and due to what we learned during the extensive testing on SLEIPNER A, we considered it

the right choice. It was also a form of standardisation and reduced the personnel training.

What is your impression of CRYOSTAR?

HU: Good technical staff. Good engineering capabilities. Rapid and good response, keen to try new technologies and high quality equipment in general.

How would you conclude?

HU: The implementation of the CRYOSTAR turbo expander was a challenging development project which became a success. It established the magnetic bearing turbo expander standard for offshore and onshore hydrocarbon applications.

TROLL - @ a glance

The TROLL gas sales agreements (TGSA) concluded in 1986-88 marked a departure in relation to earlier contracts for Norwegian gas exports. While the latter were 'depletion' deals covering output from a single field, the TGSA are 'supply' contracts. They undertake to deliver a specified volume to an agreed quality from any field. TROLL and the SLEIPNER area serve as guarantors of these deliveries. This approach offers greater flexibility for the sellers and enhanced security for buyers. The first TGSAs were concluded on 30 May 1986. As subsequently expanded, they commit companies in Belgium, France, the Netherlands, Germany, Spain and Austria to take around 1,000 billion cubic metres of Norwegian gas over 30 years. Gas contracts are often signed long before deliveries begin, and before production facilities or pipelines have been constructed. Deliveries under the TGSA began from the SLEIPNER A platform on 1 October 1993 and from TROLL A platform in 1996.

News

Green oxygen-service components

CRYOSTAR recently installed a new state-of-the-art degreasing plant for cleaning of components. This fully automatic machine uses the latest technology to prepare components for oxygen service, using solvents as cleaning agents. The machine operates with a high degree of safety and without environmental impact. This allows CRYOSTAR to provide superior quality, clean components for both original and spare parts (which, on request, can be vacuum packed and sealed, ready for use). This investment shows CRYOSTAR's commitment to its customers, safety and the environment!

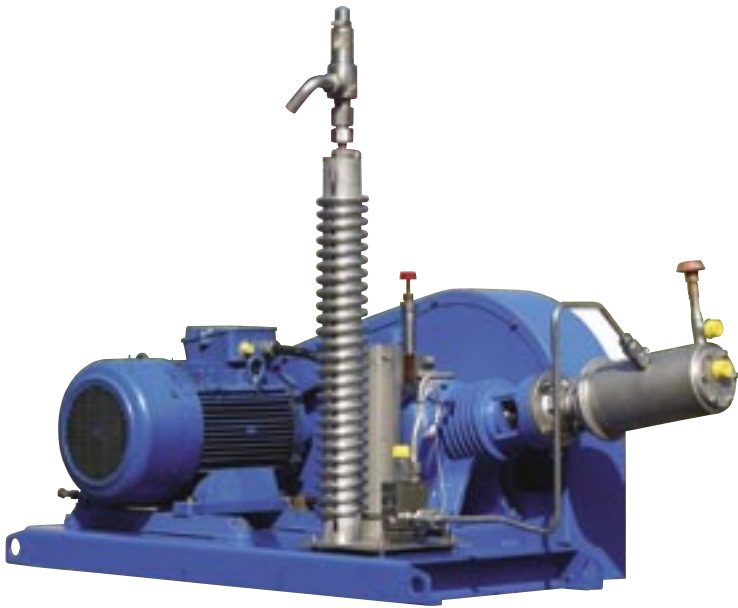
30 Years of CRYOSTAR in France!

In 1973, CRYOSTAR (then based in Pratteln, Switzerland) constructed a second manufacturing facility in France. Near the borders of Switzerland and Germany, just five minutes from the EuroAirport Basel Mulhouse, CRYOSTAR France started production in September 1973. The first products shipped from the Héisingue facility were.... food freezing tunnels! Very soon after, CRYOSTAR France produced pumps, vaporizers and turbines, and in 1975 became the only manufacturing plant. To celebrate this milestone, on 17 September 2003, an Open Day was arranged for customers, suppliers and business partners from all around Europe. It provided a unique opportunity for CRYOSTAR and its personnel to demonstrate their capabilities through presentation of the company's designed and manufactured products.

**Innovative Service Agreement**

In an effort to improve plant reliability through preventative maintenance, BOC's PGS Europe and CRYOSTAR have developed a new service, unique in the Industrial Gases Industry. In terms of the agreement, CRYOSTAR takes responsibility for all spare parts management and is appointed as preferred supplier for equipment and services for all types of cryogenic rotating equipment and its maintenance work. The spare parts stocks will be managed from CRYOSTAR UK, located in Hellaby. PGS Europe will also benefit from CRYOSTAR's technical and consulting support. This partnership offers increased equipment reliability, coupled with reduced maintenance costs.

MRP – the cutting edge of technology



CRYOSTAR is developing a new reciprocating cryogenic pump under the brand name of MRP (Modular Reciprocating Pump). This is a new concept in modular pumps and will be available with two different stroke lengths to cover a large range of flows from 4-25l/min, with a maximum discharge pressure of 420barg. The maximum speed will be limited to 400rpm in order to increase the durability of parts subject to wear.

Modular Aspects:

To meet the needs of multi- markets, the MRP is being developed using a modular philosophy, with the following key points:

- > There are two stroke lengths available using the same cold end and piston to cover a flow range from 4-25l/min;
- > The crank drive can be oil or grease lubricated;
- > An oil-seal cartridge that can be dismantled easily;
- > A tapping to fit a temperature probe in the coupling area to detect seal leakage;
- > A tapping to fit a temperature probe in the crank drive housing to measure the oil temperature; and
- > Tappings for a nitrogen purge to prevent moisture entering the crank drive.

Cold end:

The technology is being developed with the following key points at the fore:

- > The cold end has a sophisticated insulated cylinder with a robust and large vacuum chamber to reduce the required NPSH to almost zero and to reduce the cool down time and liquid losses. The insulation has also been designed to avoid any mechanical stress on the welds in order to improve the life-time of the cylinder, the reliability and safety of this high pressure component;
 - > The suction valve profile has been designed to reduce the pressure drop of liquid into the cylinder;
 - > The numbers of high-pressure seals (piston rings) have been increased to improve the volumetric efficiency;
 - > The low-pressure seal arrangement is a new design which will noticeably increase the seal life time; and
- The cold end will be in accordance with the latest safety regulations (PED-CE97/23, etc...)

Crank Drive:

Features:

- > The crank drive is a new design which allows for the use of either grease or oil lubricated bearings;
- > However, with oil lubrication, the life-time of the bearings will be increased two-fold.
- > To maintain a strict alignment, a static DU sleeve is no longer used. This is replaced by special segments located on the cross head in order to reduce the radial clearances and the friction coefficient. The noise and vibration levels are reduced, even at maximum discharge pressure;
- > From the safety point of view, oxygen compatible oil will be available; and
- > Simplified maintenance procedures enable faster disassembly and reassembly.

If you would like more information about the MRP and/or other CRYOSTAR technologies contact your local CRYOSTAR office.

Events

★ November 24-27, 2003

WELDEX-2003, 3rd international specialized exhibition of materials, equipment and technologies for welding, Sokolniki Culture & Exhibition Centre, Moscow, Russia.

★ February 3-5, 2004

WeldMex 2004, the World Trade Center, Mexico City, Mexico.

For more details:

www.weldmex.com

★ March 3-5, 2004

Flame tech,
Amsterdam, Netherlands.

★ March 21-24, 2004

The 14th Liquefied Natural Gas Conference and Exhibition (LNG14), Qatar International Exhibition Center, Doha, Qatar.

For more details:

www.lng14.com

★ May 5-14, 2004

20th Intl Cryogenic Engineering conference, Beijing, China.



Tools and datas: Argon and Hydrogen Conversion Data

We have decided to dedicate this section of our magazine to include usefull tools and datas that are handy in our industry. In this issue, the Argon and hydrogen conversion data table.

	Weight		Gas		Liquid	
	Pounds (Lb)	Kilograms (KG)	Cubic Feet (SCF)	Cubic Meters (Nm3)	Gallons (Gal)	Liters (L)
Argon						
1 Pound	1.000000	0.453592	9.708160	0.255114	0.085959	0.325389
1 Kilogram	2.204622	1.000000	21.402828	0.562430	0.189506	0.717360
1 SCF Gas	0.103006	0.046723	1.000000	0.026285	0.008854	0.033517
1 Nm ³ Gas	3.919818	1.777999	38.044053	1.000000	0.336942	1.275466
1 Gal Liquid	11.633494	5.276864	112.939821	2.967866	1.000000	3.785412
1 L Liquid	3.073244	1.394000	29.835543	0.784027	0.264172	1.000000
Hydrogen						
1 Pound	1.000000	0.453592	192.021870	5.047380	1.692942	6.408483
1 Kilogram	2.204622	1.000000	423.335731	11.127566	3.732298	14.128285
1 SCF Gas	0.005208	0.002362	1.000000	0.026285	0.008816	0.033374
1 Nm ³ Gas	0.198123	0.089867	38.044053	1.000000	0.335410	1.269665
1 Gal Liquid	0.590688	0.267931	113.424961	2.981425	1.000000	3.785412
1 L Liquid	0.156043	0.070780	29.963703	0.787609	0.264172	1.000000

SCF (Standard Cubic Foot) gas measured at 1 atmosphere and 70°F. Liquid measured at 1 atmosphere and boiling temperature. Hydrogen gas values expressed in the stable conditions 75% or-tho, 25% pure.

Nm3 (normal cubic meter) measured at 1 atmosphere and 0°C. All values rounded to nearest 4/5 significant numbers. Hydrogen liquid values expressed in the stable para condition.



© CRYOSTAR - all rights reserved
Contact: magazine@cryostar.com

★ CRYOSTAR France SA

ZI - BP 48
FR-68220 Hémingue
info@cryostar.com
Phone: +33 (0)3 89 70 27 27
Fax: +33 (0)3 89 70 27 77

★ CRYOSTAR USA West

9211 S.Greenleaf Ave
Santa Fe Springs
CA - 90670 USA
usa@cryostar.com
Phone: +1 (562) 903-1290
Phone : 1-800-483-1052 (for US and Canada only)
Fax: +1 (562) 903-4511

★ CRYOSTAR USA East

2670 Lehigh Street
Whitehall
PA - 18052 USA
usa@cryostar.com
Phone: +1 (610) 231-0210
Phone : 1-800-483-1052 (for US and Canada only)
Fax: +1 (610) 231-1522

★ CRYOSTAR UK

Kea Park Close
Hellaby, Rotherham
South Yorkshire S66 8LB - UK
uk@cryostar.com
Phone: +44 1709 702 777
Fax: +44 1709 702 771

★ CRYOSTAR China

393 Dongxin road
Hangzhou - China 310004
china@cryostar.com
Phone: +86 571 8536 8331
Fax: +86 571 8536 8409

★ CRYOSTAR Singapore

203 Henderson Road
BLK B#10-09
Henderson Industrial park
S(159546) - Singapore
singapore@cryostar.com
Phone: +65 6276 7441
Fax: +65 6276 7442

★ CRYOSTAR Automation

Saint Julien d'Empare
FR-12700 Capdenac
info@cryostar.com
Phone: +33 (0)5 65 80 20 20
Fax: +33 (0)5 65 80 20 25