

Standard helium liquefier/refrigerator L1410/LR1430.



Linde continues the long tradition of dependable and affordable helium systems with production of the Model 1400-1600 series of helium systems. Capacities depend upon liquid nitrogen (LN₂) pre-cooling and on the chosen size of compressor. All standard cold boxes are equipped with LN₂ pre-cooling capability, which provides a significant increase in capacity.

The liquefaction and refrigeration process is based on a modified Claude cycle with two gas piston expanders. The system is controlled by a state-of-the-art PLC based control system. Significant system parameters are measured by digital instruments.

A purifier is integrated in the L1410 cold box to enable the liquefier to accept recovered helium contaminated with up to 10% of air impurities. Initial purification down to 1% impurity level is achieved by air condensation, the remaining air is then frozen out. Regeneration of the freeze-out purifier is fully automatic. The cooling for the purification is generated by the helium cycle, so no external cryogenes are required.

The LR1430 liquefier/refrigerator is based on the L1410 design using the same standard components, but has the capability to operate as a 4.6K liquefier or as a 4.6K refrigerator. In liquefaction mode, a coaxial Remote Delivery Tube (RDT) supplies liquid helium to the mother dewar via the inner passage, and returns gaseous helium via the outer passage. In refrigeration mode, female bayonets inside the LR1430 provide the supply to the load, and return from the load through a second JT valve for efficient recovery of available refrigeration. Two 80K activated charcoal adsorbers guard against any degradation of performance from trace impurities in the helium gas stream.

The LR1430 does not contain an internal, automatic helium purification system. If there is potential to function in full Liquefaction mode in the future, a Linde Model 500A Automatic External Helium Purifier can be added at that time. Alternately, an LR1630 liquefier/refrigerator model would be recommended since it has an internal automatic helium purifier.

Piston expanders

The piston expanders have been improved over the years with better bearings and connecting rods. The load motor and alternator combination has been replaced with a single VFD motor. The resistor banks are reduced in size and mounted on the cold box cabinet. These improvements have significantly increased reliability.

Standard scope of supply

- The standard helium liquefier/refrigerator comprises:
- Vacuum insulated cold box, either with integrated automatic purifier and a transfer line connection to/from the storage dewar (L1410); or with female bayonet connections to/from a load and a coaxial transfer line connection to/from the storage dewar (LR1430)
 - Finned tube and shell heat exchangers with LN₂ pre-cooling function
 - Two gas piston expanders
 - Recycle compressor with hermetically sealed motor, eliminating air contamination through a seal
 - Compressor oil removal system / gas management system
 - Water cooled, 15 gpm at 75°F max and 45 psig supply pressure (57 lpm at 24°C and 310 kPa)

Options

- Pure helium gas buffer tank
- Cryogenic adsorber, external and portable
- Line drier
- LHe storage dewar and transfer line
- Standard installation kit
- Helium gas recovery system
- Spare parts and maintenance kits
- Maintenance contract

Standard control system supply

- Data acquisition, remote monitoring and control system interface via remote computer
- PLC-based Main Operator Console
- 15-inch touch screen for process visualization with dynamic color graphic display

Options

- Trend recording
- Display of control loop status and process variables

**Technical specification
L1610/LR1630**

L1410 liquefaction guaranteed performance (liters/hour)

50 Hz	60 Hz	50 Hz	60 Hz	
Without LN ₂ precooling	Without LN ₂ precooling	With LN ₂ precooling	With LN ₂ precooling	Compressor
8	10	16	20	RSS
17	17	39	47	RS
-	-	47	-	RSX

LR1430 4.6K refrigeration guaranteed performance (watts)

50 Hz	60 Hz	50 Hz	60 Hz	
Without LN ₂ precooling	Without LN ₂ precooling	With LN ₂ precooling	With LN ₂ precooling	Compressor
30	41	40	51	RSS
64	64	100	114	RS
-	-	114	-	RSX

L1410/LR1430 main dimensions

Description	L x W x H [m]	Weight [kg]
Model L1410 Helium Liquefier	1.270 x 1.067 x 1.700	818
Model LR1430 Helium Refrigerator	1.270 x 1.067 x 1.700	818
Compressor - RSS	1.450 x 1.250 x 1.420	1100
Compressor - RS & RSX	1.450 x 1.350 x 1.480	1135

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