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# 1986 STANDARD for

## LIQUID-LINE Driers



Standard 710

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#### FOREWORD

This standard supersedes the previous edition (ARI Standard 710-80) and contains a procedure for establishing capacity ratings of refrigerant driers based on a statistical treatment of test data.

The limiting factors in the selection of a drier for a given application are water capacity, refrigerant flow capacity, and filter capacity. While this standard contains provisions for determining water capacities and refrigerant-flow capacities, no attempt has been made to rate filter performance because there is insufficient data presently available regarding the subject of filtration.

It is recognized that there is no relationship between the amount of water entering, or requiring removal from, a given refrigeration system and the refrigerating capacity of that system, since the amount of water in a system is a variable and unknown quantity. Therefore, as far as drying ability is concerned, a drier cannot be rated dependably in terms of the refrigerating capacity of the system to which it will be connected. Certain assumptions must be made to apply a rated drier to an existing system wherein the amount of water present is unknown, and for this purpose the following procedure is offered as a *guide*:

- 1. The wetness of the system above the EPD (equilibrium point dryness) is assumed to be 550 ppm (5 drops of water per pound of refrigerant charge) [11 drops of water per kilogram of refrigerant charge] for Refrigerant 12 and 990 ppm (9 drops of water per pound of refrigerant charge) [20 drops of water per kilogram of refrigerant charge] for Refrigerants 22 and 502. The value of 990 ppm was selected for Refrigerants 22 and 502 to provide for the drying of these refrigerants to a lower relative saturation value than required for Refrigerant 12.
- 2. To estimate the pounds [kilograms] of refrigerant charge in a given system that the drier will maintain in equilibrium for a specified Standard Condition, divide the water-capacity rating of the drier (drops of water) by the assumed wetness (drops of water per pound of refrigerant charge) [drops of water per kilogram of refrigerant charge] suggested above in Par. 1. Conversely, to estimate the water capacity of a drier (drops of water) that is needed for a given system, multiply the total refrigerant charge in the system (pounds of refrigerant) [kilograms of refrigerant] by the assumed wetness (drops of water per pound of refrigerant charge) [drops of water per kilogram of refrigerant charge in the system (pounds of refrigerant) [kilograms of refrigerant] by the assumed wetness (drops of water per pound of refrigerant charge) [drops of water per kilogram of refrigerant charge] suggested above in Par. 1.
- 3. The total refrigerant charge and the flow rate in the system should be the actual basis for selecting a drier.

The above suggested procedure is intended merely as a guide, and it is not to be construed as being a part of this standard.

The refrigerant designations used in this standard are in accordance with the American National Standard *Number Designation of Refrigerants* (ANSI/ASHRAE 34-1978 American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc.).

Addendum to ARI Standard 710-86 for "Liquid Line Driers"

In paragraph 5.2.3 and Table 1 the Refrigerant Flow Capacity Ratings shall be at 1.0psi [6.89 kPa]



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ARI STANDARD 710-86

## LIQUID-LINE DRIERS

## Section 1. Purpose

**1.1** *Purpose.* The purpose of this standard is to establish, for driers to be used in the liquid lines of refrigerating and air-conditioning systems for all applications: definitions, minimum standard specifications; recommended methods of testing and rating; and recommendations for safety.

**1.1.1** This standard is intended for the guidance of the industry, including equipment manufacturers, wholesalers, contractors, service engineers, and users.

**1.1.2** As covered in this standard, the specifications and performance characteristics of liquid-line driers include tubing connections, water capacity, flow capacity, and safety recommendations.

**1.2** *Provisions*. This standard provides a means of determining water capacity and refrigerant-flow capacity of a liquid-line drier at specified conditions. Such ratings serve as performance comparison points and furnish data for the selection of liquid-line driers for various applications.

**1.3** *Limitations*. This standard does not attempt to reflect the complete performance of a drier over the entire range of possible applications. The Standard Ratings of water capacity and refrigerant-flow capacity are comparison points, and they provide a means of drier evaluation at the specified rating conditions.

**1.4** *Review and Amendment.* This standard is subject to review and amendment as the art of the industry advances.

## Section 2. Scope

**2.1** Scope. This standard covers driers utilizing solid desiccants (as distinguished from liquid anti-freeze solutions), designed for use in the liquid line (as distinguished from driers used in the suction line or low side) of all types of refrigeration and air-conditioning systems.

**2.2** Applicability. This standard applies to driers for use in refrigeration systems using Refrigerant 12 Refrigerant 22 or Refrigerant 502 as the refrigerant.

**2.3** Clean Ratings. Although many commercial driers have filtering media, the subject of filtration is separate and distinct from the considerations of this standard. Therefore, the rating of a liquid-line drier is on the premise of a clean drier and clean refrigerant.

2.4 Acid Removal. It is known that acid in a refrigeration system causes harmful corrosion. Various acids are found in and produced by the system. Many driers will remove acids; however, there is no positive knowledge at the present time as to what concentration of various acids is allowable, nor how to test a drier's ability to remove these acids. Therefore, while noting its importance, no consideration of acid removal is given in this standard at this time.

## Section 3. Definitions

**3.1** Drier. A manufactured device, for use in the liquid line of a refrigeration system, whose primary purpose is to collect and hold at its location that water in the system which is in excess of the amount which can be tolerated in the system, by means of a desiccant which is the material contained in the drier device to remove and retain the excess water.

**3.2** Desiccant. A solid that will collect and hold water and in itself is insoluble in the refrigerant medium used — refrigerant, oil, and water.

**3.3** Equilibrium Point Dryness (EPD). Used in this standard to define the lowest possible water content of a liquid refrigerant attainable by a specific drier at a specific temperature after it has collected a specific quantity of water, when the two have been in contact until an equilibrium between the water in the refrigerant and the water in the drier has been reached. Equilibrium point dryness is expressed in parts per million (ppm) by weight.

**3.4** *Water Capacity.* The amount of water which a drier will collect and hold, and still maintain at each Standard Condition temperature, at equilibrium, a water content at or below a given concentration (EPD) in any of the liquid refrigerants. It is expressed in drops, but may also be expressed in grams on the basis of 20 drops per gram. For purposes of this standard, one drop of water per pound of refrigerant [2 drops of water per kilogram of refrigerant] is assumed to be equal to 110 parts per million (ppm).

**3.5** *Refrigerant Flow Capacity.* The flow, in tons [kW], for a given refrigerant which the drier (including connection fittings) will pass and not exceed the maximum pressure drop specified.

**3.5.1** Ton [kW] Flow. The flow rate of refrigerant in pounds per minute per ton [kilogram per second per kilowatt], as specified in this standard.

**3.6** *Temperature*. The temperature, in degrees Fahrenheit [Celsius], of the liquid refrigerant passing through the drier.