ICD-R 1010-TSS

	Name	Role/Title
Owner	Jens Harborn	Work Unit Leader - Target Helium Cooling
Reviewer	Ola Ingemansson Tatiana Adamikova	Electrical & Instrumentation Engineer – Target Control Group ESS In-kind Project Manager - TIK 2.2
Approver	Ulf Oden Linda Coney	Lead Engineer Target Systems – Target Division Group Leader, Target Controls & Safety – Target Division

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1. INTRODUCTION

This document follows the basic principles described in [1].

Interfaces between the **Target Primary Cooling System** (1010) and the **Target Safety System** (TSS or 1018) are described in this document. Interface descriptions included in this document are marked in red in figure 1 below. Target cooling consists of three systems, but only the Target Primary Cooling System ,1010, has interfaces with TSS.

For more information about the Target Helium Cooling Systems refer to [2] and [3].

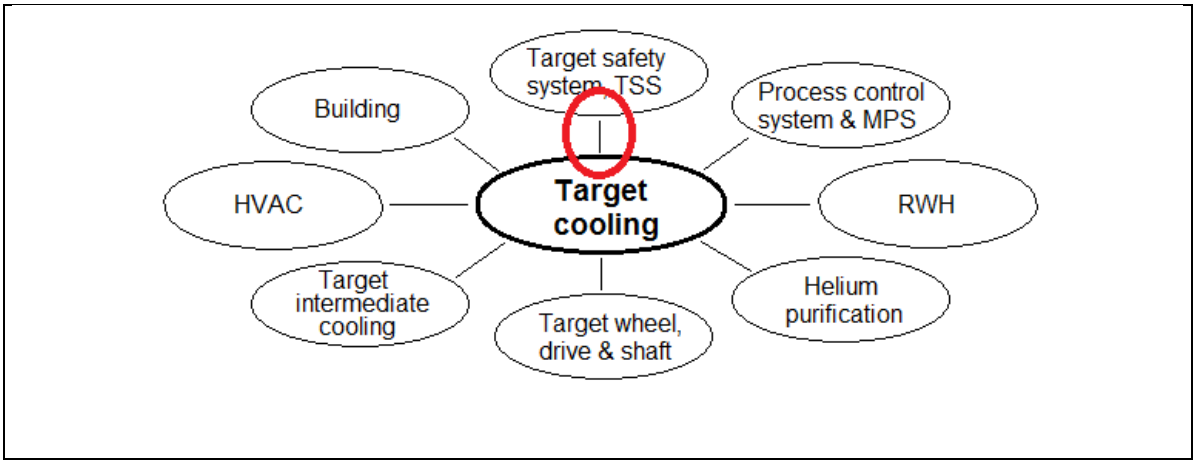

Figure 1: Target system interfaces. Interfaces included in this document marked in red.

2. INTERFACE AGREEMENT

2.1. Interfaces between WP2 (system 1010) & WP7 (system 1080, TSS)

System within WP2	Note
Target Wheel, Drive & Shaft	Interface with TSS
Target Primary Cooling System 1010	Interface with TSS
Pressure Control & Storage System 1011	No interface with TSS
Helium Injection System 1013	No interface with TSS
Target Monitoring System 1063	No interface with TSS
Inner Shielding	No interface with TSS
Beam Dump	No interface with TSS

2.2. Responsibilities for mechanical parts between Work package 2 & Work package 7

WP7 responsibilities: Design, quality documentation, purchase and delivery of parts with correct material and quality, and quality documentation to fulfil RCC-MrX requirements at design temperature 300°C and design pressure 1.30 MPa(a), marked orange in Figure 2.

WP2 responsibilities: Assembly, installation, welding test, welding qualification, pressure test, and stress calculations of all parts, as shown in Figure 2. Black parts are the main loop pipes.

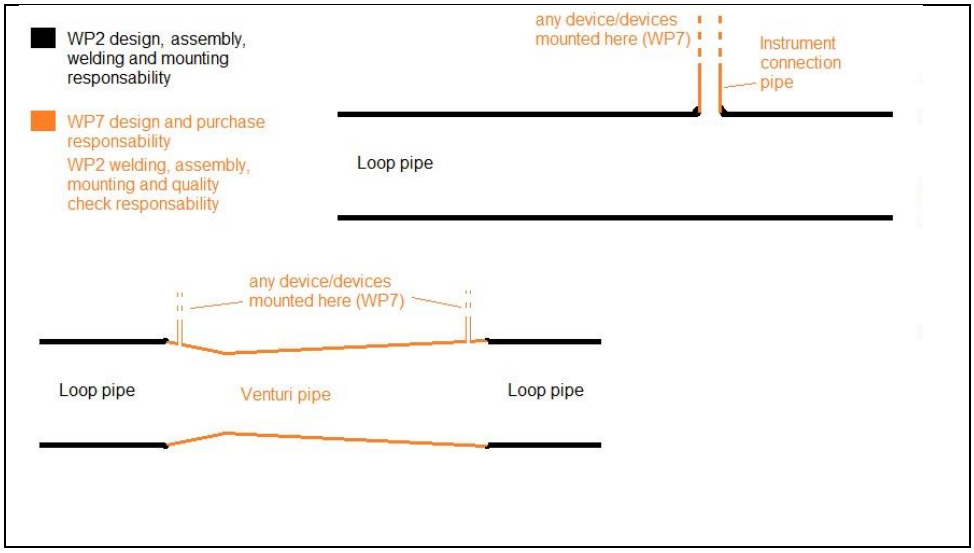

Figure 2: WP2 & WP7 mechanical part responsibilities

2.3. Summary measurements in the helium loop

Three types of instrumentation in system 1010 are required for TSS

- Flow: Venturi pipe welded into the main loop pipes
- Temperature: Swagelok coupling connectors welded on the main loop pipes
- Pressure: Small dimension pipes welded on the process pipe, welded joints to, for example, root valves

All instrumentation mounting points locations are marked in the figure below.

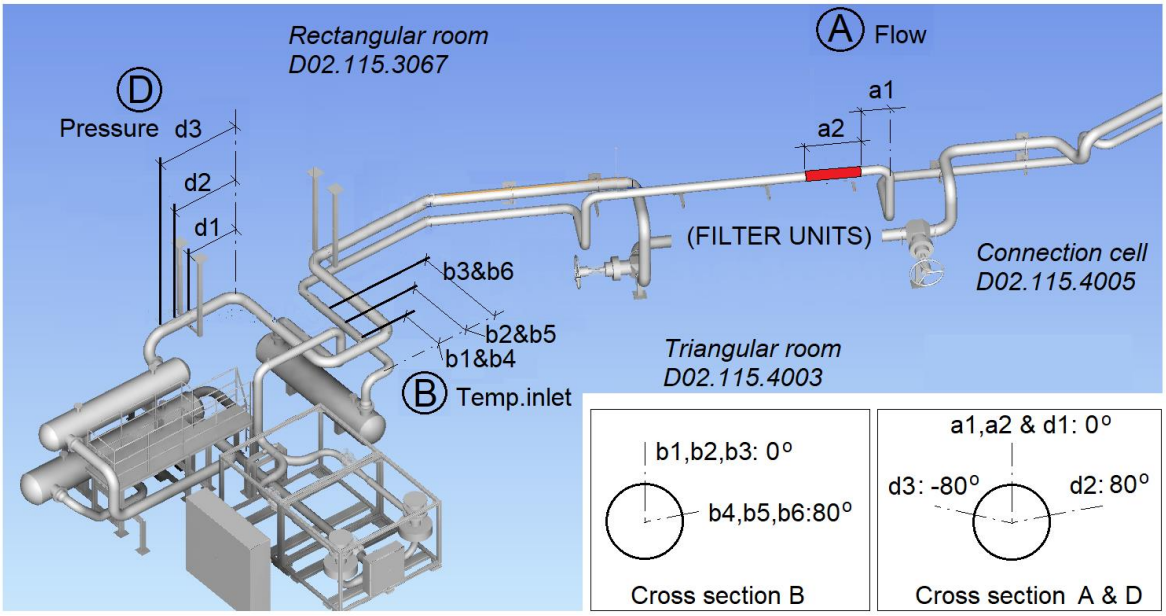

Figure 3: Pipe connection points in the utility rooms, level 110. Red marked component is the venturi pipe with pressure sensor connections pointing upwards (0°)

2.4. Physical connection points imposed on system 1010 by TSS

ID	TSSP-101	Pipe connections on the INLET to target
Requirement	***Flow:*** Two welded joints in to, and out from, a Venturi pipe on location **A** at a distance according to figure 3, labels **a1=0.50m** and **a2=0.80m**. Design temperature 300°C, design pressure 1.30 MPa(a). **Mass of the Venturi pipe:** 1.3 x mass of the system pipe DN200. **Centre of gravity of the Venturi pipe with connected equipment**: 1/3 of the length closest to the smallest inner diameter. ***Temperature:*** Six separate Swagelok connectors with dimensions according to WP7. The location on pipes is **label B** and distance (centre-centre) between the individual connections and the pipe bend according to Figure 2**, labels b1&b4=0.75m, b2&b5=1.00m and b3&b6=1.25m**. Angular position according to "**Cross section B**" in Figure 3. Design temperature 300°C, design pressure 1.30 MPa(a).	
Rationale/Reference	The straight pipe length before the venturi pipe must be at least a certain number of pipe inner diameters (ideally 30: 0.206 m x 30 = 6.0 m) and a straight pipe length after the venturi pipe must be at least 0.5 m to achieve high enough accuracy of the measured values from the Venturi pipe sensors. The red marking in figure 3 represents the Venturi pipe part. The flow direction through the Venturi pipe is from position A to the right in Figure 3.	

ID	TSSP-102	Pipe connections on the OUTLET from target
Requirement	***Pressure:*** Three separate connections welded pipe DN12. The location on pipes is **label D** and distance (centre-centre) between the individual connections and the pipe bend according to Figure 3, labels **d1=0.75m, d2=1.00m and d3=1.25m**. Angular position according to "**Cross section A & D**" in Figure 3. Design temperature 300°C, design pressure 1.30 MPa(a). A slope of at least 10% is needed for the pipe part with pressure measurements.	
Rationale/Reference	To fulfil basic functions.	

2.5. Process parameter span imposed on system TSS by 1010

ID	TSSP-103	Helium flow, temperature and pressure span
Requirement	1. helium mass flow from 0 kg/s to 3.5 kg/s (nominal is 2.85 kg/s) 2. helium temperature from 20°C to 300°C in the inlet pipe to target wheel 3. loop pressure from 0 Pa and 1.2 MPa in the outlet pipe from target	
Rationale/Reference	The process parameters maximum and minimum value span is needed for the TSS system design.	

2.6. Maintenance & Operation

ID	TSSP-201	Helium loop drain and decontamination
Requirement	TSS equipment shall be able to handle system decontamination using oxalic acid water solution.	
Rationale/Reference	If the decontamination fluid is trapped in the instrumentation piping it is hard to get sufficiently pure helium when refilled.	

ID	TSSP-202	Helium loop normal operation
Requirement	(no specific requirements applicable during normal operations have been identified)	
Rationale/Reference		

3. REFERENCES

[1] ESS-0002917 Interface Management Plan

[2] ESS-0012524 SDD-req. Requirements and functions, Target Cooling

[3] ESS-0012527 SDD-sol. Solutions and layout, Target Cooling

DOCUMENT REVISION HISTORY

Version	Reason for revision	Date
1.0	New document (using new template)	2015-04-14
2.0	Changed flow measurement to Venturi. Added requirements TSSP-103. Added requirement on minimum straight pipe before and after the flow measurement. Adjusted TSSP-101 & TSSP-102.	2018-05-03
3.0	Temperature measurements adjusted; Removed outlet (C), moved and added 3 inlet (B) and editorial changes	2018-11-27