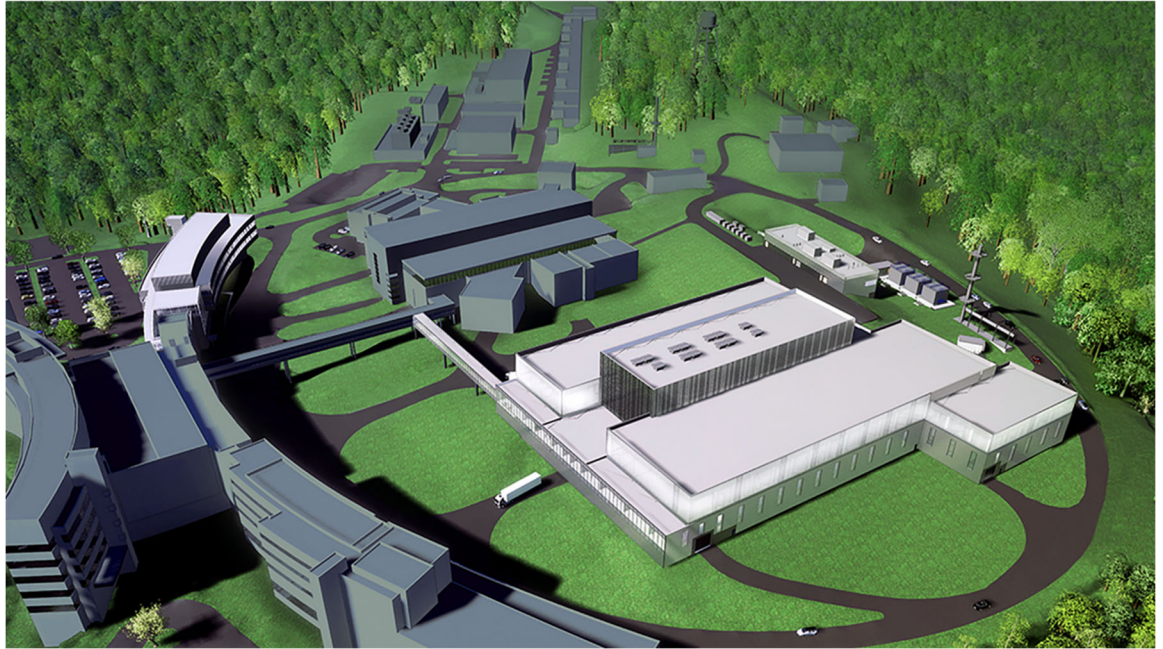


Second Target Station (STS) Target Assembly - Drive Requirements



S03020300-SRD10000
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Second Target Station Project

S03020300-SRD10000

**SECOND TARGET STATION (STS) TARGET ASSEMBLY - DRIVE
REQUIREMENTS**

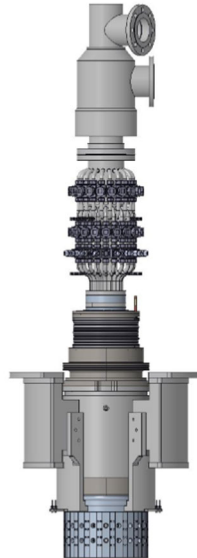
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1. SCOPE

The scope of the Target Drive is visually indicated below. The requirements document treats the system as a black box. For a detailed description of the scope, please reference the Target Assembly System Design Description



2. REQUIREMENTS DERIVED FROM CREDITED CONTROLS

The following controls are derived directly from the credited control described in the Hazard Analysis.

2.1 S.03.02.02-3461 Operational check of disconnect

There shall be a means to indicate the status of the segment isolation disconnects prior to operation. The status indication shall confirm the disconnect is fully engaged.

Upstream References (2)

[S.03.02-1627](#)

Isolation Jumper Position

[HAR-2895](#)

Hazard Analysis

2.2 S.03.02.02-3463 Segment Rotation Sensor

The target drive shall provide an interface for the speed sensors as described in S01020500-IST10104

Upstream References (2)

3. INTERFACE REQUIREMENTS

Requirements related to implementing the Target Assembly interfaces.

3.1 S.03.02.02-1647 Drive Lift Points

Drive components shall have lift points or methods capable of supporting the full component weight.

Reference Note: This requirement is designed to satisfy IS - Target Assembly - Remote Handling, Windchill # S01020500-IST10208.

Upstream References (1)

[S.03.02-1490](#)

Remote Handling Interface

3.2 S.03.02.02-1646 Max Component Height

The Target drive components shall be less than 7.9m above the beamline elevation.

Note: The maximum height prevents interaction with the roof and suspended components in the target drive room.

Upstream References (1)

[S.03.02-1490](#)

Remote Handling Interface

3.3 S.03.02.02-1645 Process System Interface flanges

The target drive shall provide two 4" Class 150# flanges in accordance with ASNI B16.47 at the locations indicated in S01020500-IST10211.

Upstream References (1)

[S.03.02-1489](#)

Interface Flanges

3.4 S.03.02.02-1644 Drive Pressure Drop

The target Drive shall have a pressure drop of less than 42 kPa at 596 L/min.

Reference Note: This requirement is designed to satisfy IS - Target Assembly - Target Process Systems, Windchill # S01020500-IST10211.

Upstream References (1)

[S.03.02-1487](#)

Max Pressure drop

3.5 S.03.02.02-1643 Target Drive - CV Interface Geometry

The target drive interface shall be in accordance with IS - Target Assembly - Core Vessel, S01020500-IST10209.

Upstream References (1)

[S.03.02-1481](#)

Interface Geometry

3.6 S.03.02.02-1642 Rotary Seal Leak Rate

The leak rate across the target rotary seal shall not exceed 1Torr-L/s

Upstream References (1)

[S.03.02-1480](#)

Leak Rate

3.7 S.03.02.02-10743 Drive positioning features

The drive shall have the capacity to position (move or adjust) the full weight of the target assembly within +/- 1mm of the global coordinate system during installation.

Note: The drive must have tooling or features to permit the installation crew to position the target on the core vessel lid and must have fiducial markers coordinated to the rotation axis of the target assembly.

Upstream References (2)

[S.03.02-10699](#)

Upper mounting point adjustment allowance

[S.03.02-10646](#)

Upper mounting point - Horizontal Installation tolerance

3.8 S.03.02.02-10744 Allowance for adjustment

The target drive shall have the capacity to handle +/-5mm of horizontal variation relative to the ideal (CAD) location of the core vessel lid, and +/-1.5mm of vertical variation.

Note: The target drive must have shims and bolt clearances to allow the core vessel lid to have reasonable machining and fabrication tolerances. The target will "take up" any variations in core vessel manufacturing and installation.

Upstream References (3)

[S.03.02-10793](#)

Upper Mounting point - Vertical Installation tolerances

[S.03.02-10646](#)

Upper mounting point - Horizontal Installation tolerance

[S.03.02-10699](#)

Upper mounting point adjustment allowance

3.9 S.03.02.02- Lid Interface Vacuum leak rate

The interface between the target assembly and the core vessel lid shall have a leak rate less than 1×10^{-5} mbar-L/s.

Note: leak rate between the static sealing elements of the core vessel lid and the target drive assembly.

Upstream References (0)

4. AVAILABILITY REQUIREMENTS

Requirements related to meeting the availability-related requirements from the Target Assembly.

4.1 S.03.02.02-1485 Leak Test

There shall be a method to check individual segments for leaks while the segment is in the core vessel.

Upstream References (1)

[S.03.02-1499](#)

Failure Indication

4.2 S.03.02.02-1620 Crown Attachment

The bearing assembly shall be connected to Life-of-facility components (crown) by replaceable connections (No blind threaded holes)

Upstream References (1)

[S.03.02.04-1500](#)

Robust Interfaces

4.3 S.03.02.02-1619 Replaceable Segment Attachment Threads

Segments shall be attached to the drive by utilizing replaceable connections (No blind threaded holes to be damaged)

Upstream References (1)

[S.03.02.04-1500](#)

Robust Interfaces

4.4 S.03.02.02-1666 Drive Spurious Stop

Drive components shall not undergo permanent deformation after a sudden stop, where a stop is defined as a deceleration from full speed using the peak torque of the motor.

Upstream References (1)

[S.03.02-1543](#)

Spurious Stop Survival

4.5 S.03.02.02-1621 Secondary Cooling Flow

There shall be valved secondary cooling connections that remain in place during seal and drive bearing maintenance to provide flow to all segments.

Upstream References (1)

[S.03.02.03-1570](#) Maintenance Temperatures

4.6 S.03.02.02-1615 Drive Water Isolation

There shall be a method to isolate water from maintenance personnel during segment maintenance.

Upstream References (1)

[S.03.02-1446](#) Minimize Contamination

4.7 S.03.02.02-1611 Shaft Maintenance Support

There shall be a method to support rotating components (shaft and drive components) during bearing replacement.

Upstream References (1)

[S.03.02.02-1622](#) Drive Bearing Replacement Time

4.8 S.03.02.02-3199 Maintenance and Lifetime Criteria

Components shall meet one of the following criteria

Reliability & Maintainability Group	Replacement Time (Beam on-off)	Minimum Lifetime*	Failure Indication
Life of Facility	N/A	40 yrs	Not anticipated
Group A (long outage, predictable failures)	1400 hours	5,000 hrs	predictable & with diagnostic warning
Group B (Long outage replacement, anticipated failures with significant consequences)	250 hrs**	2,500 hrs***	Less predictable, unreliable diagnostics
Group C (Short Outage replacement)	72 hrs	500 hrs	N/A
Group D (tuning outages)	16 hrs	192 hrs	N/A

**Note: Represents the technical minimum required to meet availability. Replacement at these rates would be unrealistic for most components due to costs, labor, and disposal considerations. Further margin is recommended.*

****Note:** The replacement time for replacement without exceeding the allowed downtime is 250 hours. This criterion is much more stringent than the long outage. Therefore, the more stringent value is the requirement.

*****The budget would be 1,250 hours, but the project desires to avoid replacement of large expensive components more frequently than once per year.**

Reference Note: This requirement is designed to satisfy IS - Target Assembly - Operations, Windchill # S01020500-IST10210.

Upstream References (1)

[S.03.02-3198](#) Maintenance and Lifetime Criteria

S.03.02.02-1676 Rotation Angle Measurement

The target drive shall provide an angular position sensor capable of resolving rotational position with an accuracy <0.1 degree.

Upstream References (2)

[S.03.02.02-3199](#) Maintenance and Lifetime Criteria

[S.03.02-1499](#) Failure Indication

S.03.02.02-1670 Manual Rotation

There shall be a method to enable manual rotation without power to the drive.

Upstream References (2)

[S.03.02.02-3199](#) Maintenance and Lifetime Criteria

[S.03.02-1499](#) Failure Indication

S.03.02.02-1610 Bearing Temperature Monitor

There shall be a method to measure changes in bearing temperature or vibration. (to prevent sudden bearing failure or lockup)

Upstream References (2)

[S.03.02-1499](#) Failure Indication

[S.03.02.02-3199](#) Maintenance and Lifetime Criteria

S.03.02.02-1622 Drive Bearing Replacement Time

The seal or drive bearing shall be capable of replacement within 72 hours.

Upstream References (1)

[S.03.02.02-3199](#) Maintenance and Lifetime Criteria

S.03.02.02-2998 Motor Assembly Replacement Time

The motor assembly shall be capable of replacement within 72 hours.

Upstream References (1)

[S.03.02.02-3199](#)

Maintenance and Lifetime Criteria

S.03.02.02-1624 Instrumentation replacement time

All instrumentation shall be capable of replacement within 72 hours.

Upstream References (1)

[S.03.02.02-3199](#)

Maintenance and Lifetime Criteria

S.03.02.02-1774 Cool Down time

In the operating configuration of the target assembly and core vessel, the drive components shall be at or below 100mm/hr on contact within 8 hours of cessation of the beam.

Upstream References (1)

[S.03.02.02-3199](#)

Maintenance and Lifetime Criteria

4.9 S.03.02.02-3844 Long Reach Tooling

The segment shall be capable of removal and installation with long-reach tooling.

Note: All connections shall be accessible and manipulated with long-reach tooling in the event that the area around the target is contaminated or the dose is higher than expected.

Upstream References (1)

[S.03.02.04-1500](#)

Robust Interfaces

4.10 S.03.02.02-3847 Resurface Sealing Faces

Sealing surfaces on Life of Facility components (Crown) shall be capable of manual resurfacing with a stone, cloth-backed abrasive, or similar.

Upstream References (1)

[S.03.02.04-1500](#)

Robust Interfaces

4.11 S.03.02.02-3849 Vertical Lift

The drive shall not obstruct the segment from being lifted in a purely vertical motion when using a ziplift (130mm diameter)

Upstream References (1)

4.12 S.03.02.02-10978 Material radiation damage

The accumulated radiation dose (or damage) for each component and its constituent materials, evaluated at that component's end of life (i.e., at the planned replacement/retirement point), shall not exceed the applicable limits specified in the STS Materials Handbook (S03010300-TDO10000) or in manufacturer-published radiation tolerance data.

Note: Dose/damage limits may be expressed in different units (e.g., Gy, rad, DPA). Where DPA is used, DPA-NRT shall be applied.

Upstream References (2)

[S.03.02-10947](#)

Material radiation damage

[S.03.02-1452](#)

Availability Goal

5. DISPOSAL PREPARATION & TRANSPORTATION REQUIREMENTS

Requirements related to shipping and disposal.

5.1 S.03.02.02-3585 Maximum Dimensions

Components shall have maximum dimensions of less than Ø685mm x 2270mm when removed from core vessel or be capable of size reduction to the indicated sizing

NOTE: This sizing is to accommodate fitting into a disposal liner that will subsequently be loaded into the 3-60B shipping container.

Upstream References (1)

[S.03.10.02-3560](#)

Liner Interior Dimensions

5.2 S.03.02.02-10214 Transportation in 3-60B

Perishable components shall be capable of transportation within the Energy Solutions 3-60B transportation cask.

Upstream References (1)

[S.03.02-10213](#)

Disposal Preparation & Transportation

5.3 S.03.02.02-10960 Maximum Mass

Target drive assembly mass shall not exceed 2000kg.

This assumes the target drive in a form to facilitate waste disposal inside a disposal liner subsequently shipped inside a 3-60B cask.

Upstream References (0)

5.4 S.03.02.02- Disposal Site

Target drive components shall be capable of disposal at a waste facility at the end of life.

Upstream References (0)

6. PERFORMANCE RELATED REQUIREMENTS

Requirements related to the performance of the overall target assembly.

6.1 S.03.02.02-3724 Start-up Time

Shall have the torque and power to reach 45 rpm within 10 minutes, from a standstill.

Upstream References (1)

[S.03.02-3597](#) Start-up Time

7. PROTECTION AND REGULATION RELATED REQUIREMENTS

Requirements related to a safe working environment. Note: safety related requirements exist throughout this document and are not limited by those within this section. For a full understanding of how safety requirements are traced to implementation, see the traceability information supplied in the System Design Description and within the requirements database.

7.1 S.03.02.02-3726 Pressure Relief

The drive shall have a pressure relief for each segment circuit capable of relieving pressure in the target segment volume.

Note: The setpoint of the relief shall be 758kPa, and with the capability of re-seating after relief.

Upstream References (1)

[S.03.02-10958](#) MAWP - Target Assembly

7.2 S.03.02.02-3454 Segment Blow Down Level

The drive shall provide blowdown features such that the remaining water level shall be greater than 3cm below the lowest tube opening on the segment attachment interface.

Upstream References (1)

[S.03.02-1565](#)

Blowdown Capability

S.03.02.02-1665 Segment Drain Ports

The drive shall provide ports for removing water from the segments prior to removal from the shaft.

Note: water may be removed by blowdown or a low point drain.

Upstream References (1)

[S.03.02.02-3454](#)

Segment Blow Down Level

S.03.02.02-1616 Segment Water Isolation

Each segment shall have valves for isolation of water flow.

Upstream References (2)

[S.03.02.02-3454](#)

Segment Blow Down Level

[S.03.02.02-1485](#)

Leak Test

S.03.02.02-3453 Segment Purge Port

The drive shall provide pressurized purge ports for individual segments prior to removal from the drive and shaft. Maximum pressure is 862 kPa

Upstream References (2)

[S.03.02.02-1485](#)

Leak Test

[S.03.02.02-3454](#)

Segment Blow Down Level

7.3 S.03.02.02-1667 Lock Out Tag Out

The target drive shall be capable of being "locked out" from rotation and energy sources during maintenance activities.

Note: isolation from mechanical sources of potential and kinetic energy. Electrical isolation is within the scope of integrated Controls.

Upstream References (0)