

SR1 RF Shielded UHV Valve Specification

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Canadian Light Source
107 North Road
University of Saskatchewan
Saskatoon, Saskatchewan Canada

Signature

Date

Original on File – Signed by:

Author: _____
D. Lowe

Reviewer #1: _____
J. Greefkes

Approver: _____
L. Dallin

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1. INTRODUCTION

1.1 Purpose

The Canadian Light Source requires twenty-four (24) all metal radio frequency (RF) shielded ultra high vacuum (UHV) valves for the storage ring vacuum system. These valves will be divided into 2 groups; 1 set of 12 “right handed”, and 1 set of 12 “left handed”

1.2 Scope

This document specifies the requirements for the Canadian Light Source (CLS) storage ring (SR1) RF shielded UHV valves and details the requirements for the design, and fabrication of the CLS storage ring quadrupole magnets. This work includes, but is not limited to:

- All tooling including die sets
- Materials
- Equipment
- Commercial components
- Detailed drawings
- Fabrication
- Assembly
- Testing & Inspections
- QA/QC documentation

1.3 Background

The Canadian Light Source, CLS, is a national facility under construction on the University of Saskatchewan campus in Saskatoon, Saskatchewan. This facility will be a 3rd generation synchrotron light source, which will produce a high intensity source of infrared, visible, ultraviolet and x-ray radiation.

This facility requires all metal RF shielded UHV valves to be designed and manufactured for installation into the CLS storage ring. This storage ring vacuum system is designed to operate in the UHV range at 1.3 nPa. This vacuum system will be part of the overall storage ring that will be capable of circulating electrons with energies of up to 2.9 GeV. These electrons will then be used as a source of synchrotron light.

2 REQUIREMENTS

2.1 Functional

- 2.1.1 Each valve assembly shall consist of the following major components:
- Pneumatic actuator
 - Electric solenoid
 - All metal valve body with RF shielded aperture
- 2.1.2 Valve shall be radiation resistant.
- 2.1.3 Valve shall have RF contacts to ensure an electrical conducting connection between the two connecting flanges.
- 2.1.4 A valve may be “right-handed” or “left-handed”, see VAT drawing 226803 or 226804 respectively. This may be determined by looking at the conflat flange side of the valve and determining which side the narrow neck is on. eg. if the neck is on the right side it is a “right-handed valve”.
- 2.1.5 Valve seat side of the valve shall be located on the conflat flange side.
- 2.1.6 Valve shall have visual position indication of “OPEN” or “CLOSED”.
- 2.1.7 Valve shall have double position indication.
- 2.1.8 Solenoid shall have a manual emergency operation.
- 2.1.9 Valve body, RF opening, and actuator shall be as illustrated in VAT drawings^[1].

2.2 Performance

- 2.2.1 Maximum differential pressure on valve shall be 101 kPa.
- 2.2.2 Conflat flange shall be DN 100.
- 2.2.3 Flat flange shall be as dimensioned in VAT drawings^[1].
- 2.2.4 Valve shall be compatible with UHV system operating at 1.3 nPa.
- 2.2.5 Out-gassing rate shall be less than 50 nPa l/s.
- 2.2.6 Leak rate shall be less than 50 nPa l/s.
- 2.2.7 Valve body shall be bakeable to 300°C.
- 2.2.8 Valve should be capable of 10000 cycles before first maintenance.
- 2.2.9 Valve shall body shall be fabricated from AISI 316 L grade stainless steel.
- 2.2.10 RF fingers should be fabricated from CuBe finger stock. Alternate finger stock shall be specified in writing to the CLS for acceptability. This valve is intended for use in a electron storage ring with a main RF operating frequency of 500MHz.
- 2.2.11 Solenoid shall be 24VDC.
- 2.2.12 Pneumatic actuator shall operate within a supply pressure range of 400 kPa to 800 kPa.

3 SAFETY AND ENVIRONMENTAL

- 3.1.1 The valve assembly shall be packaged to protect against environments encountered during shipping and storage.
- 3.1.2 The nominal operating temperature of the valve is expected to be between 20°C and 40°C. The expected normal ambient temperature of the tunnel is 27°C ± 0.1°C.
- 3.1.3 The valve shall be able to withstand a relative humidity range of 0 % to 90 %. The expected relative humidity limits under operation are from 25% during the winter months and to a maximum of 50% during the summer months.

4 APPLICABLE CODES, STANDARDS AND PROCEDURES

Not applicable

5 QUALITY ASSURANCE

The Proponent shall maintain and apply a quality assurance program compliant with ISO-9001 for the design, manufacture, and testing of all valves.

6 INSPECTION, TESTING AND COMMISSIONING

The Proponent shall supply inspection, testing, and commissioning procedures at the request of CLS.

7 RELIABILITY AND MAINTAINABILITY

- 7.1 The expected lifetime shall be greater than 10,000 cycles.
- 7.2 The pneumatic actuator shall be removable, if it is not bakeable to 300°C.
- 7.3 Pneumatic and electrical connections shall be readily accessible for maintenance.

8 LAYOUT

Not Applicable.

9 OTHER REQUIREMENTS AND CONSTRAINTS

Tolerances, where not defined or where difficult to achieve, are subject to negotiation.

10 REFERENCES

- [1] VAT drawings 226803 and 226804. Used with permission of VAT.