INTERFACES DEFINITION

DFX DEVICE

COLD POWERING WORK PACKAGE – WP6A

[HL-LHC EQCOD ACCORDING TO CONFIGURATION MANAGEMENT]

Abstract

This document presents the interfaces the DFX device shall present to comply with the installation and integration in the LHC tunnel environment.

Draft for information

Document being internally reviewed

TRACEABILITY

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1 SCOPE

This document presents the interfaces of the DFX series devices. It should be noted that the DFX prototype is a spare unit for the HL-LHC machine and shall therefore be designed according to the HL-LHC machine requirements. The prototype DFX is produced in the framework of the CERN-UK collaboration.

This document is closely related to the DFX functional specification [1].

The structure maintaining the bus bars is not part of the supply of the DFX prototype. Therefore, the bus bars geometries and layout is not detailed in this interface document.

2 INTERFACES

2.1 SCLink interfaces

2.1.1 Vacuum and helium jackets interfaces

To mechanically connect the vacuum and helium jackets of the SCLink to the DFX, the mechanical interfaces shall be compliant with the drawings in [2].

2.1.2 Bus bars interfaces

The extremity of the helium vessel interface presents a Ø200 mm x 1 m long rigid cylinder co-axial to the flange axis. The 700 mm lower part contain the MgB2-NbTi splices.

The extremity of the rigid cylinder presents 19 bus bars in NbTi maintained together by supports. In order to fix these supports, the DFX shall present the mechanical interfaces presented in [3].

2.2 NbTi-NbTi splices interfaces

The NbTi-NbTi splices shall be fixed to the helium reservoir. The DFX shall present the interface to the splices supports as presented in [4].

2.3 DCM interfaces

2.3.1 Vacuum and helium jackets interfaces

To mechanically connect the vacuum and helium jackets of the DCM to the DFX, the mechanical interfaces shall be compliant with the drawings in [5].

2.3.2 Bus bars interfaces

The extremity of the DCM helium vessel presents 19 NbTi bus bars fixed to a lambda plate. The DFX shall present mechanical interfaces to fix the bus bars supports, see [3].

2.4 Cryogenic interfaces

2.4.1 Jumper interfaces

The four cryogenic lines of the DFX shall be connected to the cryogenic jumper lines as well as the vacuum jacket. The DFX interface shall be compliant with the interface detailed in [6].

2.4.2 Temperature sensor supports

As indicated in [8], the DFX shall present two temperature sensors on the outside of the helium vessel. The interface shall be compliant with the CERNOX long support presented in [7] §4.1.

2.4.3 Heaters interfaces

As indicated in [1], the DFX shall present two electrical heaters in the liquid volume for operation and two electrical heaters for warming up located in the liquid helium volume at the lowest position. The mechanical interfaces shall comply with the dimensions of the RH100-NH100 model detailed in the technical sheet in [9].

2.4.4 Level gauges interfaces

The instrumentation wires shall present a warm connector for the level gauges installed in the DFX.

2.4.5 Delta P gauge

The delta P gauge requires two tubes equipped with Swagelock® connectors.

2.4.6 Pressure gauge interface

The pressure gauge will be installed on the SD line in the QXL. Consequently, no specific mechanical interface is required in the DFX.

2.4.7 Safety relief devices interfaces

The burst disc interface shall be a standard CF63 flange.

The pressure relief valve (not a safety device) shall present a CF40 flange interface.

2.5 Vacuum interfaces

2.5.1 SCLink insulation vacuum volume

- Pumping system interface

A standard pumping system shall be installed on a DN100 port interface according to drawing [10]. The turbo pump shall always be installed horizontally.

- Gauges interface

Three gauges assembled on a common port measure the pressure level. The port interface is a DN100 standard flange as defined in drawing [11].

- Relief plate interface

The SCLink insulation vacuum shall be protected with one DN100 standard relief plate made of ISO-K DN100 flanges equipped with a spring defined [12].

2.5.2 DFX insulation vacuum volume

- Pumping system interface

A standard pumping system shall be installed on a DN100 port interface according to drawing [10]. The turbo pump shall always be installed horizontally.

- Gauges interface

Three gauges assembled on a common port measure the pressure level. The port interface is a DN100 standard flange as defined in drawing [11].

- Relief plate interface

The insulation vacuum shall be protected with one DN200 standard relief plate according to drawing [13].

2.6 Instrumentation

2.6.1 V-taps & WIB

Voltage taps wire are defined in [8]. The Wiring Interconnection Box (WIB) shall be fixed to the supports defined in [4].

2.6.2 Cryogenic instrumentation wires

Temperature sensors wires are defined in [8].

2.6.3 Feedthrough for cryogenic instrumentation in vacuum volume

The DFX shall present a DN100 ISO-K flange for the cryogenic instrumentation located in vacuum.

2.6.4 Feedthrough for instrumentation in helium volume

Instrumentation located in the helium volume (190 V-taps, 32 CERNOX wires, 8 heaters wires) shall be routed to three independent boxes. The interface of the feedthrough is presented in [15].

2.7 Civil engineering interfaces

CERN is in charge of the aligning and supporting structure in the LHC tunnel. The DFX shall present the following interfaces for support:

- Top plate to ceiling : the top plate shall be equipped with several vertically threaded blocks;
- DFX to ground : the lower vacuum vessel shall present four horizontally threaded interfaces on the non IP side. The fixing of the horizontal vessels to ground shall adapt to the lifting interfaces.

2.8 Transport interfaces

The DFX shall present lifting points adapted to the proposed assembly sequence. Each part over 15 kg shall present threaded interfaces to normalised lifting hooks.

3 REFERENCES

[1] Y.Leclercq et. Al "Functional Specification of the DFX device" EDMS 1905633.
[2] TE-MSC group "Interface SCLink-DFX" EDMS 2156597.
[3] Bus bars supports interfaces, LHCLDQDXXXX
[4] Splices support interfaces, LHCLDQDXXXX
[5] TE-MSC group "Mechanical interface DFX-DCM" EDMS 2157340.
[6] TE-MSC group "Mechanical interfaces DFX-Cryogenic Jumper" EDMSXXXX
[7] Ch.Balle "Installation guide for LHC cryogenic thermometers", EDMS 110748
[8] J.Fleiter "Functional Specification of the Instrumentation of Inner Triplets Cold Powering System", EDMS XXXXX
[9] Vishay® "Wirewound Resistors, Industrial Power,Aluminum Housed, Chassis Mount" EDMS 2157481
[10] TE-VSC group "VPGFY00X Fixed pumping group", EDMS 1815441 and EDMS 1815454
[11] TE-VSC group "Assembly Vasac, Instrumentation grouping gauge Type C", EDMS 528354
[12] TE-VSC group "Spring for DN100 relief plate", Smarteam reference: ST0224553_01, EDMS 986987
[13] EN-MME group "interfaces DN200 relief plate", Smarteam references: ST115084_01 and ST0705009_01
[14]
[15] TE-MSC "Interface of the cold instrumentation feedthrough for the DFX", EDMS 2169655