

Diaphragm Valve Drainability &
Holdup Volume Quantification Testing
Procedure and Report

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1.0 Purpose

The purpose of this procedure is to verify the drainability of diaphragm valves and quantify the holdup volume of various manufacturers' diaphragm valve design.

2.0 Scope

This procedure and testing shall apply to the drainability and holdup volume testing of Bürkert, Gemü, ITT, and Saunders 1-1/2" diaphragm valves. Each valve shall be tested at the manufacturer's recommended drain angle published in its engineering literature. The test will be performed at both 1/4 inch per foot and 1/8 inch per foot slope.

3.0 Responsibilities

CBC Project Manager shall generate the drainability and holdup volume reports and shall ensure that all portions of this document are met. Quality Assurance department shall execute all tests and complete all the test reports.

4.0 Reference Documents

Bürkert Diaphragm Valve Literature / Engineering Data
Crane Saunders Diaphragm Valve Literature / Engineering Data
ITT Diaphragm Valve Literature / Engineering Data
Gemü Diaphragm Valve Literature / Engineering Data
COTTER BROTHERS CORP- Testing Set Up Drawings
COTTER BROTHERS CORP- Drainability & Holdup Volume Testing Standard
Operating Procedure

5.0 Equipment

5.1 Drainability/Holdup Volume Testing Equipment

Diaphragm Valves
Pressure Gauge (Calibrated)
Centrifugal Pump
Pump Speed Controller
Digital Timer
Digital Level
Digital Camera

5.2 Diaphragm Valves

1-1/2" TC x TC Bürkert Diaphragm Valve
1-1/2" TC x TC Gemü Diaphragm Valve
1-1/2" TC x TC ITT Diaphragm Valve
1-1/2" TC x TC Saunders Diaphragm Valve
Clear Lexan Cover

5.3 Safety Equipment

Safety Glasses
Safety Shoes

5 Technique

Test each manufacturer's 1-1/2" TC x TC diaphragm valve three times, non-consecutively at varying slope levels. Slope to be varied to the following levels: 1/4 inch per foot, and 1/8 inch per foot. There will be a total of six (6) tests for each manufacturer's diaphragm valves.

Document each test performed on Diaphragm Valve Drainability & Holdup Volume Test Report.

6 Acceptance Criteria

In order for the Diaphragm Valve Drainability & Holdup Volume test to be considered acceptable, the following conditions must be met.

- 1- Pump must be set at 50 gpm for 5 minutes.
- 2- Pressure measured in system must be held at 10 psig for 3 minutes to stabilize.
- 3- Lock off high point vent and then drain valve. Let stabilize at 10 psig.
- 4- Open high point vent and then low point drain.
- 5- System must be allowed to drain for 5 minutes.

7 Documentation

Visual Test Results (See Appendix B)

8 Summary

This drainability/holdup volume test procedure was generated and executed to quantify the actual holdup volume retained in various manufacturers' diaphragm valves.

The findings of this study conclude that the holdup volume no matter the diaphragm valve manufacturer, surface finish of the valve, is greater than at minimum five feet of process tubing of the same size.

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October 4, 2013

APPENDIX A

DIAPHRAGM VALVE SPECIFICATIONS

**Sanitary Diaphragm Valves
 Profilometer Readings - As Recorded**

9/5/2013

	Left TC	Right TC	Chamber	Average Ra
	Ra	Ra	Ra	
Burkert	20	20	21	
	20	14	26	
	22	12	19	
			20	19.4 Ra

Gemu	4	5	5	
	7	8	4	
	5	7	12	
			8	6.5 Ra

ITT	8	6	10	
	7	7	12	
	8	9	10	
			13	9 Ra

Saunders	8	7	10	
	13	10	10	
	6	12	13	
			13	10.2 Ra

Highest Ra Reading	26	Ra	Manufacturer
Highest Ra (Avg)	19.4	Ra	Burkert
Lowest Ra Reading	4	Ra	Gemu
Lowest Ra (Avg)	6.5	Ra	Gemu

ASME BPE Surface Finish (SF) from Table SF-2.4-1

SF4 = 15 Ra / Electropolished
SF5 = 20 Ra / Electropolished
SF6 = 25 Ra / Electropolished

Published Drain Angle 1-1/2" TC x TC, Forged 316L SS, Diaphragm Valves

A

B

C

D

APPENDIX B

VISUAL TEST RESULTS



