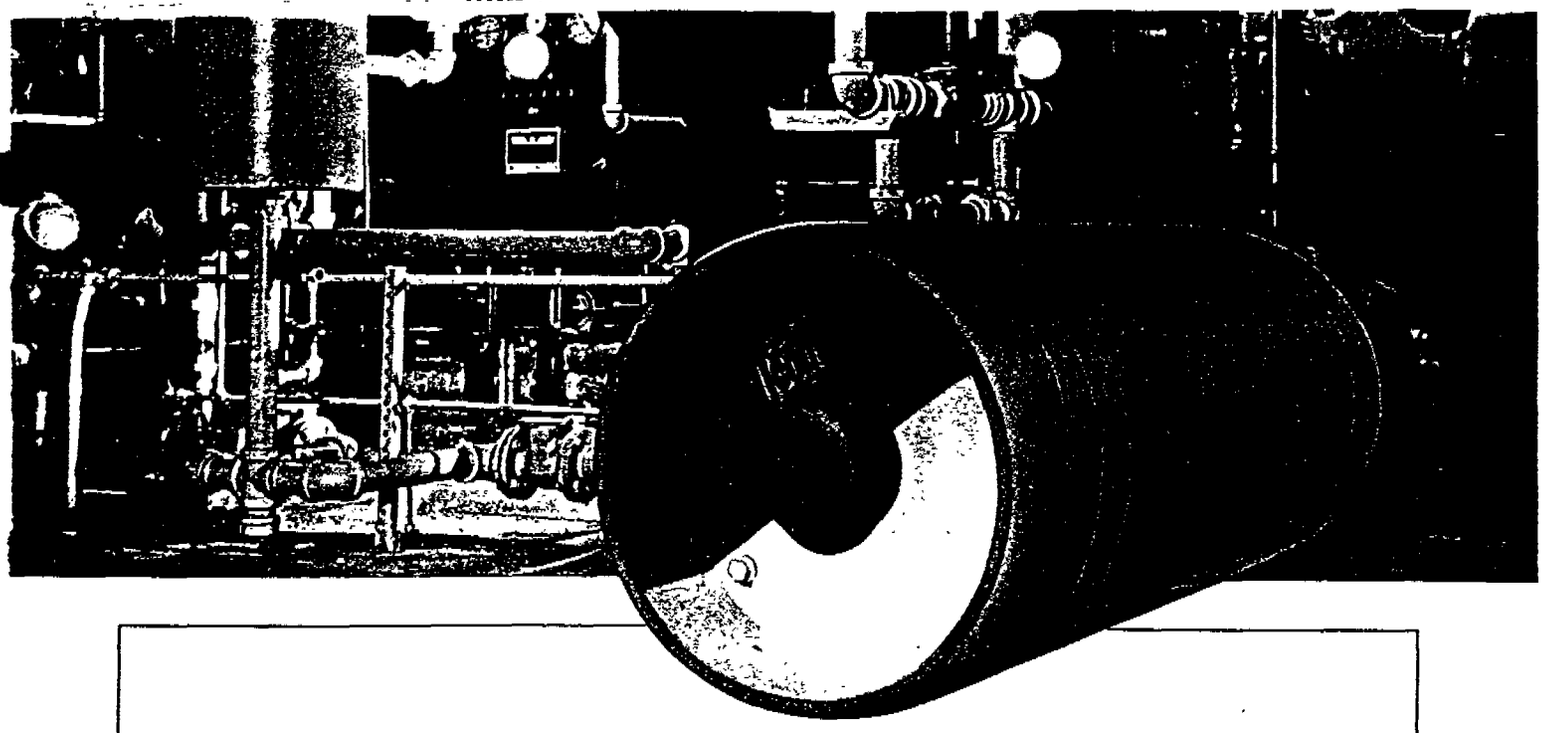
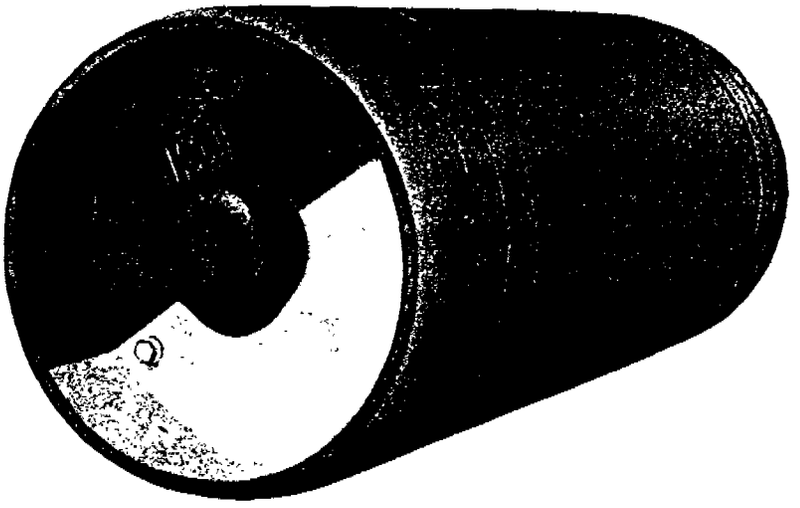


storage and handling of Ucon fluorocarbons ton cylinders



Ucon®
fluorocarbons

UNION CARBIDE

Union Carbide Corporation, Chemicals Division • 270 Park Avenue • New York, New York 10017

general information

One-ton capacity cylinders used for the shipment of UCON fluorocarbon propellants and refrigerants are constructed in compliance with Interstate Commerce Commission Specifications ICC-106A-500. Weights and dimensions are shown in Fig. 1.

The cylinders are equipped with two service valves, (see Fig. 2) centrally located on the cylinder head. When the cylinder is placed so that the valves are aligned vertically, the dip tube of the lower valve extends to the bottom of the cylinder for liquid take-off. The top valve provides a means of entry to the vapor space of the cylinder.

The cylinders are also equipped with a safety valve, set to relieve at 375 psig internal pressure, and with five fusible plugs. The fusible plugs melt at 158-165°F, so that the cylinders will have added relief capacity in the event of exposure to high temperature, as in a fire.

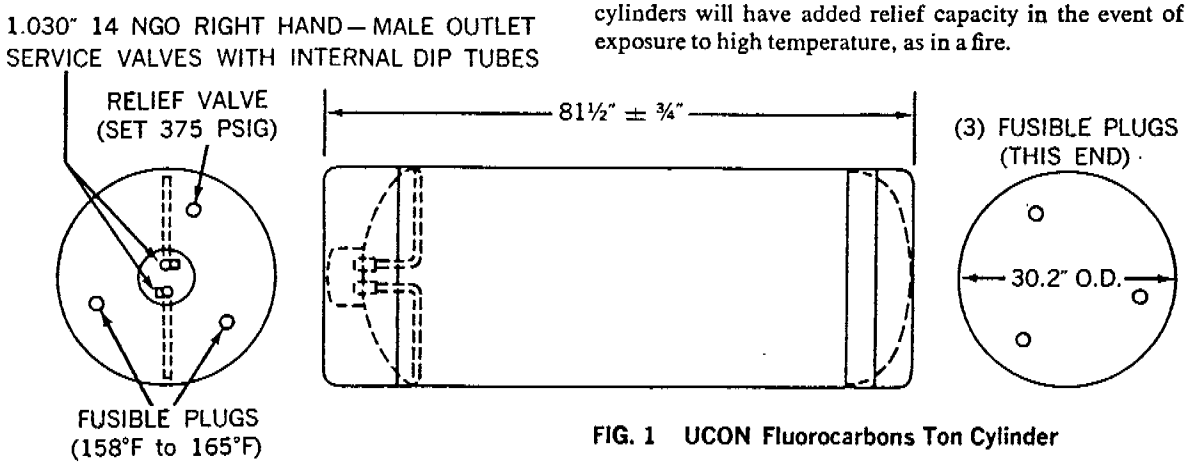


FIG. 1 UCON Fluorocarbons Ton Cylinder

TARE WT. CYLINDER = 1070 LB. (APPROX.)

NET WT. CONTENTS	
UCON 11 = 2200 lb.	UCON 22 = 1750 lb.
UCON 12 = 2000 lb.	UCON 113 = 2200 lb.
	UCON 114 = 2200 lb.

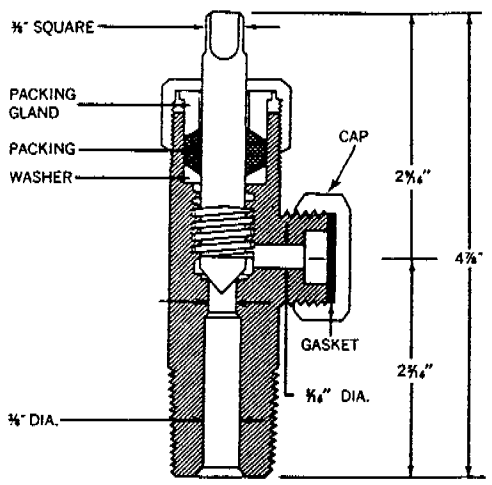


FIG. 2. Diagram of Ton Cylinder Service Valve

These service valves require American Standards Association Connection No. 660. Connection No. 660 can be specified for use with ¼" piping or ¼", ⅜" or ½" SAE flared tubing.

color coding

A color coding system has been adopted to assist the user in rapid identification of cylinders. The service heads of cylinders are painted a distinctive color in accordance with the following code:

UCON Fluorocarbon	Color Code*
11	Orange
12	White
22	Green
113	Purple
114	Blue

*This color coding is not used for mixtures, rather the service head is painted to match the cylinder

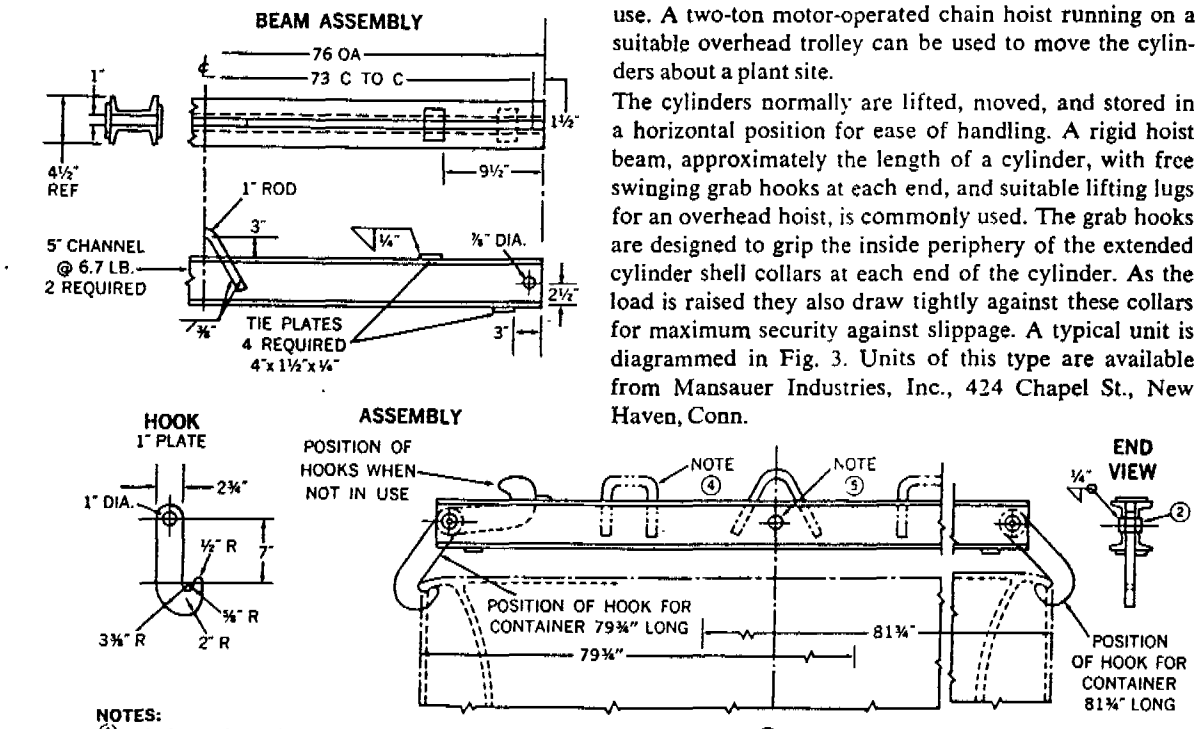
In addition, an arrow is painted on the service head of the cylinders which indicates the placement of the internal dip tubes. Thus, the operator can readily determine when the cylinder is properly aligned for use (i.e., when the arrow is in a directly vertical position).

delivery and receiving

Delivery of ton cylinders of UCON fluorocarbons is made in standard trucks. A receiving dock, about 50 inches above the roadbed level, is desirable to facilitate unloading. The full cylinders weigh about 3100 pounds so that a means of unloading them is needed. A fork truck, capable of carrying a 3100 pound load at a 15-inch load center on forks, may be used. Alternately, a hoist may be used: either a fixed hoist to lift the cylinders and transfer them to small wheeled trucks or a portable hoist to lift and convey the cylinders to the point of storage or use. A two-ton motor-operated chain hoist running on a suitable overhead trolley can be used to move the cylinders about a plant site.

The cylinders normally are lifted, moved, and stored in a horizontal position for ease of handling. A rigid hoist beam, approximately the length of a cylinder, with free swinging grab hooks at each end, and suitable lifting lugs for an overhead hoist, is commonly used. The grab hooks are designed to grip the inside periphery of the extended cylinder shell collars at each end of the cylinder. As the load is raised they also draw tightly against these collars for maximum security against slippage. A typical unit is diagrammed in Fig. 3. Units of this type are available from Mansauer Industries, Inc., 424 Chapel St., New Haven, Conn.

FIG. 3



NOTES:
① This beam is designed to lift ton containers from 79¾" to 82½" long. ② Tolerances on fractional dimensions ± 1/16". ③ Total weight approx. 125 lb. ④ Fork centers to suit. Furnished as an extra. ⑤ Bail can be omitted and lifting pin placed as shown for low head room. Furnished as an extra.

storage

It is preferable to store ton cylinders in a dry, sheltered, well-ventilated area. It may be important to store less volatile fluorocarbons, such as Ucon 11, in a heated building. If the temperature of a ton cylinder of Ucon 11 falls below 75°F, the vapor space of the cylinder will be under vacuum and it will be difficult or impossible to pump out the contents of the cylinder.

Cylinders should be held in place by blocks or saddles to prevent them from rolling.

discharging contents

Special vent and discharge connections and pressure and temperature relief devices, which are provided with each cylinder, must be considered when preparing to discharge the cylinder contents. The vent and discharge connections extend inside the cylinder head to points close to the inside shell, 180° apart. Thus, with the cylinder properly rotated to align the valves vertically, the bottom valve will permit full liquid withdrawal. The top valve can then be used for vapor withdrawal, or for back-pressuring of the cylinder with compressed fluorocarbon vapors from an external compressor system, if this is desired. It is best to incline the cylinders slightly toward the valve end to insure maximum product removal. (5% incline recommended)

For refrigeration systems, and for aerosol propellant applications, the use of compressed air for pressuring the cylinders must be avoided to keep air and moisture out of the product. In these cases the propellant can be pumped from the cylinder to the point of use. Pressuring the cylinder with compressed fluorocarbon vapors or heating the cylinder to raise the vapor pressure may also be considered.

heating ton cylinders

Use two or three standard 250 watt infrared lamps for each ton cylinder with the wiring circuit arranged to open at 120°F cylinder surface temperature as detected by a heat-sensitive thermal element strapped to the cylinder and actuating a thermal cut-out switch. As an extra precaution, the wiring circuit should also include a pressure-actuated switch which will open at a product vapor pressure corresponding to a temperature below the fusible-plug limit. The lower limit of the fusible-plug temperature range is 158°F, and a good safety margin must be observed. Cylinders may also be stored in a heated room. *Hot water baths, direct flame heating, steam, and other heat sources that can create temperatures above 140°F must be avoided.*

pumping from ton cylinders

The most commonly used system for transfer of liquid from a ton cylinder involves the use of a pump (see Fig. 4). As shown, connection is made, via flexible connector, from the lower service valve to the pump. A pressure gauge is included to show pressure in the line. A compound gauge (vacuum and pressure) may be best to use – in case the cylinder is under slight vacuum due to low temperature.

Electric or air-driven pumps are available, and either positive displacement (rotary) or regenerative turbine pumps are often used. The pump should be capable of greater capacity and pressure than is normally used. A pressure regulator can be used to control the pressure in the transfer line at the desired level, and to divert excess flow back into the cylinder via the upper service valve. Some pumps contain built-in over-pressure relief devices. If these are not used, it is desirable to include a relief valve in the piping circuit to protect the system in the event that the pump is operated when all valves downstream of it are closed.

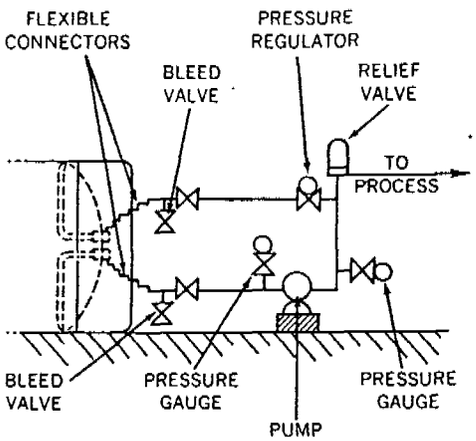


FIG. 4 Pumping Arrangement for Discharging Ton Cylinders

Bleed valves should be included in the system, as near to the cylinder connections as feasible. These are opened, to bleed off pressure in the lines, before disconnecting the flexible lines from the cylinder valves.

It is sometimes desirable to have a hydraulic accumulator in the piping system to dampen pressure shock caused by quick-closing valves. "Pressure snuffers" are available, for use with pressure gauges, to dampen pressure variations in the gauge readings. A pressure gauge should be installed downstream of the pump so that a visual check can be made to insure proper operation of the pump and pressure regulator.

Transfer lines can be of steel pipe or refrigeration grade tubing and fittings. Some tubing fittings are sufficiently porous to permit loss of fluorocarbons, so refrigerant grade or equivalent fittings should be obtained. It may also be desirable to install a pipeline drier to remove any entrapped moisture in the lines.

recovery of vapors

Often, it is not economically feasible to recover vapors from the cylinders. A refrigeration compressor and a condensation unit are needed. Additional equipment items sometimes used are an oil trap and drier unit. A cylinder or tank is needed to hold the recovered fluorocarbon and a suitable scale is recommended to insure against overfilling of this cylinder. In the refrigeration industry, where such equipment may be available, vapor recovery may be feasible. Where such equipment is not readily available, its cost is probably not justifiable unless a large number of cylinders is to be handled.

safety precautions

Ucon fluorocarbons are nonflammable, have a low order of toxicity, and are chemically stable at normal temperatures and conditions of use. However, the cooling caused by rapid evaporation of these volatile materials could cause discomfort or injury if spilled on the body.

Fluorocarbon vapors are much heavier than air, and thus may accumulate in low areas unless adequate ventilation is provided. Such accumulations may be harmful because they represent oxygen deficient atmosphere.

physical properties of Ucon fluorocarbons

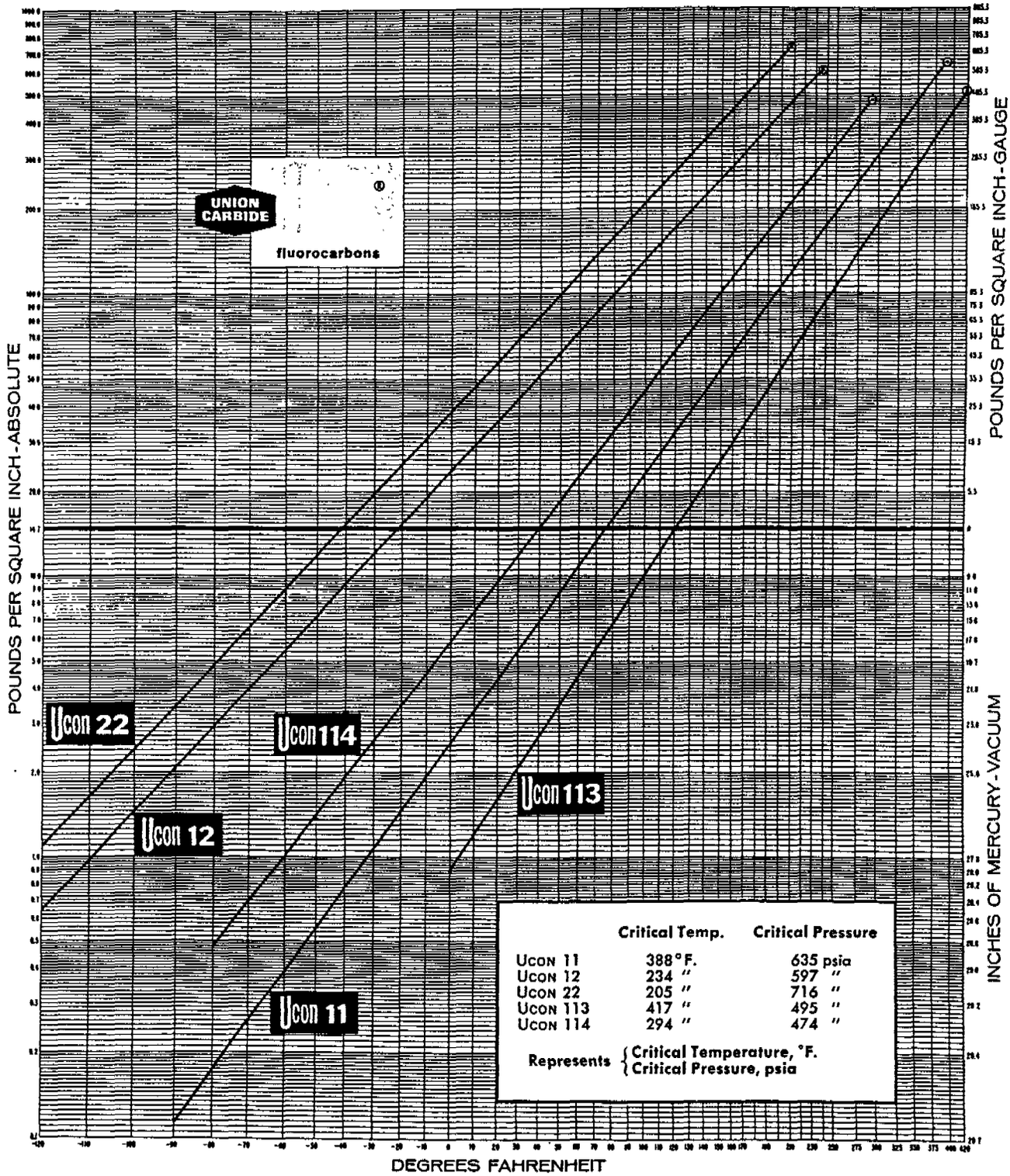
	FLUOROCARBONS					SPECIALTY BLENDS			
NAME	Ucon 11	Ucon 12	Ucon 22	Ucon 113	Ucon 114	Ucon Fragrance Propellant	Ucon Vinyl Chloride Propellant	Ucon Propellant A	Ucon Paint Propellant
Formula or Composition	CCl_3F	CCl_2F_2	$CHClF_2$	$CCl_2F{\cdot}CClF_2$	$CClF_2{\cdot}CClF_2$	82.3% Ucon 114 9.2% Ucon 12 8.5% Butane	39% Ucon 11 39% Ucon 12 22% Vinyl Chloride	45% Ucon 11 45% Ucon 12 10% Isobutane	13% Dimethyl Ether 77% Ucon 12 10% Ucon 11
Molecular Weight	137.4	120.9	86.5	187.4	170.9	—	—	—	—
Boiling Pt. at atmos. pressure °F. °C.	 74.8 23.8	 —21.6 —29.8	 —41.4 —40.8	 117.6 47.6	 38.4 3.6	 — —	 — —	 — —	 — —
Liquid Density-lb./gal. at 70°F. (21°C.)	12.4	11.1	10.1	13.1	12.3	11.5	10.5	10.6	10.1
Liquid Density-lb./cu. ft. at 70°F. (21°C.) at 130°F. (55°C.)	 92.7 87.6	 82.7 74.4	 75.5 66.4	 98.3 93.2	 91.6 84.9	 86.1 —	 78.6 —	 79.2[a] —	 75.5 —
Liquid Density-g./c.c. at 70°F. (21°C.) at 130°F. (55°C.)	 1.49 1.40	 1.33 1.19	 1.21 1.06	 1.58 1.50	 1.47 1.36	 1.38 —	 1.26 —	 1.27[a] —	 1.21 —
Solubility of Water in Ucon Fluorocarbon-% by wt. at 70°F. (21°C.) at 32°F. (0°C.)	 0.009 0.0036	 0.008 0.0024	 .114 —	 0.009 0.0036	 0.007 0.0026	 — —	 — —	 — —	 — —
Vapor Pressure at 70°F. (21°C.), psig.	—	70.2	122.5	—	12.6	20	36.5	38	62
Explosive Limits-% by vol. in air Upper Lower	 Non-Flammable	 Non-Flammable	 Non-Flammable	 Non-Flammable	 Non-Flammable	 Non-Flammable	 Non-Flammable	 Non-Flammable	 Non-Flammable

[a] At 77°F.

see inside fold
for
vapor pressure tables

- Ucon fluorocarbons
- Ucon 12/Ucon 11 fluorocarbon blends

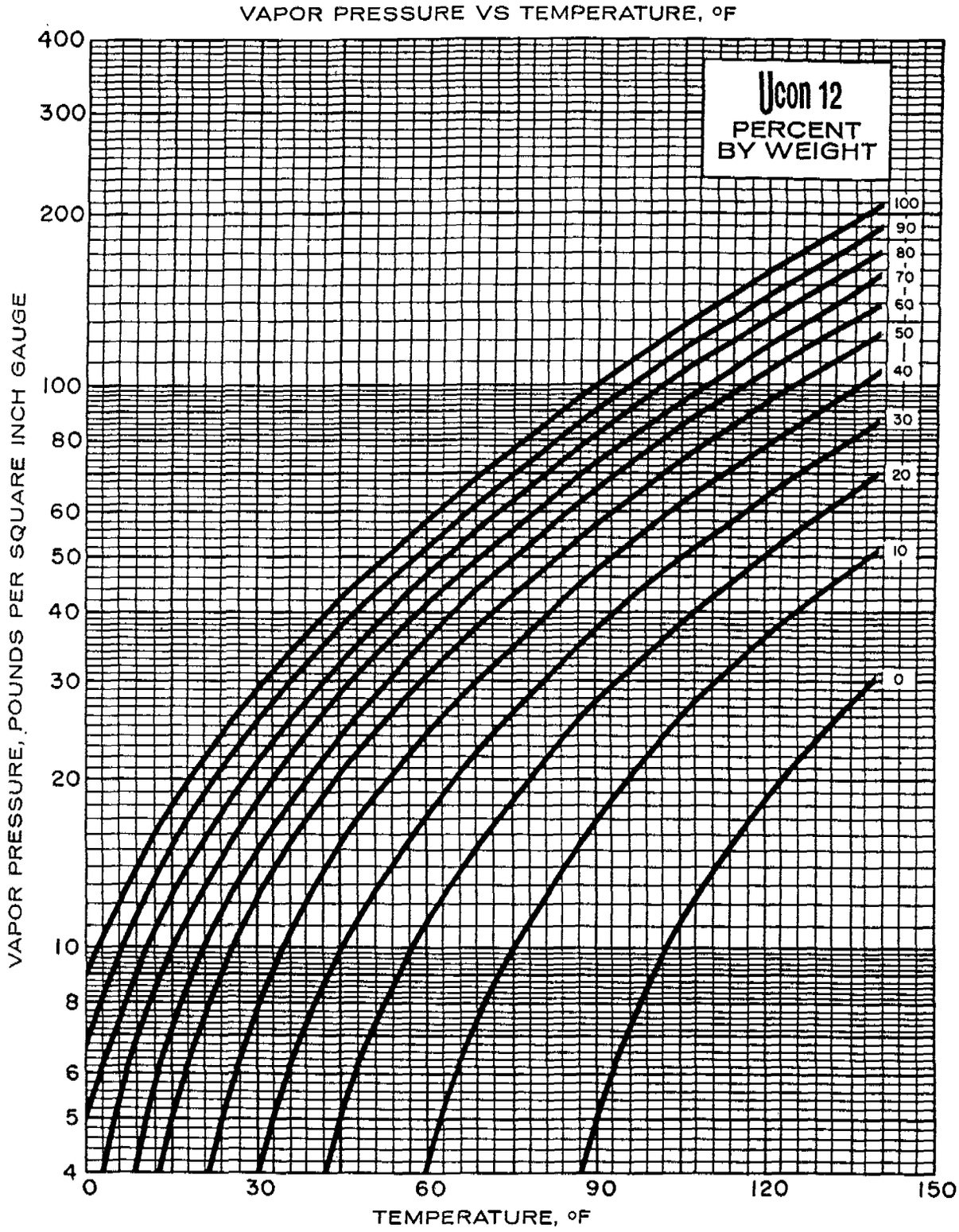
vapor pressure of Ucon fluorocarbons



	Critical Temp.	Critical Pressure
Ucon 11	388°F.	635 psia
Ucon 12	234 "	597 "
Ucon 22	205 "	716 "
Ucon 113	417 "	495 "
Ucon 114	294 "	474 "

Represents { Critical Temperature, °F. / Critical Pressure, psia

Ucon 12/Ucon 11
fluorocarbon blends



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