A-T Controls, Inc.
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Engineer: CMB **No.:** DI00018
Date Created: 02/04/2016
Date Modified: 07/09/2021

Vacuum Service

A vacuum is defined as pressure below atmospheric pressure at sea level. Atmospheric pressure is usually defined as about 14.70 psia (pounds per square inch absolute), 760 mm Hg (Mercury) absolute, 29.92 inches Hg absolute, or 760 torr. Absolute pressures are defined by the equation shown below:

$$P_{Absolute} = P_{Gauge} + P_{Atmosphere}$$

The American Vacuum Society has defined different states of vacuum as shown in the chart below (**Note:** High Vacuum and Very High Vacuum levels are very difficult to achieve and are not common vacuum applications):

Vacuum Type	Definition
Low Vacuum	Atmospheric Pressure (760 torr) to 25 torr
Medium Vacuum	Low vacuum to 0.001 torr
High Vacuum	Medium vacuum to $1*10^{-6}$ torr
Very High Vacuum	High vacuum to $1*10^{-9}$ torr

Note: torr is an absolute pressure unit. Please use the equation above if given a gauge vacuum unit. 1 torr ≈ 0.0393 inches Hg absolute ≈ 0.9999 mm Hg absolute ≈ 0.0193 psia

Cleaning and Lubrication

Most vacuum applications require a clean and pure environment. A-T Controls offers a degreasing service. This service can also eliminate potential outgassing (release of dissolved gas from materials).
A-T Controls thoroughly cleans all valve parts and lubricates the O-ring with a compatible lubricant. The valves are vacuum packed with desiccant and marked as cleaned for Vacuum Service.

Materials for Vacuum

50/50 STFE, RTFE, PTFE, CTFE, TFM™-1600, and other filled PTFE based materials are common for floating ball valve and soft seated HPBFV vacuum applications. Both Carbon Steel and Stainless Steel (CF8M and CF3M) are used for body and trim material. Viton®, Buna, EPDM, and PTFE seats are commonly used for RSBFV vacuum applications. PTFE packing and graphite packing can be used in floating ball valves and HPBFVs, however graphite will be rated for a lower level of vacuum (see ratings on the next page).

Filled PTFE based materials are generally avoided and not recommended for high temperature (constantly above 400 °F) because of the potential of outgassing at higher temperatures at higher levels of vacuum. For this reason, TFM™-1600 is recommended because of its low-outgassing characteristics and wide range of chemical compatibility.

Please consult A-T Controls for material selection for your vacuum application. These parameters are guidelines, and customers are responsible for materials of construction, preparation of the valves for service, and lubricants being compatible with their vacuum application.

Vacuum Rating

Please see the table on the next page for vacuum ratings for different series valves. Valves are tested in the closed position. Please note that floating ball valves that do not include our pyramidal stem seal are **not** rated for vacuum service:

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Valve Type	Vacuum rating
Floating Ball (with Pyramidal Stem Seal, PTFE packing)	0.01 torr
Floating Ball (with Pyramidal Stem Seal, graphite packing)	1 torr
Resilient Seated Butterfly Valves (OS/OSB Series, NS/NSP Series)	0.01 torr
AS/ASC Series PFA Lined Butterfly Valve	0.01 torr
High Performance Butterfly Valves (PTFE packing)	0.01 torr
High Performance Butterfly Valves (graphite packing)	1 torr
High Performance Metal Seated Butterfly Valves (graphite packing)	1 torr
LB Series Lined Ball Valve	0.01 torr
Soft Seated Trunnion Valves	10 torr

Note: Colors represent corresponding vacuum state.

Valve Packages *(Others Available)*

3-Piece, 2-Piece, and Uni-Body Ball Valves:

3-Piece**:** **Literature Download & Content**
2-Piece & Uni-Body**:** **Literature Download & Web Content**

Resilient Seated Butterfly Valves (Series OS/OSB, Series NS/NSP, Series AS/ASC):
Literature Download & Web Content

High Performance Butterfly Valves (Series P1S/P1F/P1M/P1H):
Literature Download & Web Content

Trunnion Ball Valves (Series TS2/TS3): Literature Download & Web Content

LB Series Lined Ball Valves: Literature Download & Web Content