
Annex – PLD research cluster – Reference design and system specification

Confidential

Dutch Institute For Fundamental Energy Research (DIFFER)

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1 Introduction

High quality thin films show promising potential in increasing the performance of electrodes, electrolytes, catalysts and membranes for a large variety of applications. Thin films can therefore play a vital role in realizing the energy transition. However, there are two major challenges:

1. Well-controlled deposition and growth of high quality, well-tuned, and reproducible thin films of complex stoichiometry on large and imperfect substrates are complex processes that are not fully understood yet. As a consequence, the fabrication of such thin films is still highly empirical.
2. In light of the energy transition, metal oxide thin film materials are of major interest. The combination of several metals in an oxide composition yields several millions of possible combinations. Most of them have never been investigated before. As such, much (academic) ground work has yet to be done.

The Dutch Institute for Fundamental Energy Research (DIFFER) has the ambition to overcome these challenges and has therefore initiated the development of a Pulsed-Laser-Deposition (PLD) research facility for energy materials. This research facility shall enable state-of-the art research on deposition of metal oxide thin films for academic and industrial applications on substrates up to $\approx 10\text{cm}$ (4 inch) in diameter. This will lay the ground for integration of PLD thin films in demonstrator systems and for fast and straightforward upscaling of PLD processes from small to large deposition areas.

The workhorse of the PLD research facility is a PLD research cluster which is composed of a small area PLD chamber and a large area PLD chamber both of which include various in-situ diagnostics, a sputter chamber, an XPS/UPS system, and an (optional) in-situ storage, which are all attached to a linear transfer line with a load lock. This design is the result of a cooperation between the members of the PLD4Energy consortium lead by DIFFER.

This document presents a reference design and the associated requirements for the PLD research cluster and components thereof. The requirements are complementary to the award criteria listed in *Annex - Award criteria*. In Chapter 2 the geometrical layout, the PLD research cluster decomposition, the hardware architecture, and the software architecture of the PLD research cluster reference design are discussed. Tenderers shall use the reference design as a starting point for creating a detailed design.

The reference design provides a complete overview of all components of the PLD research cluster. Only those components for which the cluster supplier is assigned as the responsible stakeholder are part of the current tender. This set is referred to as the PLD Research Cluster Basis. The scope of the current tender is the design, realization and installation of the PLD Research Cluster Basis. The other components are to be purchased in separate tenders. The Tenderer, however, shall ensure that all components that are not part of the PLD Research Cluster Basis can be added at a later point in time by DIFFER or a third party supplier.

NOTE

A supplier is allowed to deviate from the reference design. However, such a deviation shall be carefully, and preferably quantitatively, motivated within the quotation.

In Chapter 3 the reference coordinate systems are presented which are to be used in interpreting the detailed requirements which are listed in chapters 4 through 6. These chapters contain detailed requirements for diagnostics, flange positions, motion stage accuracies and ablation laser performance measures. Note that quite a few of these requirements contain the special value ‘t.b.d’ (to be determined). These values are intentionally left open to allow for design freedom for each supplier.

NOTE

Each supplier shall replace these ‘t.b.d.’ values by real values within the provided Excel as part of the quotation.

Provided values that are changed by the supplier should be clearly marked as being changed.

2 PLD research cluster reference design

This chapter presents an overview of the PLD research cluster. The geometrical layout, the system decomposition, the hardware architecture, and the software architecture are discussed.

2.1 Geometrical layout

The conceptual geometric layout of the PLD research cluster is schematically shown in Figure 2.1. The transfer line is approximately 4 meters long and contains seven gate-valves.

- Gate-valve 1 connects the load-lock with the transfer line.
- Gate-valve 2 is reserved for attaching a vacuum suitcase.
- Gate-valve 3 connects the small area PLD chamber with the transfer line.
- Gate-valve 4 connects the sputter chamber with the transfer line.
- Gate-valve 5 is reserved for the optional in-situ storage.
- Gate-valve 6 connects the large area PLD chamber with the transfer line.
- Gate-valve 7 connects the XPS/UPS system to the transfer line.

Note that the XPS/UPS is connected via an intermediate load-lock to the transfer-line. This load-lock is needed due to the difference in base-pressure of the XPS and the rest of the PLD research cluster.

The small and large area PLD systems are positioned in parallel along one side of the transfer line at a distance of approximately two meters from center point to center point. This distance is required to allow for the attachment of the various diagnostics and the ablation laser optics while providing sufficient access space to (manually) align diagnostics

Substrates can move along the transfer line. Manual substrate manipulators are used to transfer substrates from the transfer line to the various chambers. Manual transfer is preferred to minimize the required amount of automation and (software) integration between the transfer line and the various chambers. The substrate manipulators are either attached to the respective vacuum chamber or they are attached to the transfer line directly opposite of the chamber depending on the amount of available wall space on the respective chamber.

Finally, DIFFER should be able to extend the transfer line in the future to add additional vacuum chambers to the PLD research cluster.

NOTE

A radial layout of the PLD research cluster has been considered as well. In such a layout, the various chambers are connected via a central radial distribution chamber. A radial layout, however, is considered to be too compact to be used as a user facility. Moreover, the linear layout requires less automation and is easily extendable. Hence, a linear layout is preferred.

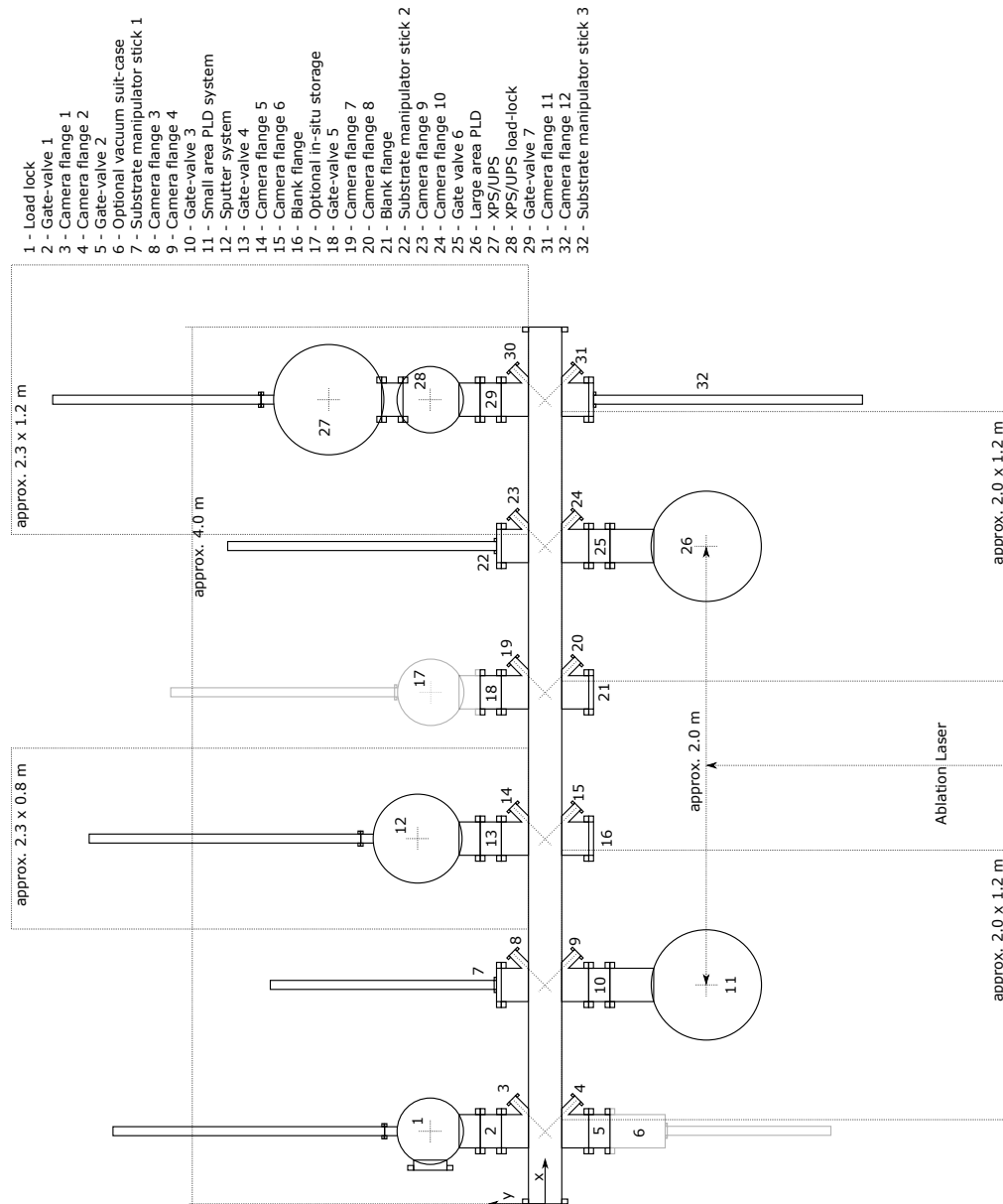


Figure 2.1: Schematic layout of the PLD research cluster.

2.2 Decomposition

Figure 2.2 provides an overview of all components to be integrated within the PLD research cluster. Note that the table of contents of chapters 4, 5 and 6 follow this structure exactly. The functional

interfaces and requirements known at the time of writing of these components are specified within the respective sections.

The first level of the system decomposition shown in Figure 2.2 contains the seven main components of the PLD research cluster and three additional components: the Lab safety system, the central CODAC system, and the site utilities, which are part of the DIFFER site infrastructure.

The second level of the system decomposition contains the sub-components of the small area PLD chamber, the large area PLD chamber, sputter chamber and transfer-line. To provide flexibility in future (re)configuration of the PLD research cluster all main components of the PLD research clusters have their own power distribution box, electronics cabinet, operating and control system, and, if needed, a gas distribution system. In fact, each chamber could be run as a ‘stand alone’ system if required. Additionally, this built-in redundancy is beneficial for the overall system availability. That is, the failure of, for example, the operating and control system of one chamber, will not affect the other chambers.

Note that many of the diagnostics of the large area PLD chamber have the prefix ‘OPTIONAL’. This indicates that these diagnostics are to be (or might be) added in a later stage but the chamber design should already account for these components.

On the third level, the various operating and control systems are decomposed into the individual software packages for process and diagnostics operation and control. It is assumed that all software that is part of the same operating and control system runs on the same PC.

Furthermore, note that the overview does not contain structural components such as support frames. In a later design stage the supplier and DIFFER shall decide and agree upon on the number of frames to use and which components are to be supported by which frame.

2.3 System architecture

In designing a system architecture there has been a strong focus on making the PLD research cluster as modular as possible and minimizing the number of interfaces between components, such that the required amount of customization of off-the-shelf components is minimized and the cluster can easily be upgraded in the future.

Figures 2.3 through 2.5 visualize the system architecture at each level of the system decomposition in Dependency Structure Matrix (DSM) form. A DSM is an $N \times N$ matrix showing the interfaces (dependencies) among N components. A pie chart at position i, j within the matrix indicates that component i has one or more interfaces with component j . The colors of the wedges of the pie chart indicate the type of interfaces that are present between components i and j . For example, an electrical-energy-flow interface indicates that there is an electrical connection between components i and j . While a control-information-flow interface indicates that control signals are being sent. Hence, each pie chart with the DSM needs to be converted into a real (physical/software) interface that meets the corresponding requirements during the design and realization process.

NOTE

Many interface requirements depend on design decisions to be made by the supplier. Hence the supplier shall actively discuss and agree upon the requirements for interfaces between components to be realized by DIFFER and components to be realized by the supplier with DIFFER. Co-development is key.

Figure 2.3 shows the system architecture at level 1 of the system decomposition shown in Figure 2.2. This figure provides a compact overview of the dependencies between the components of the DIFFER site, such as the site utilities, the central CODAC system, and the lab safety system, and the main components of the PLD research cluster, such as the transfer line, PLD systems, ablation laser system, the sputter system, the XPS, and the optional in-situ storage.

The first row and column, for example, shows to which components the site utilities shall provide electrical-energy, gaseous-material, and liquid material flows. While the second row and column show from which main components the central CODAC system requires sensor data. Note that there are few interfaces between the main components of the research cluster. The sputter and XPS system only have a flange-size and status-information-flow interface with the transfer line. The required status information relates to the position of the respective gate-valves. Hence they can easily be detached and operated as a stand alone system. The small and large area PLD systems have interfaces with the ablation laser system as well, since it is shared among the two PLD systems.

Figure 2.4 shows the system architecture at level 2 of the system decomposition in which the main components of the PLD research cluster have been decomposed into individual components. Each main component has a similar internal architecture. That is, each main component is composed of a few integrative components that have many interfaces. For example, the vacuum vessels (rows 4, 36, 73, 105), operating and control systems (rows 5, 37, 74, 108), power distribution boxes (rows 6, 38, 75, 106), and electronic racks (rows 7, 39, 76, 107) are integrative components. Most other components have 2-6 interfaces and are therefore modular in nature.

In Figure 2.5 the various operating and control systems (rows 5, 37, 74, 108 in 2.4) are decomposed into the multiple software applications. These software applications are assumed to run on the same hardware and are therefore clustered together. Note, however, that the operating and control clusters (rows 5-7, 44-55, 96-107, 145-149) are completely empty. Hence the individual software applications have no mutual interfaces and are run as stand-alone applications. So far, it has been assumed that the coordination of experimental parameter values, such as the tilt of the substrate, among various software applications can be done manually.

Note that the operating and control software of the small area PLD, large area PLD and sputter systems (rows 45, 97, 146) have direct status-information-flow interfaces with the respective gate-valves. These interfaces are needed to prevent that one can start an experiment with an open gate-valve which could result in contamination of the transfer line.

In each chamber, all hardware that is used to influence the experimental conditions within the chamber is controlled via an integrated process operating and control software. Diagnostics are operated and controlled via (off-the-shelf) dedicated software. Most diagnostic software applications only interact

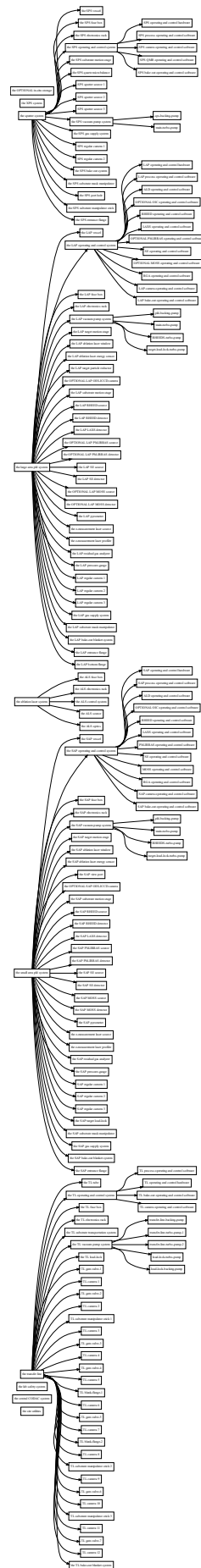


Figure 2.2: PLD research cluster system decomposition diagram.

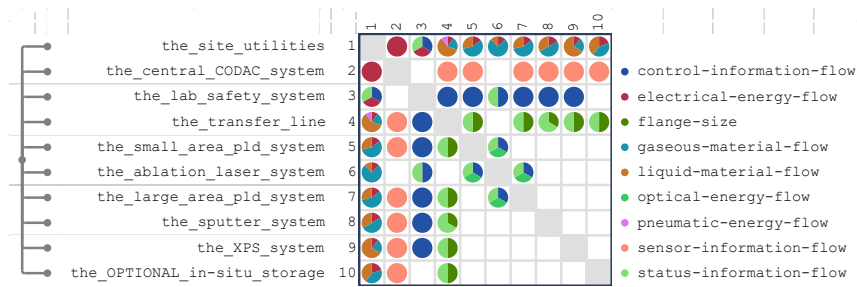


Figure 2.3: Dependency Structure Matrix (DSM) model of the PLD research cluster at the first decomposition level.

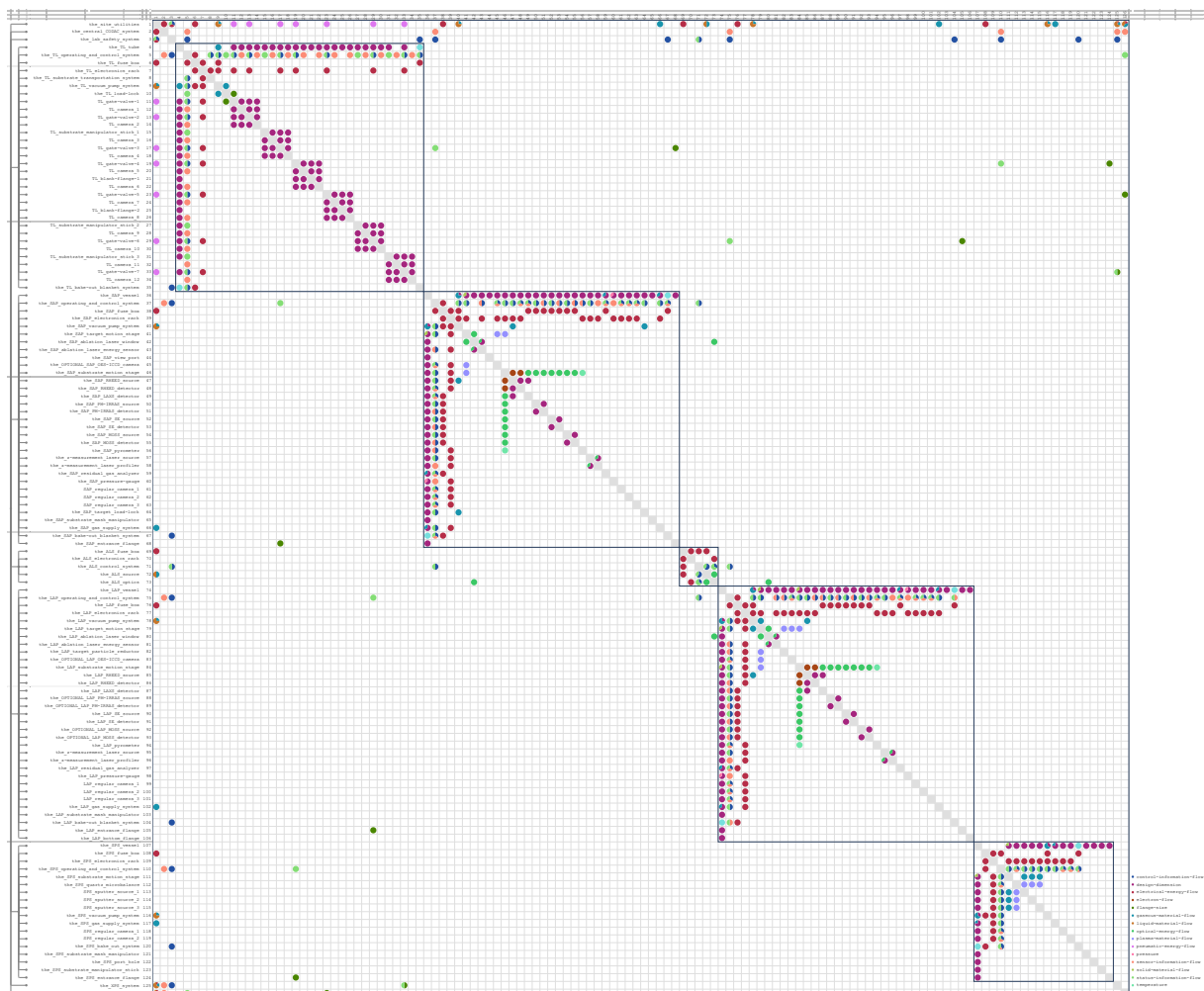


Figure 2.4: Dependency Structure Matrix (DSM) model of the PLD research cluster at the second decomposition level.

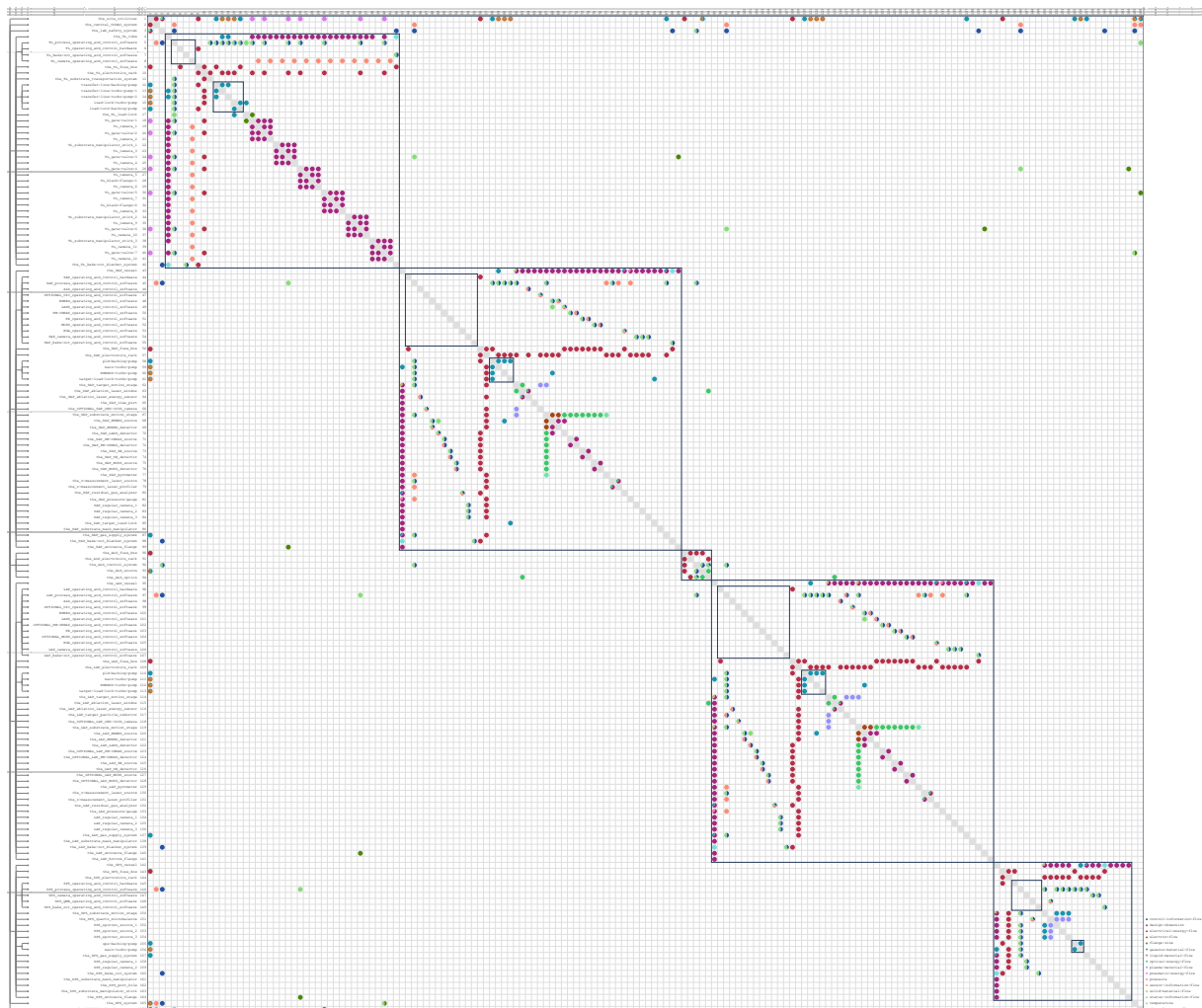


Figure 2.5: Dependency Structure Matrix (DSM) model of the PLD research cluster at the third decomposition level.

with the respective diagnostic hardware. The LAXS operating and control software is the only exception to this rule, as it requires the emission current from the RHEED source.

Additional, in Figure 2.5 the various vacuum pump systems are decomposed into the individual backing- and turbo molecular pumps. The transfer line pumps are shown in rows 12-16, small area PLD pumps are shown in rows 57-61, large area PLD pumps are shown in rows 110-112, and the sputter system pumps are shown in rows 155-156.

3 Reference coordinate systems

All translations and rotations within this document are defined following right-handed Cartesian coordinate systems of which the index finger represents the x-axis, the middle finger represents the y-axis and the thumb represents the z-axis.

The following engineering design terminology is used to describe translations and rotations of elements with respect to a reference coordinate system:

- **Surge:** translation along the x-axis (moving backward and forward).
- **Sway:** translation along the y-axis (moving left and right).
- **Heave:** translation along the z-axis (moving up and down).
- **Roll:** rotation around the x-axis indicated by ϕ (y-axis rotates counter clockwise towards z-axis).
- **Tilt:** rotation around the y-axis indicated by ψ (x-axis rotates counter clockwise towards z-axis).
- **Spin:** rotation around the z-axis indicated by θ (x-axis rotates counter clockwise towards y-axis).

3.1 Research cluster coordinate system

The position of the various chambers along the transferline is defined with respect to a reference coordinate system which is placed at the base of the transfer line as shown in Figure 2.1. The positive x-axis points down the length of the transfer line.

3.2 Chamber coordinate system

The small area PLD, large area PLD and sputter chambers shall be spherical in shape. At the center of each sphere a reference coordinate system is placed. The equator of the sphere lies within the xy-plane as shown in Figure 3.1. The z-axis is aligned with the vertical center line of the chamber, where the positive z-axis is pointing upwards. The positive x-axis points towards the entrance flange of the chamber. The position and orientation of all required flanges are defined with respect to this reference coordinate system.

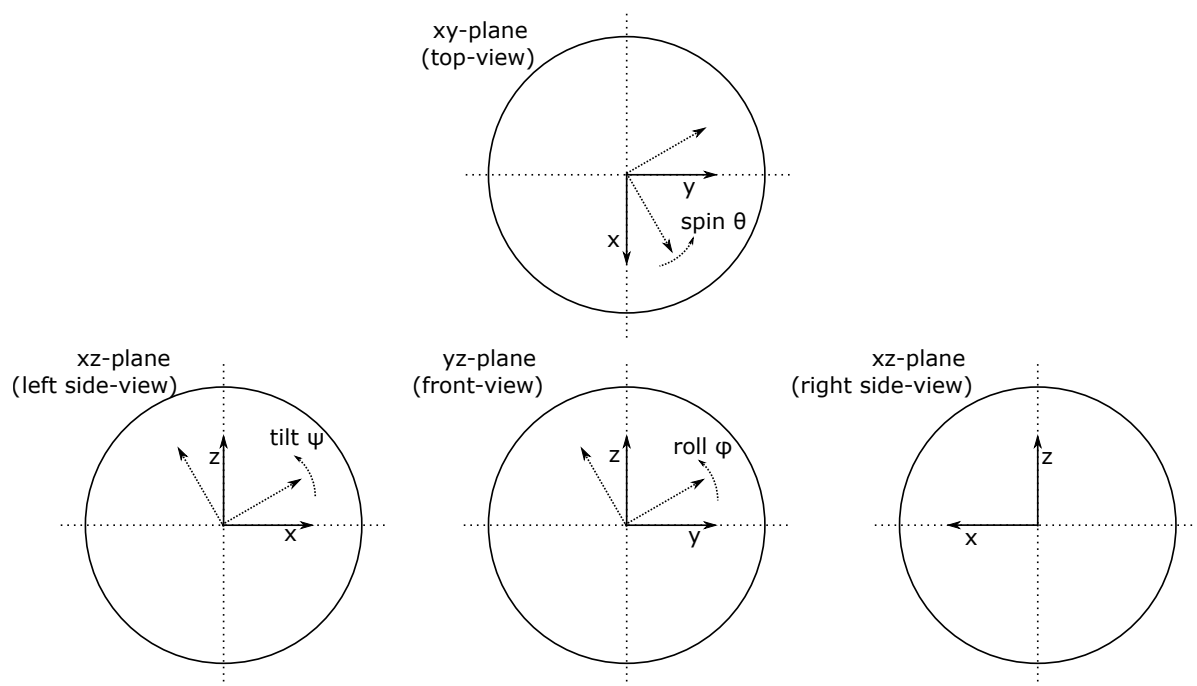


Figure 3.1: Schematic positioning of the reference coordinate system and associated rotations.

4 System specification decomposition level 1

This chapter describes the system of interest at the first decomposition level. That is, it describes 10 components which play a role within the environment in which the system of interest must operate and the (functional) interactions between those components. In Figure 4.1 the associated design-structure-matrix (DSM) is shown. The DSM shows the dependencies between the elements that are relevant to this decomposition level.

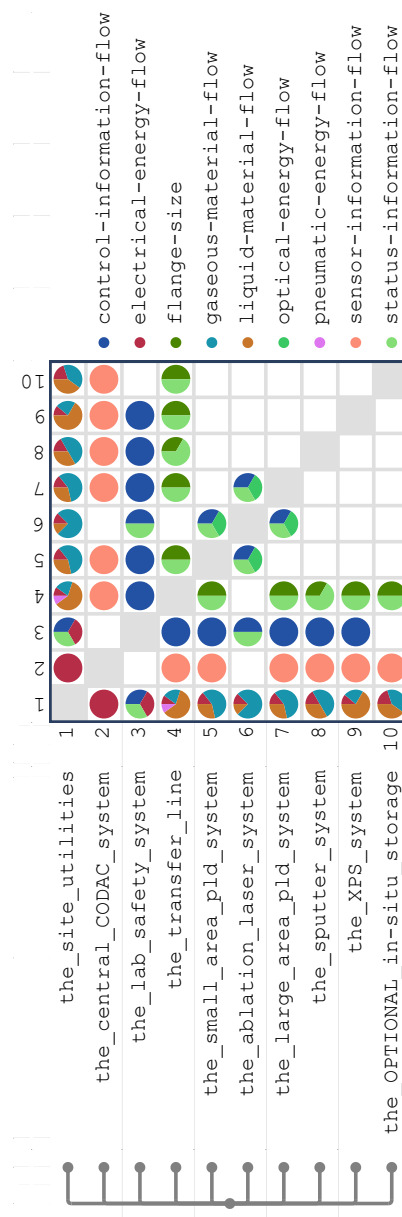


Figure 4.1: component dependency matrix of decomposition level 1.

4.1 The OPTIONAL in-situ storage

This section describes **the OPTIONAL in-situ storage**.

Comments

The name of this component is abbreviated as: **ISS** (In-Situ Storage). The in-situ storage is optional and not part of the main research cluster tender. However, DIFFER should be able to attach it in a later stage. Hence a gate valve should be available for it.

Responsible stakeholder(s):

DIFFER

The following properties are specified for the OPTIONAL in-situ storage:

- base-pressure-ISS
- entrance-flange-size-ISS
- large-substrate-storage-capacity-ISS
- small-substrate-storage-capacity-ISS

4.1.1 Quantitative design requirements

the OPTIONAL in-situ storage → dr-base-pressure-01

Base-pressure-ISS shall be at most 10^{-9} [mbar].

Status

final

flange-sizes-03

Flange-size-gate-valve-5-TL shall be equal to entrance-flange-size-ISS .

Status

final

iss-capacity-01

Large-substrate-storage-capacity-ISS shall be at least t.b.d. [-].

Status

placeholder

iss-capacity-02

Small-substrate-storage-capacity-ISS shall be at least t.b.d. [-].

Status

placeholder

4.2 The XPS system

This section describes **the XPS system**.

Comments

The name of this component is abbreviated as: **XPS** (X-ray Photoelectron Spectroscopy). The XPS system is not part of the main research cluster tender. It will be part of a separate tender. However, DIFFER should be able to attach it in a later stage. Hence a gate valve should be available for it.

Responsible stakeholder(s):

Third party supplier

The following properties are specified for the XPS system:

- base-pressure-XPS
- entrance-flange-size-XPS

4.2.1 Quantitative design requirements

the XPS system → dr-base-pressure-01

Base-pressure-XPS shall be at most 10^{-10} [mbar].

Status

final

flange-sizes-05

Flange-size-gate-valve-7-TL shall be equal to entrance-flange-size-XPS .

Status

final

4.3 The ablation laser system

This section describes **the ablation laser system**.

Comments

The name of this component is abbreviated as: **ABS** (Ablation Laser System). The ablation laser system is shared between the two PLD systems.

Responsible stakeholder(s):

Cluster supplier

4.3.1 Qualitative design requirements

als-safety-01

The ablation laser system shall not be operable when safety-signal-ALS is not equal to enable-experiment.

4.3.2 Sub-components

The ablation laser system is composed of the following sub-components:

- the ALS control system
- the ALS electronics rack
- the ALS fuse box
- the ALS optics
- the ALS source

4.4 The central CODAC system

This section describes **the central CODAC system**.

Comments

The name of this component is abbreviated as: **CCS** (Central Control and data acquisition and communication System). The CODAC system only reads and store data provided by the main components of the research cluster. It does not control components of the research cluster. The cluster and third party suppliers should actively discuss what data can be provided and stored.

Responsible stakeholder(s):

DIFFER

4.5 The lab safety system

This section describes **the lab safety system**.

Comments

The name of this component is abbreviated as: **LSS** (Lab Safety System)

Responsible stakeholder(s):

DIFFER

4.6 The large area pld system

This section describes **the large area pld system**.

Comments

The name of this component is abbreviated as: **LAP** (Large Area PLD system).

Responsible stakeholder(s):

Cluster supplier

The following properties are specified for the large area pld system:

- base-pressure-LAP

4.6.1 Quantitative design requirements

the large area pld system → dr-base-pressure-01

Base-pressure-LAP shall be at most 10^{-8} [mbar].

Status

final

4.6.2 Qualitative design requirements

lap-safety-01

The large area pld system shall not be operable when safety-signal-LAP is not equal to enable-experiment.

4.6.3 Sub-components

The large area pld system is composed of the following sub-components:

- LAP regular camera 1
- LAP regular camera 2
- LAP regular camera 3
- the LAP LAXS detector
- the LAP RHEED detector
- the LAP RHEED source
- the LAP SE detector
- the LAP SE source
- the LAP ablation laser energy sensor
- the LAP ablation laser window
- the LAP bake-out blanket system
- the LAP bottom flange
- the LAP electronics rack
- the LAP entrance flange
- the LAP fuse box
- the LAP gas supply system
- the LAP operating and control system
- the LAP pressure-gauge
- the LAP pyrometer
- the LAP residual gas analyzer
- the LAP substrate mask manipulator
- the LAP substrate motion stage
- the LAP target motion stage
- the LAP target particle reductor
- the LAP vacuum pump system
- the LAP vessel
- the OPTIONAL LAP MOSS detector
- the OPTIONAL LAP MOSS source
- the OPTIONAL LAP OES-ICCD camera
- the OPTIONAL LAP PM-IRRAS detector
- the OPTIONAL LAP PM-IRRAS source
- the z-measurement laser profiler
- the z-measurement laser source

4.7 The site utilities

This section describes **the site utilities**.

Comments

The name of this component is abbreviated as: as: : **SUT** (Site UTilities)

Responsible stakeholder(s):

DIFFER

4.8 The small area pld system

This section describes **the small area pld system**.

Comments

The name of this component is abbreviated as: **SAP** (Small Area Pld system).

Responsible stakeholder(s):

Cluster supplier

The following properties are specified for the small area pld system:

- base-pressure-SAP

4.8.1 Quantitative design requirements

the small area pld system → dr-base-pressure-01

Base-pressure-SAP shall be at most 10^{-8} [mbar].

Status

final

4.8.2 Qualitative design requirements

sap-safety-01

The small area pld system shall not be operable when safety-signal-SAP is not equal to enable-experiment.

4.8.3 Sub-components

The small area pld system is composed of the following sub-components:

- SAP regular camera 1
- SAP regular camera 2
- SAP regular camera 3
- the OPTIONAL SAP OES-ICCD camera
- the SAP LAXS detector
- the SAP MOSS detector
- the SAP MOSS source
- the SAP PM-IRRAS detector
- the SAP PM-IRRAS source

- the SAP RHEED detector
- the SAP RHEED source
- the SAP SE detector
- the SAP SE source
- the SAP ablation laser energy sensor
- the SAP ablation laser window
- the SAP bake-out blanket system
- the SAP electronics rack
- the SAP entrance flange
- the SAP fuse box
- the SAP gas supply system
- the SAP operating and control system
- the SAP pressure-gauge
- the SAP pyrometer
- the SAP residual gas analyzer
- the SAP substrate mask manipulator
- the SAP substrate motion stage
- the SAP target load-lock
- the SAP target motion stage
- the SAP vacuum pump system
- the SAP vessel
- the SAP view port
- the z-measurement laser profiler
- the z-measurement laser source

4.9 The sputter system

This section describes **the sputter system**.

Comments

The name of this component is abbreviated as: **SPS** (SPutter System).

Responsible stakeholder(s):

Cluster supplier

The following properties are specified for the sputter system:

- base-pressure-SPS

4.9.1 Quantitative design requirements

the sputter system → dr-base-pressure-01

Base-pressure-SPS shall be at most 10^{-8} [mbar].

Status

final

4.9.2 Qualitative design requirements

sps-sputter-materials-01

The sputter system shall enable sputtering of at least gold and platinum.

sps-safety-01

The sputter system shall not be operable when safety-signal-SPS is not equal to enable-experiment.

4.9.3 Sub-components

The sputter system is composed of the following sub-components:

- SPS regular camera 1
- SPS regular camera 2
- SPS sputter source 1
- SPS sputter source 2
- SPS sputter source 3
- the SPS bake out system
- the SPS electronics rack
- the SPS entrance flange
- the SPS fuse box
- the SPS gas supply system
- the SPS operating and control system
- the SPS port hole
- the SPS quartz microbalance
- the SPS substrate manipulator stick
- the SPS substrate mask manipulator
- the SPS substrate motion stage
- the SPS vacuum pump system
- the SPS vessel

4.10 The transfer line

This section describes **the transfer line**.

Comments

The name of this component is abbreviated as: **TL** (Transfer Line).

Description

The TL is used to manually transfer the substrates into and from the various connected chambers. Transportation of substrates along the length of the transfer line is automated.

Responsible stakeholder(s):

Cluster supplier

The following properties are specified for the transfer line:

- base-pressure-TL

4.10.1 Quantitative design requirements

the transfer line → dr-base-pressure-01

Base-pressure-TL shall be at most 10^{-8} [mbar].

Status

final

4.10.2 Qualitative design requirements

tl-vacuum-suitcase

The transfer line shall enable the transfer of substrates to a vacuum suitcase.

tl-safety-01

The transfer line shall not be operable when safety-signal-TL is not equal to enable-experiment.

4.10.3 Sub-components

The transfer line is composed of the following sub-components:

- TL blank-flange-1
- TL blank-flange-2

- TL camera 1
- TL camera 10
- TL camera 11
- TL camera 12
- TL camera 2
- TL camera 3
- TL camera 4
- TL camera 5
- TL camera 6
- TL camera 7
- TL camera 8
- TL camera 9
- TL gate-valve-1
- TL gate-valve-2
- TL gate-valve-3
- TL gate-valve-4
- TL gate-valve-5
- TL gate-valve-6
- TL gate-valve-7
- TL substrate manipulator stick 1
- TL substrate manipulator stick 2
- TL substrate manipulator stick 3
- the TL bake-out blanket system
- the TL electronics rack
- the TL fuse box
- the TL load-lock
- the TL operating and control system
- the TL substrate transportation system
- the TL tube
- the TL vacuum pump system

5 System specification decomposition level 2

This chapters describes the system of interest at decomposition level 2 and introduces 121 additional components. In Figure 5.1 the associated design-structure-matrix (DSM) is shown. The DSM shows the dependencies between the elements that are relevant to this decomposition level.



Figure 5.1: component dependency matrix of decomposition level 2.

5.1 The ALS fuse box

This section describes **the ALS fuse box**. This component is a sub-component of the ablation laser system.

Comments

The name of this component is abbreviated as: **FB** (FuseBox).

Responsible stakeholder(s):

DIFFER

5.2 The ALS electronics rack

This section describes **the ALS electronics rack**. This component is a sub-component of the ablation laser system.

Comments

The name of this component is abbreviated as: **EC** (ElectronicsCabinet).

Responsible stakeholder(s):

Cluster supplier

5.3 The ALS control system

This section describes **the ALS control system**. This component is a sub-component of the ablation laser system.

Comments

The name of this component is abbreviated as: **CS** (Control system).

Responsible stakeholder(s):

Cluster supplier

5.4 The ALS source

This section describes **the ALS source**. This component is a sub-component of the ablation laser system.

Comments

The name of this component is abbreviated as: **ABL** (ABlation Laser).

Responsible stakeholder(s):

Cluster supplier

The following properties are specified for the ALS source:

- laser-wavelength
- maximum-average-laser-power
- maximum-laser-pulse-energy
- maximum-laser-pulse-frequency
- pulse-duration

5.4.1 Quantitative design requirements

the ablation laser system → the ALS source → dr-abl-01

Laser-wavelength shall be equal to 248 [nm].

Status

final

the ablation laser system → the ALS source → dr-abl-02

Maximum-laser-pulse-energy shall be at least 750 [mJ].

Status

final

the ablation laser system → the ALS source → dr-abl-03

Maximum-laser-pulse-frequency shall be at least 50 [Hz].

Status

final

the ablation laser system → the ALS source → dr-abl-04

Maximum-average-laser-power shall be equal to 30 [W].

Status

final

the ablation laser system → the ALS source → dr-abl-05

Pulse-duration shall be equal to 20 [ns].

Status

final

5.4.2 Qualitative design requirements

the ablation laser system → abl-control-01

The ALS source control is be manually assigned to the small or large area PLD system via a hardware switch.

5.5 The ALS optics

This section describes **the ALS optics**. This component is a sub-component of the ablation laser system.

Comments

The name of this component is abbreviated as: **ALO** (Ablation Laser Optics).

Responsible stakeholder(s):

Cluster supplier

The following properties are specified for the ALS optics:

- laser-optics-box-state

5.5.1 Qualitative design requirements

the ablation laser system → alo-automation-01

The ALS optics shall enable automated switching between the large and small area PLD chamber.

the ablation laser system → alo-automation-02

The ALS optics shall ensure that when the ablation laser source is operated from the small area PLD system, the optical path towards the large area pld system is closed by a shutter.

the ablation laser system → alo-automation-03

The ALS optics shall ensure that when the ablation laser source is operated from the large area PLD system, the optical path towards the small area pld system is closed by a shutter.

5.6 The LAP vessel

This section describes **the LAP vessel**. This component is a sub-component of the large area pld system.

Comments

The name of this component is abbreviated as: **PCV** (Pld Chamber Vessel).

Responsible stakeholder(s):

Cluster supplier

The following properties are specified for the LAP vessel:

- vessel-geometry

5.7 The LAP operating and control system

This section describes **the LAP operating and control system**. This component is a sub-component of the large area pld system.

Comments

The name of this component is abbreviated as: **OCS** (Operating and Control System).

Responsible stakeholder(s):

Cluster supplier

5.7.1 Sub-components

The LAP operating and control system is composed of the following sub-components:

- ALD operating and control software
- LAP bake-out operating and control software
- LAP camera operating and control software
- LAP operating and control hardware
- LAP process operating and control software
- LAXS operating and control software
- OPTIONAL MOSS operating and control software
- OPTIONAL OIC operating and control software

- OPTIONAL PM-IRRAS operating and control software
- RGA operating and control software
- RHEED operating and control software
- SE operating and control software

5.8 The LAP fuse box

This section describes **the LAP fuse box**. This component is a sub-component of the large area pld system.

Comments

The name of this component is abbreviated as: **FB** (FuseBox).

Responsible stakeholder(s):

DIFFER

5.9 The LAP electronics rack

This section describes **the LAP electronics rack**. This component is a sub-component of the large area pld system.

Comments

The name of this component is abbreviated as: **ELC** (ELectronics Cabinet).

Responsible stakeholder(s):

Cluster supplier

5.10 The LAP vacuum pump system

This section describes **the LAP vacuum pump system**. This component is a sub-component of the large area pld system.

Comments

The name of this component is abbreviated as: **VPS** (Vacuum Pump System).

Responsible stakeholder(s):

Cluster supplier

The following properties are specified for the LAP vacuum pump system:

- flange-size-VPS
- flange-spin-VPS
- flange-tilt-VPS
- flange-z-offset-VPS

5.10.1 Quantitative design requirements

the large area pld system → vps-orientation-01

Flange-tilt-VPS should be equal to t.b.d. [degrees].

Status

placeholder

the large area pld system → vps-orientation-02

Flange-spin-VPS should be equal to t.b.d. [degrees].

Status

placeholder

the large area pld system → vps-orientation-03

Flange-z-offset-VPS should be equal to t.b.d. [mm].

Status

placeholder

the large area pld system → vps-flange-size-01

Flange-size-VPS shall be equal to DN160CF [-].

Status

final

5.10.2 Sub-components

The LAP vacuum pump system is composed of the following sub-components:

- RHEEDS-turbo-pump
- main-turbo-pump
- pld-backing-pump
- target-load-lock-turbo-pump

5.11 The LAP target motion stage

This section describes **the LAP target motion stage**. This component is a sub-component of the large area pld system.

Comments

The name of this component is abbreviated as: **TMS** (Target Motion Stage ELectronics Cabinet).

Responsible stakeholder(s):

Cluster supplier

The following properties are specified for the LAP target motion stage:

- flange-size-TMS
- flange-spin-TMS
- flange-tilt-TMS
- flange-z-offset-TMS
- position-repeatability-TMS
- positioning-accuracy-TMS
- target-capacity-TMS
- target-length-TMS
- target-shape-TMS
- target-thickness-TMS
- target-width-TMS
- z-travel-range-TMS

5.11.1 Quantitative design requirements

the large area pld system → the LAP target motion stage → tms-performance-01

Positioning-accuracy-TMS shall be at least 100 [μm].

Status

final

the large area pld system → the LAP target motion stage → tms-performance-02

Position-repeatability-TMS shall be at least 100 [μm].

Status

final

the large area pld system → the LAP target motion stage → tms-z-range-01

Z-travel-range-TMS shall be at least +/-30 [mm].

Status

final

the large area pld system → the LAP target motion stage → tms-capacity-01

Target-capacity-TMS shall be at least 5 [-].

Status

final

the large area pld system → the LAP target motion stage → tms-target-shape-01

Target-shape-TMS shall be equal to rectangular [-].

Status

final

the large area pld system → the LAP target motion stage → tms-target-length-01

Target-length-TMS shall be equal to 71 [mm].

Status

final

the large area pld system → the LAP target motion stage → tms-target-width-01

Target-width-TMS shall be equal to 35 [mm].

Status

final

the large area pld system → the LAP target motion stage → tms-target-thickness-01

Target-thickness-TMS shall be equal to 6.25 [mm].

Status

the large area pld system → the LAP target motion stage → tms-target-thickness-01

final

the large area pld system → tms-orientation-01

Flange-tilt-TMS shall be equal to 0 [degrees].

Status

final

the large area pld system → tms-orientation-02

Flange-spin-TMS should be equal to 180 [degrees].

Status

final

the large area pld system → tms-orientation-03

Flange-z-offset-TMS shall be equal to -75 [mm].

Status

final

the large area pld system → tms-flange-size-01

Flange-size-TMS shall be equal to DN160F [-].

Status

final

5.11.2 Qualitative design requirements

the large area pld system → tms-vacuum-loading-01

The LAP target motion stage shall support (un)loading targets via a load lock.

5.12 The LAP ablation laser window

This section describes **the LAP ablation laser window**. This component is a sub-component of the large area pld system.

Comments

The name of this component is abbreviated as: **ALW** (Ablation Laser Window).

Responsible stakeholder(s):

Cluster supplier

The following properties are specified for the LAP ablation laser window:

- flange-size-ALW
- flange-spin-ALW
- flange-tilt-ALW
- flange-z-offset-ALW

5.12.1 Quantitative design requirements

the large area pld system → alw-orientation-01

Flange-tilt-ALW shall be equal to t.b.d. [degrees].

Status

placeholder

the large area pld system → alw-orientation-02

Flange-spin-ALW shall be equal to t.b.d. [degrees].

Status

placeholder

the large area pld system → alw-orientation-03

Flange-z-offset-ALW shall be equal to t.b.d. [mm].

Status

placeholder

the large area pld system → alw-flange-size-01

Flange-size-ALW shall be equal to t.b.d. [-].

Status

placeholder

5.12.2 Qualitative design requirements

the large area pld system → alw-maintenance-01

The LAP ablation laser window shall be removable for cleaning and maintenance purposes without having to brake vacuum within the PLD chamber.

5.13 The LAP ablation laser energy sensor

This section describes **the LAP ablation laser energy sensor**. This component is a sub-component of the large area pld system.

Comments

The name of this component is abbreviated as: **LES** (Laser Energy Sensor).

Responsible stakeholder(s):

Cluster supplier

The following properties are specified for the LAP ablation laser energy sensor:

- active-area-diameter-LES
- energy-range-LES
- flange-size-LES
- flange-spin-LES
- flange-tilt-LES
- flange-z-offset-LES
- max-energy-density-LES
- max-pulse-width-LES
- wavelenght-range-LES

5.13.1 Quantitative design requirements

the large area pld system → the LAP ablation laser energy sensor → ald-performance-01

Active-area-diameter-LES shall be at least 50 [mm].

the large area pld system → the LAP ablation laser energy sensor → ald-performance-01

Statusfinal

the large area pld system → the LAP ablation laser energy sensor → ald-performance-02

Energy-range-LES shall be at least 1000 [mJ].

Statusfinal

the large area pld system → the LAP ablation laser energy sensor → ald-performance-03

Wavelength-range-LES shall be at least 190-266 [nm].

Statusfinal

the large area pld system → the LAP ablation laser energy sensor → ald-performance-04

Max-energy-density-LES shall be at least 200 [mJ/cm²].**Status**final

the large area pld system → the LAP ablation laser energy sensor → ald-performance-05

Max-pulse-width-LES shall be at least 86 [μs].

Statusfinal

the large area pld system → les-orientation-01

Flange-tilt-LES shall be equal to t.b.d. [degrees].

Statusplaceholder

the large area pld system → les-orientation-02

Flange-spin-LES shall be equal to t.b.d. [degrees].

Status

placeholder

the large area pld system → les-orientation-03

Flange-z-offset-LES shall be equal to t.b.d. [mm].

Status

placeholder

the large area pld system → les-flange-size-01

Flange-size-LES shall be equal to t.b.d. [-].

Status

placeholder

5.14 The LAP target particle reductor

This section describes **the LAP target particle reductor**. This component is a sub-component of the large area pld system.

Comments

The name of this component is abbreviated as: **TPR** (Target Particle Reductor).

Responsible stakeholder(s):

Cluster supplier

The following properties are specified for the LAP target particle reductor:

- flange-size-TPR
- flange-spin-TPR
- flange-tilt-TPR
- flange-z-offset-TPR
- partical-reduction-efficiency-TPR

5.14.1 Quantitative design requirements

the large area pld system → tpr-orientation-01

Flange-tilt-TPR shall be equal to t.b.d. [degrees].

Status

placeholder

the large area pld system → tpr-orientation-02

Flange-spin-TPR shall be equal to t.b.d. [degrees].

Status

placeholder

the large area pld system → tpr-orientation-03

Flange-z-offset-TPR shall be equal to t.b.d. [mm].

Status

placeholder

the large area pld system → tpr-flange-size-01

Flange-size-TPR shall be equal to DN100CF [-].

Status

final

the large area pld system → tpr-efficiency-01

Partical-reduction-efficiency-TPR shall be at least 99.8 [%].

Comments

This requirement shall hold for particles $\geq 1\mu$.

Status

final

5.14.2 Qualitative design requirements

the large area pld system → tpr-retractable-01

The LAP target particle reductor shall be retractable.

5.15 The OPTIONAL LAP OES-ICCD camera

This section describes **the OPTIONAL LAP OES-ICCD camera**. This component is a sub-component of the large area pld system.

Comments

The name of this component is abbreviated as: **OIC** (Optical emission spectroscopy and Intensified charge coupling device Camera).

Responsible stakeholder(s):

DIFFER

The following properties are specified for the OPTIONAL LAP OES-ICCD camera:

- flange-size-OIC
- flange-spin-OIC
- flange-tilt-OIC
- flange-z-offset-OIC
- max-frame-rate-ICCD
- max-gating-rate-ICCD
- max-image-resolution-ICCD
- max-temporal-resolution-ICCD
- min-cooling-temperature-ICCD
- peak-quantum-efficiency-at-room-temperature-ICCD
- spectrographic resolution-ICCD
- wave-length-range-ICCD

5.15.1 Quantitative design requirements

the large area pld system → the OPTIONAL LAP OES-ICCD camera → oes-iccd-performance-01

Max-gating-rate-ICCD shall be at least 500 [khz].

Status

final

the large area pld system → the OPTIONAL LAP OES-ICCD camera → oes-iccd-performance-02

Max-frame-rate-ICCD shall be at least 4.2 [frames/s].

Status

final

the large area pld system → the OPTIONAL LAP OES-ICCD camera → oes-iccd-resolution-03

Max-image-resolution-ICCD shall be at least 1024x1024 [pixels].

Status

final

the large area pld system → the OPTIONAL LAP OES-ICCD camera → oes-iccd-resolution-04

Max-temporal-resolution-ICCD shall be at least 2 [ns].

Status

final

the large area pld system → the OPTIONAL LAP OES-ICCD camera → oes-iccd-resolution-05

Min-cooling-temperature-ICCD shall be at least -40 [degrees Celsius].

Status

final

the large area pld system → the OPTIONAL LAP OES-ICCD camera → oes-iccd-resolution-06

Wave-length-range-ICCD shall be at least 280-910 [nm].

Status

final

the large area pld system → the OPTIONAL LAP OES-ICCD camera → oes-iccd-resolution-07

Peak-quantum-efficiency-at-room-temperature-ICCD shall be at least 20 [%].

Status

the large area pld system → the OPTIONAL LAP OES-ICCD camera → oes-iccd-resolution-07

final

the large area pld system → the OPTIONAL LAP OES-ICCD camera → oes-iccd-resolution-08

Spectrographic resolution-ICCD shall be at least 1200 [l/mm].

Status

final

the large area pld system → oic-orientation-01

Flange-tilt-OIC shall be equal to 0 [degrees].

Status

final

the large area pld system → oic-orientation-02

Flange-spin-OIC shall be equal to t.b.d. [degrees].

Status

placeholder

the large area pld system → oic-orientation-03

Flange-z-offset-OIC shall be equal to 0 [mm].

Status

final

the large area pld system → oic-flange-size-01

Flange-size-OIC shall be equal to DN40CF [-].

Status

final

5.16 The LAP substrate motion stage

This section describes **the LAP substrate motion stage**. This component is a sub-component of the large area pld system.

Comments

The name of this component is abbreviated as: **SMS** (Substrate Motion Stage).

Responsible stakeholder(s):

Cluster supplier

The following properties are specified for the LAP substrate motion stage:

- flange-size-SMS
- flange-spin-SMS
- flange-tilt-SMS
- flange-x-offset-SMS
- flange-z-offset-SMS
- heating-method-SMS
- max-substrate-heating-temperature-LAP
- max-substrate-temperature-gradient-SMS
- maximum-substrate-size-LAP
- position-repeatability-SMS
- position-stability-SMS
- positioning-accuracy-SMS
- roll-range-SMS
- spin-range-SMS
- tilt-range-SMS
- x-travel-range-SMS
- y-travel-range-SMS
- z-travel-range-SMS

5.16.1 Quantitative design requirements

the large area pld system → the LAP substrate motion stage → sms-performance-01

Positioning-accuracy-SMS shall be at least 20 [mum].

Status

final

the large area pld system → the LAP substrate motion stage → sms-performance-02

Position-repeatability-SMS shall be at least 20 [mum].

the large area pld system → the LAP substrate motion stage → sms-performance-02

Status

final

the large area pld system → the LAP substrate motion stage → sms-performance-03

Position-stability-SMS shall be at least 20 [μm].

Status

final

the large area pld system → the LAP substrate motion stage → sms-performance-04

X-travel-range-SMS shall be at least +/-50 [mm].

Status

final

the large area pld system → the LAP substrate motion stage → sms-performance-05

Y-travel-range-SMS shall be at least +/-50 [mm].

Status

final

the large area pld system → the LAP substrate motion stage → sms-performance-06

Z-travel-range-SMS shall be at least +/-50 [mm].

Status

final

the large area pld system → the LAP substrate motion stage → sms-performance-07

Tilt-range-SMS shall be at least +/-2 [degrees].

Status

final

the large area pld system → the LAP substrate motion stage → sms-performance-08

Roll-range-SMS shall be at least +/-2 [degrees].

Status

final

the large area pld system → the LAP substrate motion stage → sms-performance-09

Spin-range-SMS shall be equal to infinite [degrees].

Status

final

the large area pld system → sms-orientation-01

Flange-tilt-SMS shall be equal to 90 [degrees].

Status

final

the large area pld system → sms-orientation-02

Flange-spin-SMS shall be equal to 0 [degrees].

Status

final

the large area pld system → sms-orientation-03

Flange-z-offset-SMS shall be equal to 0 [mm].

Status

final

the large area pld system → sms-orientation-04

Flange-x-offset-SMS shall be equal to 10 [mm].

Status

the large area pld system → sms-orientation-04

final

the large area pld system → sms-flange-size-01

Flange-size-SMS shall be equal to DN250CF [-].

Status

final

the large area pld system → sms-substrate-size-01

Maximum-substrate-size-LAP shall be equal to 101.6 [mm].

Comments

This is the maximum substrate size that one should be able to mount on the substrate motion stage.

Status

final

the large area pld system → sms-temperature-01

Max-substrate-heating-temperature-LAP shall be at least 900 [degrees Celsius].

Status

final

the large area pld system → thermal-gradient-01

Max-substrate-temperature-gradient-SMS shall be at most 5 [degrees Celsius/cm].

Status

final

the large area pld system → sms-heating-method-01

Heating-method-SMS shall be equal to radiative-heating [-].

Status

the large area pld system → sms-heating-method-01

final

5.17 The LAP RHEED source

This section describes **the LAP RHEED source**. This component is a sub-component of the large area pld system.

Comments

The name of this component is abbreviated as: **RHEEDS** (Reflective High-Energy Diffraction Source).

Responsible stakeholder(s):

Cluster supplier

The following properties are specified for the LAP RHEED source:

- beam-diameter-range-RHEEDS
- beam-voltage-RHEEDS
- flange-size-RHEEDS
- flange-spin-RHEEDS
- flange-tilt-RHEEDS
- flange-z-offset-RHEEDS
- max-beam-current-RHEEDS

5.17.1 Quantitative design requirements

the large area pld system → the LAP RHEED source → rheedss-beam-voltage

Beam-voltage-RHEEDS shall be at least 30 [keV].

Status

final

the large area pld system → the LAP RHEED source → rheedss-max-beam-current

Max-beam-current-RHEEDS shall be at least 120 [muA].

Status

final

the large area pld system → the LAP RHEED source → rheedss-beam-diameter-range

Beam-diameter-range-RHEEDS shall be at least 04-5 [mm].

Status

final

the large area pld system → rheeds-orientation-01

Flange-tilt-RHEEDS shall be equal to t.b.d. [degrees].

Status

placeholder

the large area pld system → rheeds-orientation-02

Flange-spin-RHEEDS shall be equal to t.b.d. [degrees].

Status

placeholder

the large area pld system → rheeds-orientation-03

Flange-z-offset-RHEEDS shall be equal to t.b.d. [mm].

Status

placeholder

the large area pld system → rheeds-flange-size-01

Flange-size-RHEEDS shall be equal to DN100CF [-].

Status

final

5.18 The LAP RHEED detector

This section describes **the LAP RHEED detector**. This component is a sub-component of the large area pld system.

Comments

The name of this component is abbreviated as: **RHEEDD** (Reflective High-Energy Diffraction Detector).

Responsible stakeholder(s):

Cluster supplier

The following properties are specified for the LAP RHEED detector:

- bit-depth-RHEEDD
- dynamic-range-RHEEDD
- flange-size-RHEEDD
- flange-spin-RHEEDD
- flange-tilt-RHEEDD
- flange-z-offset-RHEEDD
- frame-rate-RHEEDD
- pixel-size-RHEEDD
- resolution-RHEEDD

5.18.1 Quantitative design requirements

the large area pld system → the LAP RHEED detector → rheedd-performance-01

Resolution-RHEEDD shall be at least 656-492 [pixels].

Status

final

the large area pld system → the LAP RHEED detector → rheedd-performance-02

Pixel-size-RHEEDD shall be at most 9 [μm].

Status

final

the large area pld system → the LAP RHEED detector → rheedd-performance-03

Dynamic-range-RHEEDD shall be at least 65 [dB].

Status

final

the large area pld system → the LAP RHEED detector → rheedd-performance-04

Frame-rate-RHEEDD shall be at least 50 [frames/s].

Status

final

the large area pld system → the LAP RHEED detector → rheedd-performance-05

Bit-depth-RHEEDD shall be at least 12 [bits].

Status

final

the large area pld system → rheedd-orientation-01

Flange-tilt-RHEEDD shall be equal to t.b.d. [degrees].

Status

placeholder

the large area pld system → rheedd-orientation-02

Flange-spin-RHEEDD shall be equal to t.b.d. [degrees].

Status

placeholder

the large area pld system → rheedd-orientation-03

Flange-z-offset-RHEEDD shall be equal to t.b.d. [mm].

Status

placeholder

the large area pld system → rheedd-flange-size-01

Flange-size-RHEEDD shall be equal to DN100CF [-].

Status

the large area pld system → rheedd-flange-size-01

final

5.19 The LAP LAXS detector

This section describes **the LAP LAXS detector**. This component is a sub-component of the large area pld system.

Comments

The name of this component is abbreviated as: **LAXSD** (Low Angle X-ray Spectroscopy Detector).

Responsible stakeholder(s):

Third party supplier

The following properties are specified for the LAP LAXS detector:

- energy-resolution-LAXSD
- flange-size-LAXSD
- flange-spin-LAXSD
- flange-tilt-LAXSD
- flange-z-offset-LAXSD
- max-count-rate-LAXSD
- x-ray-energy-range-LAXSD

5.19.1 Quantitative design requirements

the large area pld system → the LAP LAXS detector → laxsd-performance-01

X-ray-energy-range-LAXSD shall be equal to 1-20 [keV].

Status

final

the large area pld system → the LAP LAXS detector → laxsd-performance-02

Energy-resolution-LAXSD shall be at least 130 [eV].

Status

final

the large area pld system → the LAP LAXS detector → laxsd-performance-03

Max-count-rate-LAXSD shall be at least 10000 [cps].

Status

final

the large area pld system → laxsd-orientation-01

Flange-tilt-LAXSD shall be equal to 0 [degrees].

Status

final

the large area pld system → laxsd-orientation-02

Flange-spin-LAXSD shall be equal to t.b.d. [degrees].

Comments

The LAXS detector shall have an angle of 90 degrees with the RHEED gun.

Status

placeholder

the large area pld system → laxsd-orientation-03

Flange-z-offset-LAXSD shall be equal to t.b.d. [mm].

Status

placeholder

the large area pld system → laxsd-flange-size-01

Flange-size-LAXSD shall be equal to DN160CF [-].

Status

final

5.20 The OPTIONAL LAP PM-IRRAS source

This section describes **the OPTIONAL LAP PM-IRRAS source**. This component is a sub-component of the large area pld system.

Comments

The name of this component is abbreviated as: **PM-IRRAS-S** (Phase Modulated Infrared Reflection Absorption Spectroscopy Source). The PM-IRRAS diagnostic is optional for the large area PLD chamber and not part of the initial contract. However, DIFFER should be able to add at a later point in time.

Responsible stakeholder(s):

Third party supplier

The following properties are specified for the OPTIONAL LAP PM-IRRAS source:

- flange-size-PM-IRRAS-S
- flange-spin-PM-IRRAS-S
- flange-tilt-PM-IRRAS-S
- flange-z-offset-PM-IRRAS-S

5.20.1 Quantitative design requirements

the large area pld system → pm-irras-s-orientation-01

Flange-tilt-PM-IRRAS-S shall be equal to -10 [degrees].

Status

final

the large area pld system → pm-irras-s-orientation-02

Flange-spin-PM-IRRAS-S shall be equal to t.b.d. [degrees].

Status

placeholder

the large area pld system → pm-irras-s-orientation-03

Flange-z-offset-PM-IRRAS-S shall be equal to t.b.d. [mm].

Status

placeholder

the large area pld system → pm-irras-s-flange-size-01

Flange-size-PM-IRRAS-S shall be equal to DN63CF [-].

Status

final

5.21 The OPTIONAL LAP PM-IRRAS detector

This section describes **the OPTIONAL LAP PM-IRRAS detector**. This component is a sub-component of the large area pld system.

Comments

The name of this component is abbreviated as: **PM-IRRAS-D** (Phase modulated Infrared reflection absorption spectroscopy Detector). The PM-IRRAS diagnostic is optional for the large area PLD chamber and not part of the initial contract. However, DIFFER should be able to add at a later point in time.

Responsible stakeholder(s):

Third party supplier

The following properties are specified for the OPTIONAL LAP PM-IRRAS detector:

- flange-size-PM-IRRAS-D
- flange-spin-PM-IRRAS-D
- flange-tilt-PM-IRRAS-D
- flange-z-offset-PM-IRRAS-D

5.21.1 Quantitative design requirements

the large area pld system → pm-irras-D-orientation-01

Flange-tilt-PM-IRRAS-D shall be equal to -10 [degrees].

Status

final

the large area pld system → pm-irras-D-orientation-02

Flange-spin-PM-IRRAS-D shall be equal to t.b.d. [degrees].

Status

placeholder

the large area pld system → pm-irras-D-orientation-03

Flange-z-offset-PM-IRRAS-D shall be equal to t.b.d. [mm].

Status

placeholder

the large area pld system → pm-irras-D-flange-size-01

Flange-size-PM-IRRAS-D shall be equal to DN63CF [-].

Status

final

5.22 The LAP SE source

This section describes **the LAP SE source**. This component is a sub-component of the large area pld system.

Comments

The name of this component is abbreviated as: **SES** (Spectroscopic ellipsometry Source).

Responsible stakeholder(s):

Third party supplier

The following properties are specified for the LAP SE source:

- flange-size-SES
- flange-spin-SES
- flange-tilt-SES
- flange-z-offset-SES
- spot-size-SES

5.22.1 Quantitative design requirements

the large area pld system → the LAP SE source → ses-dr-performance-03

Spot-size-SES shall be approximately t.b.d. [mm].

Status

placeholder

the large area pld system → ses-orientation-01

Flange-tilt-SES shall be equal to -30 [degrees].

Status

final

the large area pld system → ses-orientation-02

Flange-spin-SES shall be equal to t.b.d. [degrees].

Status

placeholder

the large area pld system → ses-orientation-03

Flange-z-offset-SES shall be equal to t.b.d. [mm].

Status

placeholder

the large area pld system → ses-flange-size-01

Flange-size-SES shall be equal to DN40CF [-].

Status

final

5.23 The LAP SE detector

This section describes **the LAP SE detector**. This component is a sub-component of the large area pld system.

Comments

The name of this component is abbreviated as: **SED** (Spectroscopic ellipsometry Detector).

Responsible stakeholder(s):

Third party supplier

The following properties are specified for the LAP SE detector:

- flange-size-SED

- flange-spin-SED
- flange-tilt-SED
- flange-z-offset-SED
- measurement-speed-range-SED
- number-of-wavelengths-per-spectrum-SED
- spectral-range-SED

5.23.1 Quantitative design requirements

the large area pld system → the LAP SE detector → sed-performance-02

Measurement-speed-range-SED shall be at least 3-3 [s/spectrum].

Status

final

the large area pld system → the LAP SE detector → sed-performance-03

Spectral-range-SED shall be at least 193-1680 [nm].

Status

final

the large area pld system → the LAP SE detector → sed-performance-04

Number-of-wavelengths-per-spectrum-SED shall be at least 600 [points/spectrum].

Status

final

the large area pld system → sed-orientation-01

Flange-tilt-SED shall be equal to -30 [degrees].

Status

final

the large area pld system → sed-orientation-02

Flange-spin-SED shall be equal to t.b.d. [degrees].

the large area pld system → sed-orientation-02

Status

placeholder

the large area pld system → sed-orientation-03

Flange-z-offset-SED shall be equal to t.b.d. [mm].

Status

placeholder

the large area pld system → sed-flange-size-01

Flange-size-SED shall be equal to DN40CF [-].

Status

final

5.24 The OPTIONAL LAP MOSS source

This section describes **the OPTIONAL LAP MOSS source**. This component is a sub-component of the large area pld system.

Comments

The name of this component is abbreviated as: **MOSSS** (Multi-beam Optical Stress Sensor Source). The MOSS diagnostic is optional for the large area PLD chamber and not part of the initial contract. However, DIFFER should be able to add at a later point in time.

Responsible stakeholder(s):

DIFFER

The following properties are specified for the OPTIONAL LAP MOSS source:

- flange-size-MOSSS
- flange-spin-MOSSS
- flange-tilt-MOSSS
- flange-z-offset-MOSSS

5.24.1 Quantitative design requirements

the large area pld system → mosss-orientation-01

Flange-tilt-MOSSS shall be equal to -45 [degrees].

Status

final

the large area pld system → mosss-orientation-02

Flange-spin-MOSSS shall be equal to t.b.d. [degrees].

Status

placeholder

the large area pld system → mosss-orientation-03

Flange-z-offset-MOSSS shall be equal to t.b.d. [mm].

Status

placeholder

the large area pld system → mosss-flange-size-01

Flange-size-MOSSS shall be equal to DN40CF [-].

Status

final

5.25 The OPTIONAL LAP MOSS detector

This section describes **the OPTIONAL LAP MOSS detector**. This component is a sub-component of the large area pld system.

Comments

The name of this component is abbreviated as: **MOSSD** (Multi-beam Optical Stress Sensor Detector). The MOSS diagnostic is optional for the large area PLD chamber and not part of the initial contract. However, DIFFER should be able to add at a later point in time.

Responsible stakeholder(s):

DIFFER

The following properties are specified for the OPTIONAL LAP MOSS detector:

- flange-size-MOSSD
- flange-spin-MOSSD
- flange-tilt-MOSSD
- flange-z-offset-MOSSD

5.25.1 Quantitative design requirements

the large area pld system → mossd-orientation-01

Flange-tilt-MOSSD shall be equal to -45 [degrees].

Status

final

the large area pld system → mossd-orientation-02

Flange-spin-MOSSD shall be equal to t.b.d. [degrees].

Status

placeholder

the large area pld system → mossd-orientation-03

Flange-z-offset-MOSSD shall be equal to t.b.d. [mm].

Status

placeholder

the large area pld system → mossd-flange-size-01

Flange-size-MOSSD shall be equal to DN40CF [-].

Status

final

5.26 The LAP pyrometer

This section describes **the LAP pyrometer**. This component is a sub-component of the large area pld system.

Comments

The name of this component is abbreviated as: **PM** (PyroMeter).

Responsible stakeholder(s):

Cluster supplier

The following properties are specified for the LAP pyrometer:

- flange-size-PM
- flange-spin-PM
- flange-tilt-PM
- flange-z-offset-PM

5.26.1 Quantitative design requirements

the large area pld system → the LAP pyrometer → ms-orientation-01

Flange-tilt-PM shall be equal to -20 [degrees].

Status

final

the large area pld system → the LAP pyrometer → ms-orientation-02

Flange-spin-PM shall be equal to 287.5 [degrees].

Status

final

the large area pld system → the LAP pyrometer → ms-orientation-03

Flange-z-offset-PM shall be equal to 0 [mm].

Status

final

the large area pld system → the LAP pyrometer → ms-flange-size-01

Flange-size-PM shall be equal to DN40CF [-].

Status

final

the large area pld system → pm-orientation-01

Flange-tilt-PM shall be equal to t.b.d. [degrees].

Status

placeholder

the large area pld system → pm-orientation-02

Flange-spin-PM shall be equal to t.b.d. [degrees].

Status

placeholder

the large area pld system → pm-orientation-03

Flange-z-offset-PM shall be equal to t.b.d. [mm].

Status

placeholder

the large area pld system → pm-flange-size-01

Flange-size-PM shall be equal to DN40CF [-].

Status

final

5.27 The z-measurement laser source

This section describes **the z-measurement laser source**. This component is a sub-component of the large area pld system.

Comments

The name of this component is abbreviated as: **ZMS** (Z Measurement laser Source).

Responsible stakeholder(s):

Cluster supplier

The following properties are specified for the z-measurement laser source:

- flange-size-ZMS

- flange-spin-ZMS
- flange-tilt-ZMS
- flange-z-offset-ZMS

5.27.1 Quantitative design requirements

the large area pld system → zms-orientation-01

Flange-tilt-ZMS shall be equal to t.b.d. [degrees].

Status

placeholder

the large area pld system → zms-orientation-02

Flange-spin-ZMS shall be equal to t.b.d. [degrees].

Status

placeholder

the large area pld system → zms-orientation-03

Flange-z-offset-ZMS shall be equal to t.b.d. [mm].

Status

placeholder

the large area pld system → zms-flange-size-01

Flange-size-ZMS shall be equal to DN16CF [-].

Status

final

5.28 The z-measurement laser profiler

This section describes **the z-measurement laser profiler**. This component is a sub-component of the large area pld system.

Comments

The name of this component is abbreviated as: **ZMP** (Z Measurement laser Profiler).

Responsible stakeholder(s):

Cluster supplier

The following properties are specified for the z-measurement laser profiler:

- flange-size-ZMP
- flange-spin-ZMP
- flange-tilt-ZMP
- flange-z-offset-ZMP

5.28.1 Quantitative design requirements

the large area pld system → zmp-orientation-01

Flange-tilt-ZMP shall be equal to t.b.d. [degrees].

Status

placeholder

the large area pld system → zmp-orientation-02

Flange-spin-ZMP shall be equal to t.b.d. [degrees].

Status

placeholder

the large area pld system → zmp-orientation-03

Flange-z-offset-ZMP shall be equal to t.b.d. [mm].

Status

placeholder

the large area pld system → zmp-flange-size-01

Flange-size-ZMP shall be equal to DN16CF [-].

Status

final

5.29 The LAP residual gas analyzer

This section describes **the LAP residual gas analyzer**. This component is a sub-component of the large area pld system.

Comments

The name of this component is abbreviated as: **MS** (Mass Spectrometer). The mass spectrometer is to be used for residual gas analysis.

Responsible stakeholder(s):

Cluster supplier

The following properties are specified for the LAP residual gas analyzer:

- flange-size-RGA
- flange-spin-RGA
- flange-tilt-RGA
- flange-z-offset-RGA
- mass-range-RGA
- maximum-operating-pressure-RGA
- minimum-detectable-partial-pressure-RGA
- resolution-RGA
- sensitivity-RGA

5.29.1 Quantitative design requirements

the large area pld system → the LAP residual gas analyzer → rga-performance-01

Mass-range-RGA shall be at least 1-100 [amu].

Status

final

the large area pld system → the LAP residual gas analyzer → rga-performance-02

Resolution-RGA shall be at least 0.5 [amu].

Status

final

the large area pld system → the LAP residual gas analyzer → rga-performance-03

Sensitivity-RGA shall be at least $0 \cdot 10^{-4}$ [A/mbar].

the large area pld system → the LAP residual gas analyzer → rga-performance-03

Status

final

the large area pld system → the LAP residual gas analyzer → rga-performance-04

Minimum-detectable-partial-pressure-RGA shall be equal to $0 \cdot 10^{-11}$ [mbar].

Status

final

the large area pld system → the LAP residual gas analyzer → rga-performance-05

Maximum-operating-pressure-RGA shall be at least $0 \cdot 10^{-4}$ [mbar].

Status

final

the large area pld system → ms-orientation-01

Flange-tilt-RGA shall be equal to t.b.d. [degrees].

Status

placeholder

the large area pld system → ms-orientation-02

Flange-spin-RGA shall be equal to t.b.d. [degrees].

Status

placeholder

the large area pld system → ms-orientation-03

Flange-z-offset-RGA shall be equal to t.b.d. [mm].

Status

placeholder

the large area pld system → ms-flange-size-01

Flange-size-RGA shall be equal to DN40CF [-].

Status

final

5.30 The LAP pressure-gauge

This section describes **the LAP pressure-gauge**. This component is a sub-component of the large area pld system.

Comments

The name of this component is abbreviated as: **PG** (Pressure Gauge)

Responsible stakeholder(s):

Cluster supplier

The following properties are specified for the LAP pressure-gauge:

- flange-size-PG
- flange-spin-PG
- flange-tilt-PG
- flange-z-offset-PG

5.30.1 Quantitative design requirements

the large area pld system → pg-orientation-01

Flange-tilt-PG shall be equal to t.b.d. [degrees].

Status

placeholder

the large area pld system → pg-orientation-02

Flange-spin-PG shall be equal to t.b.d. [degrees].

Status

placeholder

the large area pld system → pg-orientation-03

Flange-z-offset-PG shall be equal to t.b.d. [mm].

Status

placeholder

the large area pld system → pg-flange-size-01

Flange-size-PG shall be equal to DN40CF [-].

Status

final

5.31 LAP regular camera 1

This section describes **LAP regular camera 1**. This component is a sub-component of the large area pld system.

Comments

The name of this component is abbreviated as: **RC1** (Regular Camera 1).

Responsible stakeholder(s):

Cluster supplier

The following properties are specified for LAP regular camera 1:

- flange-size-RC1
- flange-spin-RC1
- flange-tilt-RC1
- flange-z-offset-RC1

5.31.1 Quantitative design requirements

the large area pld system → rc1-orientation-01

Flange-tilt-RC1 shall be equal to t.b.d. [degrees].

Status

placeholder

the large area pld system → rc1-orientation-02

Flange-spin-RC1 shall be equal to t.b.d. [degrees].

Status

placeholder

the large area pld system → rc1-orientation-03

Flange-z-offset-RC1 shall be equal to t.b.d. [mm].

Status

placeholder

the large area pld system → rc1-flange-size-01

Flange-size-RC1 shall be equal to DN40CF [-].

Status

final

5.32 LAP regular camera 2

This section describes **LAP regular camera 2**. This component is a sub-component of the large area pld system.

Comments

The name of this component is abbreviated as: **RC2** (Regular Camera 2).

Responsible stakeholder(s):

Cluster supplier

The following properties are specified for LAP regular camera 2:

- flange-size-RC2
- flange-spin-RC2
- flange-tilt-RC2
- flange-z-offset-RC2

5.32.1 Quantitative design requirements

the large area pld system → rc2-orientation-01

Flange-tilt-RC2 shall be equal to t.b.d. [degrees].

Status

placeholder

the large area pld system → rc2-orientation-02

Flange-spin-RC2 shall be equal to t.b.d. [degrees].

Status

placeholder

the large area pld system → rc2-orientation-03

Flange-z-offset-RC2 shall be equal to t.b.d. [mm].

Status

placeholder

the large area pld system → rc2-flange-size-01

Flange-size-RC2 shall be equal to DN63CF [-].

Status

final

5.33 LAP regular camera 3

This section describes **LAP regular camera 3**. This component is a sub-component of the large area pld system.

Comments

The name of this component is abbreviated as: **RC3** (Regular Camera 3).

Responsible stakeholder(s):

Cluster supplier

The following properties are specified for LAP regular camera 3:

- flange-size-RC3

- flange-spin-RC3
- flange-tilt-RC3
- flange-z-offset-RC3

5.33.1 Quantitative design requirements

the large area pld system → rc3-orientation-01

Flange-tilt-RC3 shall be equal to t.b.d. [degrees].

Status

placeholder

the large area pld system → rc3-orientation-02

Flange-spin-RC3 shall be equal to t.b.d. [degrees].

Status

placeholder

the large area pld system → rc3-orientation-03

Flange-z-offset-RC3 shall be equal to t.b.d. [mm].

Status

placeholder

the large area pld system → rc3-flange-size-01

Flange-size-RC3 shall be equal to DN63CF [-].

Status

final

5.34 The LAP gas supply system

This section describes **the LAP gas supply system**. This component is a sub-component of the large area pld system.

Comments

The name of this component is abbreviated as: **GSS** (Gas Supply System).

Responsible stakeholder(s):

Cluster supplier

The following properties are specified for the LAP gas supply system:

- flange-size-GSS
- flange-spin-GSS
- flange-tilt-GSS
- flange-z-offset-GSS

5.34.1 Quantitative design requirements

the large area pld system → gss-orientation-01

Flange-tilt-GSS shall be equal to t.b.d. [degrees].

Status

placeholder

the large area pld system → gss-orientation-02

Flange-spin-GSS shall be equal to t.b.d. [degrees].

Status

placeholder

the large area pld system → gss-orientation-03

Flange-z-offset-GSS shall be equal to t.b.d. [mm].

Status

placeholder

the large area pld system → gss-flange-size-01

Flange-size-GSS shall be equal to DN16CF [-].

Status

final

5.35 The LAP substrate mask manipulator

This section describes **the LAP substrate mask manipulator**. This component is a sub-component of the large area pld system.

Comments

The name of this component is abbreviated as: **SMM** (Substrate Mask Manipulator).

Responsible stakeholder(s):

Cluster supplier

The following properties are specified for the LAP substrate mask manipulator:

- flange-size-SMM
- flange-spin-SMM
- flange-tilt-SMM
- flange-z-offset-SMM

5.35.1 Quantitative design requirements

the large area pld system → smm-orientation-01

Flange-tilt-SMM shall be equal to t.b.d. [degrees].

Status

placeholder

the large area pld system → smm-orientation-02

Flange-spin-SMM shall be equal to t.b.d. [degrees].

Status

placeholder

the large area pld system → smm-orientation-03

Flange-z-offset-SMM shall be equal to t.b.d. [mm].

Status

placeholder

the large area pld system → smm-flange-size-01

Flange-size-SMM shall be equal to DN63CF [-].

Status

final

5.36 The LAP bake-out blanket system

This section describes **the LAP bake-out blanket system**. This component is a sub-component of the large area pld system.

Comments

The name of this component is abbreviated as: **BBS** (Bake-out Blanket System).

Responsible stakeholder(s):

Cluster supplier

5.37 The LAP entrance flange

This section describes **the LAP entrance flange**. This component is a sub-component of the large area pld system.

Comments

The name of this component is abbreviated as: **EF** (Entrance Flange).

Responsible stakeholder(s):

Cluster supplier

The following properties are specified for the LAP entrance flange:

- entrance-flange-size-LAP
- flange-spin-EF
- flange-tilt-EF
- flange-z-offset-EF

5.37.1 Quantitative design requirements

the large area pld system → egv-orientation-01

Flange-tilt-EF shall be equal to 0 [degrees].

Status

final

the large area pld system → egv-orientation-02

Flange-spin-EF shall be equal to 0 [degrees].

Status

final

the large area pld system → egv-orientation-03

Flange-z-offset-EF shall be equal to 40 [mm].

Status

final

the large area pld system → egv-flange-size-01

Entrance-flange-size-LAP shall be equal to DN160CF [-].

Status

final

flange-sizes-04

Flange-size-gate-valve-6-TL shall be equal to entrance-flange-size-LAP .

Status

final

5.38 The LAP bottom flange

This section describes **the LAP bottom flange**. This component is a sub-component of the large area pld system.

Comments

The name of this component is abbreviated as: **BBF** (Blind Bottom Flange)

Responsible stakeholder(s):

Cluster supplier

The following properties are specified for the LAP bottom flange:

- flange-size-BBF

- flange-spin-BBF
- flange-tilt-BBF
- flange-z-offset-BBF

5.38.1 Quantitative design requirements

the large area pld system → bbf-orientation-01

Flange-tilt-BBF shall be equal to -90 [degrees].

Status

final

the large area pld system → bbf-orientation-02

Flange-spin-BBF shall be equal to 0 [degrees].

Status

final

the large area pld system → bbf-orientation-03

Flange-z-offset-BBF shall be equal to -75 [mm].

Status

final

the large area pld system → bbf-flange-size-01

Flange-size-BBF shall be equal to DN250CF [-].

Status

final

5.39 The SAP vessel

This section describes **the SAP vessel**. This component is a sub-component of the small area pld system.

Comments

The name of this component is abbreviated as: **PCV** (Pld Chamber Vessel).

Responsible stakeholder(s):

Cluster supplier

The following properties are specified for the SAP vessel:

- vessel-geometry

5.40 The SAP operating and control system

This section describes **the SAP operating and control system**. This component is a sub-component of the small area pld system.

Comments

The name of this component is abbreviated as: **OCS** (Operating and Control System).

Responsible stakeholder(s):

Cluster supplier

5.40.1 Sub-components

The SAP operating and control system is composed of the following sub-components:

- ALD operating and control software
- LAXS operating and control software
- MOSS operating and control software
- OPTIONAL OIC operating and control software
- PM-IRRAS operating and control software
- RGA operating and control software
- RHEED operating and control software
- SAP bake-out operating and control software
- SAP camera operating and control software
- SAP operating and control hardware
- SAP process operating and control software
- SE operating and control software

5.41 The SAP fuse box

This section describes **the SAP fuse box**. This component is a sub-component of the small area pld system.

Comments

The name of this component is abbreviated as: **FB** (FuseBox).

Responsible stakeholder(s):

DIFFER

5.42 The SAP electronics rack

This section describes **the SAP electronics rack**. This component is a sub-component of the small area pld system.

Comments

The name of this component is abbreviated as: **ELC** (ELectronics Cabinet).

Responsible stakeholder(s):

Cluster supplier

5.43 The SAP vacuum pump system

This section describes **the SAP vacuum pump system**. This component is a sub-component of the small area pld system.

Comments

The name of this component is abbreviated as: **VPS** (Vacuum Pump System).

Responsible stakeholder(s):

Cluster supplier

The following properties are specified for the SAP vacuum pump system:

- flange-size-VPS
- flange-spin-VPS
- flange-tilt-VPS
- flange-z-offset-VPS

5.43.1 Quantitative design requirements

the small area pld system → vps-orientation-01

Flange-tilt-VPS should be equal to t.b.d. [degrees].

Status

placeholder

the small area pld system → vps-orientation-02

Flange-spin-VPS should be equal to t.b.d. [degrees].

Status

placeholder

the small area pld system → vps-orientation-03

Flange-z-offset-VPS should be equal to t.b.d. [mm].

Status

placeholder

the small area pld system → vps-flange-size-01

Flange-size-VPS shall be equal to DN160CF [-].

Status

final

5.43.2 Sub-components

The SAP vacuum pump system is composed of the following sub-components:

- RHEEDS-turbo-pump
- main-turbo-pump
- pld-backing-pump
- target-load-lock-turbo-pump

5.44 The SAP target motion stage

This section describes **the SAP target motion stage**. This component is a sub-component of the small area pld system.

Comments

The name of this component is abbreviated as: **TMS** (Target Motion Stage ELectronics Cabinet).

Responsible stakeholder(s):

Cluster supplier

The following properties are specified for the SAP target motion stage:

- flange-size-TMS
- flange-spin-TMS
- flange-tilt-TMS
- flange-z-offset-TMS
- position-repeatability-TMS
- positioning-accuracy-TMS
- spin-range-TMS
- target-capacity-TMS
- target-diameter-TMS
- target-shape-TMS
- x-travel-range-TMS
- y-travel-range-TMS
- z-travel-range-TMS

5.44.1 Quantitative design requirements

the small area pld system → the SAP target motion stage → tms-performance-01

Positioning-accuracy-TMS shall be at least 100 [μm].

Status

final

the small area pld system → the SAP target motion stage → tms-performance-02

Position-repeatability-TMS shall be at least 100 [μm].

Status

final

the small area pld system → the SAP target motion stage → tms-performance-03

X-travel-range-TMS shall be at least +/-25 [mm].

Status

final

the small area pld system → the SAP target motion stage → tms-performance-04

Y-travel-range-TMS shall be at least +/-25 [mm].

Status

the small area pld system → the SAP target motion stage → tms-performance-04

final

the small area pld system → the SAP target motion stage → tms-performance-05

Z-travel-range-TMS shall be at least +/-75 [mm].

Status

final

the small area pld system → the SAP target motion stage → tms-performance-06

Spin-range-TMS shall be at least +/-190 [degrees].

Status

final

the small area pld system → the SAP target motion stage → tms-target-shape-01

Target-shape-TMS shall be equal to spherical [-].

Status

final

the small area pld system → the SAP target motion stage → tms-target-diameter-01

Target-diameter-TMS shall be equal to 1 [inch].

Status

final

the small area pld system → the SAP target motion stage → tms-target-capacity-01

Target-capacity-TMS shall be at least 5 [-].

Status

final

the small area pld system → tms-orientation-01

Flange-tilt-TMS shall be equal to -90 [degrees].

Status

final

the small area pld system → tms-orientation-02

Flange-spin-TMS shall be equal to 0 [degrees].

Status

final

the small area pld system → tms-orientation-03

Flange-z-offset-TMS shall be equal to -25 [mm].

Status

final

the small area pld system → tms-flange-size-01

Flange-size-TMS shall be equal to DN250CF [-].

Status

final

5.45 The SAP ablation laser window

This section describes **the SAP ablation laser window**. This component is a sub-component of the small area pld system.

Comments

The name of this component is abbreviated as: **ALW** (Ablation Laser Window).

Responsible stakeholder(s):

Cluster supplier

The following properties are specified for the SAP ablation laser window:

- flange-size-ALW

- flange-spin-ALW
- flange-tilt-ALW
- flange-z-offset-ALW

5.45.1 Quantitative design requirements

the small area pld system → alw-orientation-01

Flange-tilt-ALW shall be equal to t.b.d. [degrees].

Status

placeholder

the small area pld system → alw-orientation-02

Flange-spin-ALW shall be equal to t.b.d. [degrees].

Status

placeholder

the small area pld system → alw-orientation-03

Flange-z-offset-ALW shall be equal to t.b.d. [mm].

Status

placeholder

the small area pld system → alw-flange-size-01

Flange-size-ALW shall be equal to t.b.d. [-].

Status

placeholder

5.46 The SAP ablation laser energy sensor

This section describes **the SAP ablation laser energy sensor**. This component is a sub-component of the small area pld system.

Comments

The name of this component is abbreviated as: **LES** (Laser Energy Sensor).

Responsible stakeholder(s):

Cluster supplier

The following properties are specified for the SAP ablation laser energy sensor:

- active-area-diameter-LES
- energy-range-LES
- flange-size-LES
- flange-spin-LES
- flange-tilt-LES
- flange-z-offset-LES
- max-energy-density-LES
- max-pulse-width-LES
- wavelength-range-LES

5.46.1 Quantitative design requirements

the small area pld system → the SAP ablation laser energy sensor → ald-performance-01

Active-area-diameter-LES shall be at least 50 [mm].

Status

final

the small area pld system → the SAP ablation laser energy sensor → ald-performance-02

Energy-range-LES shall be at least 1000 [mJ].

Status

final

the small area pld system → the SAP ablation laser energy sensor → ald-performance-03

Wavelength-range-LES shall be at least 190-266 [nm].

Status

final

the small area pld system → the SAP ablation laser energy sensor → ald-performance-04

Max-energy-density-LES shall be at least 200 [mJ/cm²].

Status

the small area pld system → the SAP ablation laser energy sensor → ald-performance-04

final

the small area pld system → the SAP ablation laser energy sensor → ald-performance-05

Max-pulse-width-LES shall be at least 86 [mus].

Status

final

the small area pld system → les-orientation-01

Flange-tilt-LES shall be equal to t.b.d. [degrees].

Status

placeholder

the small area pld system → les-orientation-02

Flange-spin-LES shall be equal to t.b.d. [degrees].

Status

placeholder

the small area pld system → les-orientation-03

Flange-z-offset-LES shall be equal to t.b.d. [mm].

Status

placeholder

the small area pld system → les-flange-size-01

Flange-size-LES shall be equal to t.b.d. [-].

Status

placeholder

5.47 The SAP view port

This section describes **the SAP view port**. This component is a sub-component of the small area pld system.

Comments

The name of this component is abbreviated as: **VP** (View Port).

Responsible stakeholder(s):

Cluster supplier

The following properties are specified for the SAP view port:

- flange-size-VP
- flange-spin-VP
- flange-tilt-VP
- flange-z-offset-VP

5.47.1 Quantitative design requirements

the small area pld system → qmb-orientation-01

Flange-tilt-VP shall be equal to t.b.d. [degrees].

Status

placeholder

the small area pld system → qmb-orientation-02

Flange-spin-VP shall be equal to t.b.d. [degrees].

Status

placeholder

the small area pld system → qmb-orientation-03

Flange-z-offset-VP shall be equal to t.b.d. [mm].

Status

placeholder

the small area pld system → qmb-flange-size-01

Flange-size-VP shall be equal to DN100CF [-].

Status

final

5.48 The OPTIONAL SAP OES-ICCD camera

This section describes **the OPTIONAL SAP OES-ICCD camera**. This component is a sub-component of the small area pld system.

Comments

The name of this component is abbreviated as: **OIC** (Optical emission spectroscopy and Intensified charge coupling device Camera).

Responsible stakeholder(s):

DIFFER

The following properties are specified for the OPTIONAL SAP OES-ICCD camera:

- flange-size-OIC
- flange-spin-OIC
- flange-tilt-OIC
- flange-z-offset-OIC
- max-frame-rate-ICCD
- max-gating-rate-ICCD
- max-image-resolution-ICCD
- max-temporal-resolution-ICCD
- min-cooling-temperature-ICCD
- peak-quantum-efficiency-at-room-temperature-ICCD
- spectrographic resolution-ICCD
- wave-length-range-ICCD

5.48.1 Quantitative design requirements

the small area pld system → the OPTIONAL SAP OES-ICCD camera → oes-iccd-performance-01

Max-gating-rate-ICCD shall be at least 500 [khz].

Status

final

the small area pld system → the OPTIONAL SAP OES-ICCD camera → oes-iccd-performance-02

Max-frame-rate-ICCD shall be at least 4.2 [frames/s].

Status

final

the small area pld system → the OPTIONAL SAP OES-ICCD camera → oes-iccd-resolution-03

Max-image-resolution-ICCD shall be at least 1024x1024 [pixels].

Status

final

the small area pld system → the OPTIONAL SAP OES-ICCD camera → oes-iccd-resolution-04

Max-temporal-resolution-ICCD shall be at least 2 [ns].

Status

final

the small area pld system → the OPTIONAL SAP OES-ICCD camera → oes-iccd-resolution-05

Min-cooling-temperature-ICCD shall be at least -40 [degrees Celsius].

Status

final

the small area pld system → the OPTIONAL SAP OES-ICCD camera → oes-iccd-resolution-06

Wave-length-range-ICCD shall be at least 280-910 [nm].

Status

final

the small area pld system → the OPTIONAL SAP OES-ICCD camera → oes-iccd-resolution-07

Peak-quantum-efficiency-at-room-temperature-ICCD shall be at least 20 [%].

Status

the small area pld system → the OPTIONAL SAP OES-ICCD camera → oes-iccd-resolution-07

final

the small area pld system → the OPTIONAL SAP OES-ICCD camera → oes-iccd-resolution-08

Spectrographic resolution-ICCD shall be at least 1200 [l/mm].

Status

final

the small area pld system → oic-orientation-01

Flange-tilt-OIC shall be equal to 0 [degrees].

Status

final

the small area pld system → oic-orientation-02

Flange-spin-OIC shall be equal to t.b.d. [degrees].

Status

placeholder

the small area pld system → oic-orientation-03

Flange-z-offset-OIC shall be equal to 0 [mm].

Status

final

the small area pld system → oic-flange-size-01

Flange-size-OIC shall be equal to DN40CF [-].

Status

final

5.49 The SAP substrate motion stage

This section describes **the SAP substrate motion stage**. This component is a sub-component of the small area pld system.

Comments

The name of this component is abbreviated as: **SMS** (Substrate Motion Stage).

Responsible stakeholder(s):

Cluster supplier

The following properties are specified for the SAP substrate motion stage:

- flange-size-SMS
- flange-spin-SMS
- flange-tilt-SMS
- flange-x-offset-SMS
- flange-z-offset-SMS
- heating-method-SMS
- max-substrate-heating-temperature-SAP
- max-substrate-temperature-gradient-SMS
- maximum-substrate-size-SAP
- position-repeatability-SMS
- positioning-accuracy-SMS
- roll-range-SMS
- spin-range-SMS
- tilt-range-SMS
- x-travel-range-SMS
- y-travel-range-SMS
- z-travel-range-SMS

5.49.1 Quantitative design requirements

the small area pld system → the SAP substrate motion stage → sms-performance-01

Positioning-accuracy-SMS shall be at least 20 [μm].

Status

final

the small area pld system → the SAP substrate motion stage → sms-performance-02

Position-repeatability-SMS shall be at least 20 [μm].

the small area pld system → the SAP substrate motion stage → sms-performance-02

Status

final

the small area pld system → the SAP substrate motion stage → sms-performance-03

X-travel-range-SMS shall be at least +/-10 [mm].

Status

final

the small area pld system → the SAP substrate motion stage → sms-performance-04

Y-travel-range-SMS shall be at least +/-10 [mm].

Status

final

the small area pld system → the SAP substrate motion stage → sms-performance-05

Z-travel-range-SMS shall be at least +/-50 [mm].

Status

final

the small area pld system → the SAP substrate motion stage → sms-performance-07

Tilt-range-SMS shall be at least +/-2 [degrees].

Status

final

the small area pld system → the SAP substrate motion stage → sms-performance-08

Roll-range-SMS shall be at least +/-2 [degrees].

Status

final

the small area pld system → the SAP substrate motion stage → sms-performance-09

Spin-range-SMS shall be at least +/-190 [degrees].

Status

final

the small area pld system → sms-orientation-01

Flange-tilt-SMS shall be equal to 90 [degrees].

Status

final

the small area pld system → sms-orientation-02

Flange-spin-SMS shall be equal to 0 [degrees].

Status

final

the small area pld system → sms-orientation-03

Flange-z-offset-SMS shall be equal to 0 [mm].

Status

final

the small area pld system → sms-orientation-04

Flange-x-offset-SMS shall be equal to 10 [mm].

Status

final

the small area pld system → sms-flange-size-01

Flange-size-SMS shall be equal to DN250CF [-].

Status

the small area pld system → sms-flange-size-01

final

the small area pld system → sms-substrate-size-01

Maximum-substrate-size-SAP shall be equal to 25.4 [mm].

Comments

This is the maximum substrate size that one should be able to mount on the substrate motion stage. Deposition and heating shall be at least homogenous across a 1cm² area.

Status

final

the small area pld system → sms-temperature-01

Max-substrate-heating-temperature-SAP shall be at least 1000 [degrees Celsius].

Status

final

the small area pld system → sms-temperature-gradient-01

Max-substrate-temperature-gradient-SMS shall be at most 5 [degrees Celsius/cm].

Status

final

the small area pld system → sms-heating-method-01

Heating-method-SMS shall be equal to laser-heating [-].

Status

final

5.50 The SAP RHEED source

This section describes **the SAP RHEED source**. This component is a sub-component of the small area pld system.

Comments

The name of this component is abbreviated as: **RHEEDS** (Reflective High-Energy Diffraction Source).

Responsible stakeholder(s):

Cluster supplier

The following properties are specified for the SAP RHEED source:

- beam-diameter-range-RHEEDS
- beam-voltage-RHEEDS
- flange-size-RHEEDS
- flange-spin-RHEEDS
- flange-tilt-RHEEDS
- flange-z-offset-RHEEDS
- max-beam-current-RHEEDS

5.50.1 Quantitative design requirements

the small area pld system → the SAP RHEED source → rheedss-beam-voltage

Beam-voltage-RHEEDS shall be at least 30 [keV].

Status

final

the small area pld system → the SAP RHEED source → rheedss-max-beam-current

Max-beam-current-RHEEDS shall be at least 120 [μ A].

Status

final

the small area pld system → the SAP RHEED source → rheedss-beam-diameter-range

Beam-diameter-range-RHEEDS shall be at least 04-5 [mm].

Status

final

the small area pld system → rheeds-orientation-01

Flange-tilt-RHEEDS shall be equal to t.b.d. [degrees].

the small area pld system → rheeds-orientation-01

Statusplaceholder

the small area pld system → rheeds-orientation-02

Flange-spin-RHEEDS shall be equal to t.b.d. [degrees].

Statusplaceholder

the small area pld system → rheeds-orientation-03

Flange-z-offset-RHEEDS shall be equal to t.b.d. [mm].

Statusplaceholder

the small area pld system → rheeds-flange-size-01

Flange-size-RHEEDS shall be equal to DN100CF [-].

Statusfinal

5.51 The SAP RHEED detector

This section describes **the SAP RHEED detector**. This component is a sub-component of the small area pld system.

Comments

The name of this component is abbreviated as: **RHEEDD** (Reflective High-Energy Diffraction Detector).

Responsible stakeholder(s):

Cluster supplier

The following properties are specified for the SAP RHEED detector:

- bit-depth-RHEEDD
- dynamic-range-RHEEDD

- flange-size-RHEEDD
- flange-spin-RHEEDD
- flange-tilt-RHEEDD
- flange-z-offset-RHEEDD
- frame-rate-RHEEDD
- pixel-size-RHEEDD
- resolution-RHEEDD

5.51.1 Quantitative design requirements

the small area pld system → the SAP RHEED detector → rheedd-performance-01

Resolution-RHEEDD shall be at least 656-492 [pixels].

Status

final

the small area pld system → the SAP RHEED detector → rheedd-performance-02

Pixel-size-RHEEDD shall be at most 9 [mum].

Status

final

the small area pld system → the SAP RHEED detector → rheedd-performance-03

Dynamic-range-RHEEDD shall be at least 65 [dB].

Status

final

the small area pld system → the SAP RHEED detector → rheedd-performance-04

Frame-rate-RHEEDD shall be at least 50 [frames/s].

Status

final

the small area pld system → the SAP RHEED detector → rheedd-performance-05

Bit-depth-RHEEDD shall be at least 12 [bits].

the small area pld system → the SAP RHEED detector → rheedd-performance-05

Statusfinal

the small area pld system → rheedd-orientation-01

Flange-tilt-RHEEDD shall be equal to t.b.d. [degrees].

Statusplaceholder

the small area pld system → rheedd-orientation-02

Flange-spin-RHEEDD shall be equal to t.b.d. [degrees].

Statusplaceholder

the small area pld system → rheedd-orientation-03

Flange-z-offset-RHEEDD shall be equal to t.b.d. [mm].

Statusplaceholder

the small area pld system → rheedd-flange-size-01

Flange-size-RHEEDD shall be equal to DN100CF [-].

Statusfinal

5.52 The SAP LAXS detector

This section describes **the SAP LAXS detector**. This component is a sub-component of the small area pld system.

Comments

The name of this component is abbreviated as: **LAXSD** (Low Angle X-ray Spectroscopy Detector).

Responsible stakeholder(s):

Third party supplier

The following properties are specified for the SAP LAXS detector:

- energy-resolution-LAXSD
- flange-size-LAXSD
- flange-spin-LAXSD
- flange-tilt-LAXSD
- flange-z-offset-LAXSD
- max-count-rate-LAXSD
- x-ray-energy-range-LAXSD

5.52.1 Quantitative design requirements

the small area pld system → the SAP LAXS detector → laxsd-performance-01

X-ray-energy-range-LAXSD shall be equal to 1-20 [keV].

Status

final

the small area pld system → the SAP LAXS detector → laxsd-performance-02

Energy-resolution-LAXSD shall be at least 130 [eV].

Status

final

the small area pld system → the SAP LAXS detector → laxsd-performance-03

Max-count-rate-LAXSD shall be at least 10000 [cps].

Status

final

the small area pld system → laxsd-orientation-01

Flange-tilt-LAXSD shall be equal to 0 [degrees].

Status

final

the small area pld system → laxsd-orientation-02

Flange-spin-LAXSD shall be equal to t.b.d. [degrees].

Comments

The LAXS detector shall have an angle of 90 degrees with the RHEED gun.

Status

placeholder

the small area pld system → laxsd-orientation-03

Flange-z-offset-LAXSD shall be equal to t.b.d. [mm].

Status

placeholder

the small area pld system → laxsd-flange-size-01

Flange-size-LAXSD shall be equal to DN160CF [-].

Status

final

5.53 The SAP PM-IRRAS source

This section describes **the SAP PM-IRRAS source**. This component is a sub-component of the small area pld system.

Comments

The name of this component is abbreviated as: **PM-IRRAS-S** (Phase Modulated Infrared Reflection Absorption Spectroscopy Source).

Responsible stakeholder(s):

Third party supplier

The following properties are specified for the SAP PM-IRRAS source:

- flange-size-PM-IRRAS-S
- flange-spin-PM-IRRAS-S
- flange-tilt-PM-IRRAS-S
- flange-z-offset-PM-IRRAS-S

5.53.1 Quantitative design requirements

the small area pld system → pm-irras-s-orientation-01

Flange-tilt-PM-IRRAS-S shall be equal to -10 [degrees].

Status

final

the small area pld system → pm-irras-s-orientation-02

Flange-spin-PM-IRRAS-S shall be equal to t.b.d. [degrees].

Status

placeholder

the small area pld system → pm-irras-s-orientation-03

Flange-z-offset-PM-IRRAS-S shall be equal to t.b.d. [mm].

Status

placeholder

the small area pld system → pm-irras-s-flange-size-01

Flange-size-PM-IRRAS-S shall be equal to DN63CF [-].

Status

final

5.54 The SAP PM-IRRAS detector

This section describes **the SAP PM-IRRAS detector**. This component is a sub-component of the small area pld system.

Comments

The name of this component is abbreviated as: **PM-IRRAS-D** (Phase modulated Infrared reflection absorption spectroscopy Detector).

Responsible stakeholder(s):

Third party supplier

The following properties are specified for the SAP PM-IRRAS detector:

- flange-size-PM-IRRAS-D
- flange-spin-PM-IRRAS-D
- flange-tilt-PM-IRRAS-D
- flange-z-offset-PM-IRRAS-D

5.54.1 Quantitative design requirements

the small area pld system → pm-irras-D-orientation-01

Flange-tilt-PM-IRRAS-D shall be equal to -10 [degrees].

Status

final

the small area pld system → pm-irras-D-orientation-02

Flange-spin-PM-IRRAS-D shall be equal to t.b.d. [degrees].

Status

placeholder

the small area pld system → pm-irras-D-orientation-03

Flange-z-offset-PM-IRRAS-D shall be equal to t.b.d. [mm].

Status

placeholder

the small area pld system → pm-irras-D-flange-size-01

Flange-size-PM-IRRAS-D shall be equal to DN63CF [-].

Status

final

5.55 The SAP SE source

This section describes **the SAP SE source**. This component is a sub-component of the small area pld system.

Comments

The name of this component is abbreviated as: **SES** (Spectroscopic ellipsometry Source).

Responsible stakeholder(s):

Third party supplier

The following properties are specified for the SAP SE source:

- flange-size-SES
- flange-spin-SES
- flange-tilt-SES
- flange-z-offset-SES
- spot-size-SES

5.55.1 Quantitative design requirements

the small area pld system → the SAP SE source → ses-dr-performance-03

Spot-size-SES shall be approximately t.b.d. [mm].

Status

placeholder

the small area pld system → ses-orientation-01

Flange-tilt-SES shall be equal to -30 [degrees].

Status

final

the small area pld system → ses-orientation-02

Flange-spin-SES shall be equal to t.b.d. [degrees].

Status

placeholder

the small area pld system → ses-orientation-03

Flange-z-offset-SES shall be equal to t.b.d. [mm].

Status

the small area pld system → ses-orientation-03

placeholder

the small area pld system → ses-flange-size-01

Flange-size-SES shall be equal to DN40CF [-].

Status

final

5.56 The SAP SE detector

This section describes **the SAP SE detector**. This component is a sub-component of the small area pld system.

Comments

The name of this component is abbreviated as: **SED** (Spectroscopic ellipsometry Detector).

Responsible stakeholder(s):

Third party supplier

The following properties are specified for the SAP SE detector:

- flange-size-SED
- flange-spin-SED
- flange-tilt-SED
- flange-z-offset-SED
- measurement-speed-range-SED
- number-of-wavelengths-per-spectrum-SED
- spectral-range-SED

5.56.1 Quantitative design requirements

the small area pld system → the SAP SE detector → sed-performance-02

Measurement-speed-range-SED shall be at least 3-3 [s/spectrum].

Status

final

the small area pld system → the SAP SE detector → sed-performance-03

Spectral-range-SED shall be at least 193-1680 [nm].

Status

final

the small area pld system → the SAP SE detector → sed-performance-04

Number-of-wavelengths-per-spectrum-SED shall be at least 600 [points/spectrum].

Status

final

the small area pld system → sed-orientation-01

Flange-tilt-SED shall be equal to -30 [degrees].

Status

final

the small area pld system → sed-orientation-02

Flange-spin-SED shall be equal to t.b.d. [degrees].

Status

placeholder

the small area pld system → sed-orientation-03

Flange-z-offset-SED shall be equal to t.b.d. [mm].

Status

placeholder

the small area pld system → sed-flange-size-01

Flange-size-SED shall be equal to DN40CF [-].

Status

the small area pld system → sed-flange-size-01

final

5.57 The SAP MOSS source

This section describes **the SAP MOSS source**. This component is a sub-component of the small area pld system.

Comments

The name of this component is abbreviated as: **MOSSS** (Multi-beam Optical Stress Sensor Source).

Responsible stakeholder(s):

Third party supplier

The following properties are specified for the SAP MOSS source:

- flange-size-MOSSS
- flange-spin-MOSSS
- flange-tilt-MOSSS
- flange-z-offset-MOSSS

5.57.1 Quantitative design requirements

the small area pld system → mosss-orientation-01

Flange-tilt-MOSSS shall be equal to -45 [degrees].

Status

final

the small area pld system → mosss-orientation-02

Flange-spin-MOSSS shall be equal to t.b.d. [degrees].

Status

placeholder

the small area pld system → mosss-orientation-03

Flange-z-offset-MOSSS shall be equal to t.b.d. [mm].

Status

the small area pld system → mosss-orientation-03

placeholder

the small area pld system → mosss-flange-size-01

Flange-size-MOSSS shall be equal to DN40CF [-].

Status

final

5.58 The SAP MOSS detector

This section describes **the SAP MOSS detector**. This component is a sub-component of the small area pld system.

Comments

The name of this component is abbreviated as: **MOSSD** (Multi-beam Optical Stress Sensor Detector).

Responsible stakeholder(s):

Third party supplier

The following properties are specified for the SAP MOSS detector:

- flange-size-MOSSD
- flange-spin-MOSSD
- flange-tilt-MOSSD
- flange-z-offset-MOSSD

5.58.1 Quantitative design requirements

the small area pld system → mossd-orientation-01

Flange-tilt-MOSSD shall be equal to -45 [degrees].

Status

final

the small area pld system → mossd-orientation-02

Flange-spin-MOSSD shall be equal to t.b.d. [degrees].

Status

the small area pld system → mossd-orientation-02

placeholder

the small area pld system → mossd-orientation-03

Flange-z-offset-MOSSD shall be equal to t.b.d. [mm].

Status

placeholder

the small area pld system → mossd-flange-size-01

Flange-size-MOSSD shall be equal to DN40CF [-].

Status

final

5.59 The SAP pyrometer

This section describes **the SAP pyrometer**. This component is a sub-component of the small area pld system.

Comments

The name of this component is abbreviated as: **PM** (PyroMeter).

Responsible stakeholder(s):

Cluster supplier

The following properties are specified for the SAP pyrometer:

- flange-size-PM
- flange-spin-PM
- flange-tilt-PM
- flange-z-offset-PM

5.59.1 Quantitative design requirements

the small area pld system → the SAP pyrometer → ms-orientation-01

Flange-tilt-PM shall be equal to -20 [degrees].

Status

the small area pld system → the SAP pyrometer → ms-orientation-01

final

the small area pld system → the SAP pyrometer → ms-orientation-02

Flange-spin-PM shall be equal to 287.5 [degrees].

Status

final

the small area pld system → the SAP pyrometer → ms-orientation-03

Flange-z-offset-PM shall be equal to 0 [mm].

Status

final

the small area pld system → the SAP pyrometer → ms-flange-size-01

Flange-size-PM shall be equal to DN40CF [-].

Status

final

the small area pld system → pm-orientation-01

Flange-tilt-PM shall be equal to t.b.d. [degrees].

Status

placeholder

the small area pld system → pm-orientation-02

Flange-spin-PM shall be equal to t.b.d. [degrees].

Status

placeholder

the small area pld system → pm-orientation-03

Flange-z-offset-PM shall be equal to t.b.d. [mm].

Status

placeholder

the small area pld system → pm-flange-size-01

Flange-size-PM shall be equal to DN40CF [-].

Status

final

5.60 The z-measurement laser source

This section describes **the z-measurement laser source**. This component is a sub-component of the small area pld system.

Comments

The name of this component is abbreviated as: **ZMS** (Z Measurement laser Source).

Responsible stakeholder(s):

Cluster supplier

The following properties are specified for the z-measurement laser source:

- flange-size-ZMS
- flange-spin-ZMS
- flange-tilt-ZMS
- flange-z-offset-ZMS

5.60.1 Quantitative design requirements

the small area pld system → zms-orientation-01

Flange-tilt-ZMS shall be equal to t.b.d. [degrees].

Status

placeholder

the small area pld system → zms-orientation-02

Flange-spin-ZMS shall be equal to t.b.d. [degrees].

Status

placeholder

the small area pld system → zms-orientation-03

Flange-z-offset-ZMS shall be equal to t.b.d. [mm].

Status

placeholder

the small area pld system → zms-flange-size-01

Flange-size-ZMS shall be equal to DN16CF [-].

Status

final

5.61 The z-measurement laser profiler

This section describes **the z-measurement laser profiler**. This component is a sub-component of the small area pld system.

Comments

The name of this component is abbreviated as: **ZMP** (Z Measurement laser Profiler).

Responsible stakeholder(s):

Cluster supplier

The following properties are specified for the z-measurement laser profiler:

- flange-size-ZMP
- flange-spin-ZMP
- flange-tilt-ZMP
- flange-z-offset-ZMP

5.61.1 Quantitative design requirements

the small area pld system → zmp-orientation-01

Flange-tilt-ZMP shall be equal to t.b.d. [degrees].

Status

placeholder

the small area pld system → zmp-orientation-02

Flange-spin-ZMP shall be equal to t.b.d. [degrees].

Status

placeholder

the small area pld system → zmp-orientation-03

Flange-z-offset-ZMP shall be equal to t.b.d. [mm].

Status

placeholder

the small area pld system → zmp-flange-size-01

Flange-size-ZMP shall be equal to DN16CF [-].

Status

final

5.62 The SAP residual gas analyzer

This section describes **the SAP residual gas analyzer**. This component is a sub-component of the small area pld system.

Comments

The name of this component is abbreviated as: **MS** (Mass Spectrometer).

Responsible stakeholder(s):

Cluster supplier

The following properties are specified for the SAP residual gas analyzer:

- flange-size-RGA

- flange-spin-RGA
- flange-tilt-RGA
- flange-z-offset-RGA
- mass-range-RGA
- maximum-operating-pressure-RGA
- minimum-detectable-partial-pressure-RGA
- resolution-RGA
- sensitivity-RGA

5.62.1 Quantitative design requirements

the small area pld system → the SAP residual gas analyzer → rga-performance-01

Mass-range-RGA shall be at least 1-100 [amu].

Status

final

the small area pld system → the SAP residual gas analyzer → rga-performance-02

Resolution-RGA shall be at least 0.5 [amu].

Status

final

the small area pld system → the SAP residual gas analyzer → rga-performance-03

Sensitivity-RGA shall be at least $0 \cdot 10^{-4}$ [A/mbar].

Status

final

the small area pld system → the SAP residual gas analyzer → rga-performance-04

Minimum-detectable-partial-pressure-RGA shall be equal to $0 \cdot 10^{-11}$ [mbar].

Status

final

the small area pld system → the SAP residual gas analyzer → rga-performance-05

Maximum-operating-pressure-RGA shall be at least $0 \cdot 10^{-4}$ [mbar].

Status

final

the small area pld system → ms-orientation-01

Flange-tilt-RGA shall be equal to t.b.d. [degrees].

Status

placeholder

the small area pld system → ms-orientation-02

Flange-spin-RGA shall be equal to t.b.d. [degrees].

Status

placeholder

the small area pld system → ms-orientation-03

Flange-z-offset-RGA shall be equal to t.b.d. [mm].

Status

placeholder

the small area pld system → ms-flange-size-01

Flange-size-RGA shall be equal to DN40CF [-].

Status

final

5.63 The SAP pressure-gauge

This section describes **the SAP pressure-gauge**. This component is a sub-component of the small area pld system.

Comments

The name of this component is abbreviated as: **PG** (Pressure Gauge)

Responsible stakeholder(s):

Cluster supplier

The following properties are specified for the SAP pressure-gauge:

- flange-size-PG
- flange-spin-PG
- flange-tilt-PG
- flange-z-offset-PG

5.63.1 Quantitative design requirements

the small area pld system → pg-orientation-01

Flange-tilt-PG shall be equal to t.b.d. [degrees].

Status

placeholder

the small area pld system → pg-orientation-02

Flange-spin-PG shall be equal to t.b.d. [degrees].

Status

placeholder

the small area pld system → pg-orientation-03

Flange-z-offset-PG shall be equal to t.b.d. [mm].

Status

placeholder

the small area pld system → pg-flange-size-01

Flange-size-PG shall be equal to DN40CF [-].

Status

final

5.64 SAP regular camera 1

This section describes **SAP regular camera 1**. This component is a sub-component of the small area pld system.

Comments

The name of this component is abbreviated as: **RC1** (Regular Camera 1).

Responsible stakeholder(s):

Cluster supplier

The following properties are specified for SAP regular camera 1:

- flange-size-RC1
- flange-spin-RC1
- flange-tilt-RC1
- flange-z-offset-RC1

5.64.1 Quantitative design requirements

the small area pld system → rc1-orientation-01

Flange-tilt-RC1 shall be equal to t.b.d. [degrees].

Status

placeholder

the small area pld system → rc1-orientation-02

Flange-spin-RC1 shall be equal to t.b.d. [degrees].

Status

placeholder

the small area pld system → rc1-orientation-03

Flange-z-offset-RC1 shall be equal to t.b.d. [mm].

Status

placeholder

the small area pld system → rc1-flange-size-01

Flange-size-RC1 shall be equal to DN40CF [-].

Status

final

5.65 SAP regular camera 2

This section describes **SAP regular camera 2**. This component is a sub-component of the small area pld system.

Comments

The name of this component is abbreviated as: **RC2** (Regular Camera 2).

Responsible stakeholder(s):

Cluster supplier

The following properties are specified for SAP regular camera 2:

- flange-size-RC2
- flange-spin-RC2
- flange-tilt-RC2
- flange-z-offset-RC2

5.65.1 Quantitative design requirements

the small area pld system → rc2-orientation-01

Flange-tilt-RC2 shall be equal to t.b.d. [degrees].

Status

placeholder

the small area pld system → rc2-orientation-02

Flange-spin-RC2 shall be equal to t.b.d. [degrees].

Status

placeholder

the small area pld system → rc2-orientation-03

Flange-z-offset-RC2 shall be equal to t.b.d. [mm].

Status

placeholder

the small area pld system → rc2-flange-size-01

Flange-size-RC2 shall be equal to DN63CF [-].

Status

final

5.66 SAP regular camera 3

This section describes **SAP regular camera 3**. This component is a sub-component of the small area pld system.

Comments

The name of this component is abbreviated as: **RC3** (Regular Camera 3).

Responsible stakeholder(s):

Cluster supplier

The following properties are specified for SAP regular camera 3:

- flange-size-RC3
- flange-spin-RC3
- flange-tilt-RC3
- flange-z-offset-RC3

5.66.1 Quantitative design requirements

the small area pld system → rc3-orientation-01

Flange-tilt-RC3 shall be equal to t.b.d. [degrees].

Status

placeholder

the small area pld system → rc3-orientation-02

Flange-spin-RC3 shall be equal to t.b.d. [degrees].

Status

placeholder

the small area pld system → rc3-orientation-03

Flange-z-offset-RC3 shall be equal to t.b.d. [mm].

Status

placeholder

the small area pld system → rc3-flange-size-01

Flange-size-RC3 shall be equal to DN63CF [-].

Status

final

5.67 The SAP target load-lock

This section describes **the SAP target load-lock**. This component is a sub-component of the small area pld system.

Comments

The name of this component is abbreviated as: **TLL** (Target Load-Lock)

Responsible stakeholder(s):

Cluster supplier

The following properties are specified for the SAP target load-lock:

- flange-size-TLL
- flange-spin-TLL
- flange-tilt-TLL
- flange-z-offset-TLL

5.67.1 Quantitative design requirements

the small area pld system → TLL-orientation-01

Flange-tilt-TLL shall be equal to 0 [degrees].

Status

final

the small area pld system → TLL-orientation-02

Flange-spin-TLL shall be equal to 180 [degrees].

Status

final

the small area pld system → TLL-orientation-03

Flange-z-offset-TLL shall be equal to -75 [mm].

Status

final

the small area pld system → TLL-flange-size-01

Flange-size-TLL shall be equal to DN160CF [-].

Status

final

5.68 The SAP substrate mask manipulator

This section describes **the SAP substrate mask manipulator**. This component is a sub-component of the small area pld system.

Comments

The name of this component is abbreviated as: **SMM** (Substrate Mask Manipulator). The goal of this component is to be able to manipulate the mask on the substrate holder to expose a new (area of) the substrate.

Responsible stakeholder(s):

Cluster supplier

The following properties are specified for the SAP substrate mask manipulator:

- flange-size-SMM
- flange-spin-SMM
- flange-tilt-SMM
- flange-z-offset-SMM

5.68.1 Quantitative design requirements

the small area pld system → smm-orientation-01

Flange-tilt-SMM shall be equal to t.b.d. [degrees].

Status

placeholder

the small area pld system → smm-orientation-02

Flange-spin-SMM shall be equal to t.b.d. [degrees].

Status

placeholder

the small area pld system → smm-orientation-03

Flange-z-offset-SMM shall be equal to t.b.d. [mm].

Status

placeholder

the small area pld system → smm-flange-size-01

Flange-size-SMM shall be equal to DN63CF [-].

Status

final

5.69 The SAP gas supply system

This section describes **the SAP gas supply system**. This component is a sub-component of the small area pld system.

Comments

The name of this component is abbreviated as: **GSS** (Gas Supply System).

Responsible stakeholder(s):

Cluster supplier

The following properties are specified for the SAP gas supply system:

- flange-size-GSS
- flange-spin-GSS
- flange-tilt-GSS
- flange-z-offset-GSS

5.69.1 Quantitative design requirements

the small area pld system → gss-orientation-01

Flange-tilt-GSS shall be equal to t.b.d. [degrees].

Status

placeholder

the small area pld system → gss-orientation-02

Flange-spin-GSS shall be equal to t.b.d. [degrees].

Status

placeholder

the small area pld system → gss-orientation-03

Flange-z-offset-GSS shall be equal to t.b.d. [mm].

Status

placeholder

the small area pld system → gss-flange-size-01

Flange-size-GSS shall be equal to DN16CF [-].

Status

final

5.70 The SAP bake-out blanket system

This section describes **the SAP bake-out blanket system**. This component is a sub-component of the small area pld system.

Comments

The name of this component is abbreviated as: **BBS** (Bake-out Blanket System).

Responsible stakeholder(s):

Cluster supplier

5.71 The SAP entrance flange

This section describes **the SAP entrance flange**. This component is a sub-component of the small area pld system.

Comments

The name of this component is abbreviated as: **EF** (Entrance Flange).

Responsible stakeholder(s):

Cluster supplier

The following properties are specified for the SAP entrance flange:

- entrance-flange-size-SAP
- flange-spin-EF
- flange-tilt-EF
- flange-z-offset-EF

5.71.1 Quantitative design requirements

the small area pld system → egv-orientation-01

Flange-tilt-EF shall be equal to 0 [degrees].

Status

final

the small area pld system → egv-orientation-02

Flange-spin-EF shall be equal to 0 [degrees].

Status

the small area pld system → egv-orientation-02

final

the small area pld system → egv-orientation-03

Flange-z-offset-EF shall be equal to 40 [mm].

Status

final

the small area pld system → egv-flange-size-01

Entrance-flange-size-SAP shall be equal to DN160CF [-].

Status

final

flange-sizes-01

Flange-size-gate-valve-3-TL shall be equal to entrance-flange-size-SAP .

Status

final

5.72 The SPS vessel

This section describes **the SPS vessel**. This component is a sub-component of the sputter system.

Comments

The name of this component is abbreviated as: **SCV** (Sputter Chamber Vessel).

Responsible stakeholder(s):

Cluster supplier

The following properties are specified for the SPS vessel:

- vessel-geometry

5.73 The SPS fuse box

This section describes **the SPS fuse box**. This component is a sub-component of the sputter system.

Comments

The name of this component is abbreviated as: **FB** (FuseBox).

Responsible stakeholder(s):

DIFFER

5.74 The SPS electronics rack

This section describes **the SPS electronics rack**. This component is a sub-component of the sputter system.

Comments

The name of this component is abbreviated as: **ELC** (ELectronics Cabinet).

Responsible stakeholder(s):

Cluster supplier

5.75 The SPS operating and control system

This section describes **the SPS operating and control system**. This component is a sub-component of the sputter system.

Comments

The name of this component is abbreviated as: **CS** (PldControl System).

Responsible stakeholder(s):

Cluster supplier

5.75.1 Sub-components

The SPS operating and control system is composed of the following sub-components:

- SPS QMB operating and control software
- SPS bake out operating and control software
- SPS camera operating and control software
- SPS operating and control hardware
- SPS process operating and control software

5.76 The SPS substrate motion stage

This section describes **the SPS substrate motion stage**. This component is a sub-component of the sputter system.

Comments

The name of this component is abbreviated as: **SMS** (Substrate Motion Stage).

Responsible stakeholder(s):

Cluster supplier

The following properties are specified for the SPS substrate motion stage:

- flange-size-SMS
- flange-spin-SMS
- flange-tilt-SMS
- flange-z-offset-SMS
- position-repeatability-SMS
- positioning-accuracy-SMS
- spin-range-SMS
- z-travel-range-SMS

5.76.1 Quantitative design requirements

the sputter system → the SPS substrate motion stage → sms-performance-01

Positioning-accuracy-SMS shall be at least t.b.d. [mum].

Status

placeholder

the sputter system → the SPS substrate motion stage → sms-performance-02

Position-repeatability-SMS shall be at least t.b.d. [mum].

Status

placeholder

the sputter system → the SPS substrate motion stage → sms-performance-03

Spin-range-SMS shall be equal to infinite [degrees].

Status

final

the sputter system → sms-orientation-01

Flange-tilt-SMS shall be equal to 90 [degrees].

Status

final

the sputter system → sms-orientation-02

Flange-spin-SMS shall be equal to 0 [degrees].

Status

final

the sputter system → sms-orientation-03

Flange-z-offset-SMS shall be equal to 0 [mm].

Status

final

the sputter system → sms-flange-size-01

Flange-size-SMS shall be equal to DN250CF [-].

Status

final

5.77 The SPS quartz microbalance

This section describes **the SPS quartz microbalance**. This component is a sub-component of the sputter system.

Comments

The name of this component is abbreviated as: **QMB** (Quartz Micro Balance).

Responsible stakeholder(s):

Cluster supplier

The following properties are specified for the SPS quartz microbalance:

- flange-size-QMB

- flange-spin-QMB
- flange-tilt-QMB
- flange-z-offset-QMB
- rate-of-deposition-range-QMB
- thickness-range-QMB
- thickness-resolution-QMB

5.77.1 Quantitative design requirements

the sputter system → the SPS quartz microbalance → qmb-resolution-01

Thickness-resolution-QMB shall be at least 1 [Angstrom].

Status

final

the sputter system → the SPS quartz microbalance → qmb-resolution-02

Thickness-range-QMB shall be at least 9 [mum].

Status

final

the sputter system → the SPS quartz microbalance → qmb-resolution-03

Rate-of-deposition-range-QMB shall be at least 9 [nm/s].

Status

final

the sputter system → qmb-orientation-01

Flange-tilt-QMB shall be equal to t.b.d. [degrees].

Status

placeholder

the sputter system → qmb-orientation-02

Flange-spin-QMB shall be equal to t.b.d. [degrees].

the sputter system → qmb-orientation-02

Status

placeholder

the sputter system → qmb-orientation-03

Flange-z-offset-QMB shall be equal to t.b.d. [mm].

Status

placeholder

the sputter system → qmb-flange-size-01

Flange-size-QMB shall be equal to DN63CF [-].

Status

final

5.77.2 Qualitative design requirements

the sputter system → qmb-retractable-01

The SPS quartz microbalance shall be retractable.

5.78 SPS sputter source 1

This section describes **SPS sputter source 1**. This component is a sub-component of the sputter system.

Comments

The name of this component is abbreviated as: **SS1** (Sputter Source 1).

Responsible stakeholder(s):

Cluster supplier

The following properties are specified for SPS sputter source 1:

- flange-size-SS1
- flange-spin-SS1
- flange-tilt-SS1

- flange-z-offset-SS1
- sputter-target-size-SS1
- sputter-working-principle-SS1

5.78.1 Quantitative design requirements

the sputter system → ss1-orientation-01

Flange-tilt-SS1 shall be equal to -60 [degrees].

Status

final

the sputter system → ss1-orientation-02

Flange-spin-SS1 shall be equal to 60 [degrees].

Status

final

the sputter system → ss1-orientation-03

Flange-z-offset-SS1 shall be equal to 25 [mm].

Status

final

the sputter system → ss1-flange-size-01

Flange-size-SS1 shall be equal to DN160CF [-].

Status

final

the sputter system → ss1-max-target-size-01

Sputter-target-size-SS1 shall be equal to 2 [inch].

Status

final

the sputter system → ss1-working-principle-01

Sputter-working-principle-SS1 shall be equal to DC-sputtering [-].

Status

final

5.78.2 Qualitative design requirements

the sputter system → ss1-four-inch

SPS sputter source 1 shall be replaceable by a 4-inch source.

5.79 SPS sputter source 2

This section describes **SPS sputter source 2**. This component is a sub-component of the sputter system.

Comments

The name of this component is abbreviated as: **SS2** (Sputter Source 2).

Responsible stakeholder(s):

Cluster supplier

The following properties are specified for SPS sputter source 2:

- flange-size-SS2
- flange-spin-SS2
- flange-tilt-SS2
- flange-z-offset-SS2
- sputter-target-size-SS2
- sputter-working-principle-SS2

5.79.1 Quantitative design requirements

the sputter system → ss2-orientation-01

Flange-tilt-SS2 shall be equal to -60 [degrees].

Status

final

the sputter system → ss2-orientation-02

Flange-spin-SS2 shall be equal to 180 [degrees].

Status

final

the sputter system → ss2-orientation-03

Flange-z-offset-SS2 shall be equal to 25 [mm].

Status

final

the sputter system → ss2-flange-size-01

Flange-size-SS2 shall be equal to DN160CF [-].

Status

final

the sputter system → ss2-max-target-size-01

Sputter-target-size-SS2 shall be equal to 2 [inch].

Status

final

the sputter system → ss2-working-principle-01

Sputter-working-principle-SS2 shall be equal to DC-sputtering [-].

Status

final

5.79.2 Qualitative design requirements

the sputter system → ss2-four-inch

SPS sputter source 2 shall be replaceable by a 4-inch source.

5.80 SPS sputter source 3

This section describes **SPS sputter source 3**. This component is a sub-component of the sputter system.

Comments

The name of this component is abbreviated as: **SS3** (Sputter Source 3).

Responsible stakeholder(s):

Cluster supplier

The following properties are specified for SPS sputter source 3:

- flange-size-SS3
- flange-spin-SS3
- flange-tilt-SS3
- flange-z-offset-SS3
- sputter-target-size-SS3
- sputter-working-principle-SS3

5.80.1 Quantitative design requirements

the sputter system → ss3-orientation-01

Flange-tilt-SS3 shall be equal to -60 [degrees].

Status

final

the sputter system → ss3-orientation-02

Flange-spin-SS3 shall be equal to 300 [degrees].

Status

final

the sputter system → ss3-orientation-03

Flange-z-offset-SS3 shall be equal to 25 [mm].

Status

final

the sputter system → ss3-flange-size-01

Flange-size-SS3 shall be equal to DN160CF [-].

Status

final

the sputter system → ss3-max-target-size-01

Sputter-target-size-SS3 shall be equal to 4 [inch].

Status

final

the sputter system → ss3-working-principle-01

Sputter-working-principle-SS3 shall be equal to DC-sputtering [-].

Status

final

5.80.2 Qualitative design requirements

the sputter system → ss4-four-inch

SPS sputter source 3 shall be replaceable by a 2-inch source.

5.81 The SPS vacuum pump system

This section describes **the SPS vacuum pump system**. This component is a sub-component of the sputter system.

Comments

The name of this component is abbreviated as: **VPS** (Vacuum Pump System).

Responsible stakeholder(s):

Cluster supplier

The following properties are specified for the SPS vacuum pump system:

- flange-size-VPS
- flange-spin-VPS

- flange-tilt-VPS
- flange-z-offset-VPS

5.81.1 Quantitative design requirements

the sputter system → vps-orientation-01

Flange-tilt-VPS shall be equal to t.b.d. [degrees].

Status

placeholder

the sputter system → vps-orientation-02

Flange-spin-VPS shall be equal to t.b.d. [degrees].

Status

placeholder

the sputter system → vps-orientation-03

Flange-z-offset-VPS shall be equal to t.b.d. [mm].

Status

placeholder

the sputter system → vps-flange-size-01

Flange-size-VPS shall be equal to DN160CF [-].

Status

final

5.81.2 Sub-components

The SPS vacuum pump system is composed of the following sub-components:

- main-turbo-pump
- sps-backing-pump

5.82 The SPS gas supply system

This section describes **the SPS gas supply system**. This component is a sub-component of the sputter system.

Comments

The name of this component is abbreviated as: **GSS** (Gas Supply System).

Responsible stakeholder(s):

Cluster supplier

The following properties are specified for the SPS gas supply system:

- flange-size-GSS
- flange-spin-GSS
- flange-tilt-GSS
- flange-z-offset-GSS

5.82.1 Quantitative design requirements

the sputter system → gss-orientation-01

Flange-tilt-GSS shall be equal to t.b.d. [degrees].

Status

placeholder

the sputter system → gss-orientation-02

Flange-spin-GSS shall be equal to t.b.d. [degrees].

Status

placeholder

the sputter system → gss-orientation-03

Flange-z-offset-GSS shall be equal to t.b.d. [mm].

Status

placeholder

the sputter system → gss-flange-size-01

Flange-size-GSS shall be equal to DN16CF [-].

Status

final

5.83 SPS regular camera 1

This section describes **SPS regular camera 1**. This component is a sub-component of the sputter system.

Comments

The name of this component is abbreviated as: **RC1** (Regular Camera 1).

Responsible stakeholder(s):

Cluster supplier

The following properties are specified for SPS regular camera 1:

- flange-size-RC1
- flange-spin-RC1
- flange-tilt-RC1
- flange-z-offset-RC1

5.83.1 Quantitative design requirements

the sputter system → rc1-orientation-01

Flange-tilt-RC1 shall be equal to t.b.d. [degrees].

Status

placeholder

the sputter system → rc1-orientation-02

Flange-spin-RC1 shall be equal to t.b.d. [degrees].

Status

placeholder

the sputter system → rc1-orientation-03

Flange-z-offset-RC1 shall be equal to t.b.d. [mm].

Status

placeholder

the sputter system → rc1-flange-size-01

Flange-size-RC1 shall be equal to DN40CF [-].

Status

final

5.84 SPS regular camera 2

This section describes **SPS regular camera 2**. This component is a sub-component of the sputter system.

Comments

The name of this component is abbreviated as: **RC2** (Regular Camera 2).

Responsible stakeholder(s):

Cluster supplier

The following properties are specified for SPS regular camera 2:

- flange-size-RC2
- flange-spin-RC2
- flange-tilt-RC2
- flange-z-offset-RC2

5.84.1 Quantitative design requirements

the sputter system → rc2-orientation-01

Flange-tilt-RC2 shall be equal to t.b.d. [degrees].

Status

placeholder

the sputter system → rc2-orientation-02

Flange-spin-RC2 shall be equal to t.b.d. [degrees].

Status

placeholder

the sputter system → rc2-orientation-03

Flange-z-offset-RC2 shall be equal to t.b.d. [mm].

Status

placeholder

the sputter system → rc2-flange-size-01

Flange-size-RC2 shall be equal to DN40CF [-].

Status

final

5.85 The SPS bake out system

This section describes **the SPS bake out system**. This component is a sub-component of the sputter system.

Comments

The name of this component is abbreviated as: **BOS** (Bake-Out System).

Responsible stakeholder(s):

Cluster supplier

5.86 The SPS substrate mask manipulator

This section describes **the SPS substrate mask manipulator**. This component is a sub-component of the sputter system.

Comments

The name of this component is abbreviated as: **SMM** (Substrate Mask Manipulator). The goal of this component is to be able to manipulate the mask on the substrate holder to expose a new (area of) the substrate.

Responsible stakeholder(s):

Cluster supplier

The following properties are specified for the SPS substrate mask manipulator:

- flange-size-SMM
- flange-spin-SMM
- flange-tilt-SMM
- flange-z-offset-SMM

5.86.1 Quantitative design requirements

the sputter system → smm-orientation-01

Flange-tilt-SMM shall be equal to t.b.d. [degrees].

Status

placeholder

the sputter system → smm-orientation-02

Flange-spin-SMM shall be equal to t.b.d. [degrees].

Status

placeholder

the sputter system → smm-orientation-03

Flange-z-offset-SMM shall be equal to t.b.d. [mm].

Status

placeholder

the sputter system → smm-flange-size-01

Flange-size-SMM shall be equal to DN63CF [-].

Status

final

5.87 The SPS port hole

This section describes **the SPS port hole**. This component is a sub-component of the sputter system.

Comments

The name of this component is abbreviated as: **PH** (Port Hole).

Responsible stakeholder(s):

Cluster supplier

The following properties are specified for the SPS port hole:

- flange-size-PH
- flange-spin-PH
- flange-tilt-PH
- flange-z-offset-PH

5.87.1 Quantitative design requirements

the sputter system → ph-orientation-01

Flange-tilt-PH shall be equal to t.b.d. [degrees].

Status

placeholder

the sputter system → ph-orientation-02

Flange-spin-PH shall be equal to t.b.d. [degrees].

Status

placeholder

the sputter system → ph-orientation-03

Flange-z-offset-PH shall be equal to d [mm].

Status

placeholder

the sputter system → ph-flange-size-01

Flange-size-PH shall be equal to DN200CF [-].

the sputter system → ph-flange-size-01

Statusfinal

5.88 The SPS substrate manipulator stick

This section describes **the SPS substrate manipulator stick**. This component is a sub-component of the sputter system.

Comments

The name of this component is abbreviated as: **MPS** (substrate ManiPulator Stick).

Responsible stakeholder(s):

Cluster supplier

The following properties are specified for the SPS substrate manipulator stick:

- flange-size-MPS
- flange-spin-MPS
- flange-tilt-MPS
- flange-z-offset-MPS
- status-signals-SPS-SM

5.88.1 Quantitative design requirements

the sputter system → mps-orientation-01

Flange-tilt-MPS shall be equal to t.b.d. [degrees].

Statusplaceholder

the sputter system → mps-orientation-02

Flange-spin-MPS shall be equal to t.b.d. [degrees].

Statusplaceholder

the sputter system → mps-orientation-03

Flange-z-offset-MPS shall be equal to t.b.d. [mm].

Status

placeholder

the sputter system → mps-flange-size-01

Flange-size-MPS shall be equal to DN40CF [-].

Status

final

5.89 The SPS entrance flange

This section describes **the SPS entrance flange**. This component is a sub-component of the sputter system.

Comments

The name of this component is abbreviated as: **EF** (Entrance Flange).

Responsible stakeholder(s):

Cluster supplier

The following properties are specified for the SPS entrance flange:

- entrance-flange-size-SPS
- flange-spin-EF
- flange-tilt-EF
- flange-z-offset-EF

5.89.1 Quantitative design requirements

the sputter system → egv-orientation-01

Flange-tilt-EF shall be equal to 0 [degrees].

Status

final

the sputter system → egv-orientation-02

Flange-spin-EF shall be equal to 0 [degrees].

Status

final

the sputter system → egv-orientation-03

Flange-z-offset-EF shall be equal to 25 [mm].

Status

final

the sputter system → egv-flange-size-01

Entrance-flange-size-SPS shall be equal to DN160CF [-].

Status

final

flange-sizes-02

Flange-size-gate-valve-4-TL shall be equal to entrance-flange-size-SPS .

Status

final

5.90 The TL tube

This section describes **the TL tube**. This component is a sub-component of the transfer line.

Comments

The name of this component is abbreviated as: *TLT* (Transfer Line Tube)

Responsible stakeholder(s):

Cluster supplier

The following properties are specified for the TL tube:

- transfer-line-geometry

5.91 The TL operating and control system

This section describes **the TL operating and control system**. This component is a sub-component of the transfer line.

Comments

The name of this component is abbreviated as: *OCS* (Operating and Control System)

Responsible stakeholder(s):

Cluster supplier

5.91.1 Sub-components

The TL operating and control system is composed of the following sub-components:

- TL bake-out operating and control software
- TL camera operating and control software
- TL operating and control hardware
- TL process operating and control software

5.92 The TL fuse box

This section describes **the TL fuse box**. This component is a sub-component of the transfer line.

Comments

The name of this component is abbreviated as: *PDB* (Power Distribution Box)

Responsible stakeholder(s):

DIFFER

5.93 The TL electronics rack

This section describes **the TL electronics rack**. This component is a sub-component of the transfer line.

Comments

The name of this component is abbreviated as: *ER* (Electronics Rack)

Responsible stakeholder(s):

Cluster supplier

5.94 The TL substrate transportation system

This section describes **the TL substrate transportation system**. This component is a sub-component of the transfer line.

Comments

The name of this component is abbreviated as: *STS* (Substrate Transportation System)

Responsible stakeholder(s):

Cluster supplier

The following properties are specified for the TL substrate transportation system:

- large-substrate-transportation-capacity
- small-substrate-transportation-capacity

5.94.1 Quantitative design requirements

the transfer line → sts-capacity-01

Large-substrate-transportation-capacity shall be at least 3 [-].

Status

final

the transfer line → sts-capacity-02

Small-substrate-transportation-capacity shall be at least 5 [-].

Status

final

5.95 The TL vacuum pump system

This section describes **the TL vacuum pump system**. This component is a sub-component of the transfer line.

Comments

The name of this component is abbreviated as: *VPS* (Vacuum Pump System)

Responsible stakeholder(s):

Cluster supplier

5.95.1 Sub-components

The TL vacuum pump system is composed of the following sub-components:

- load-lock-backing-pump
- load-lock-turbo-pump
- transfer-line-backing-pump
- transfer-line-turbo-pump-1
- transfer-line-turbo-pump-2

5.96 The TL load-lock

This section describes **the TL load-lock**. This component is a sub-component of the transfer line.

Comments

The name of this component is abbreviated as: **LL** (Load-Lock).

Responsible stakeholder(s):

Cluster supplier

The following properties are specified for the TL load-lock:

- flange-size-LL

5.97 TL gate-valve-1

This section describes **TL gate-valve-1**. This component is a sub-component of the transfer line.

Comments

The name of this component is abbreviated as: **GV1** (Gate Valve 1).

Responsible stakeholder(s):

Cluster supplier

The following properties are specified for TL gate-valve-1:

- flange-size-gate-valve-1-TL
- x-position-GV1

5.98 TL camera 1

This section describes **TL camera 1**. This component is a sub-component of the transfer line.

Comments

The name of this component is abbreviated as: *TC1* (Transfer line Camera 1)

Responsible stakeholder(s):

Cluster supplier

The following properties are specified for TL camera 1:

- flange-size-CAM1
- x-position-CAM1

5.99 TL gate-valve-2

This section describes **TL gate-valve-2**. This component is a sub-component of the transfer line.

Comments

The name of this component is abbreviated as: **GV2** (Gate Valve 2).

Responsible stakeholder(s):

Cluster supplier

The following properties are specified for TL gate-valve-2:

- flange-size-gate-valve-2-TL
- x-position-GV2

5.100 TL camera 2

This section describes **TL camera 2**. This component is a sub-component of the transfer line.

Comments

The name of this component is abbreviated as: *TC2* (Transfer line Camera 2)

Responsible stakeholder(s):

Cluster supplier

The following properties are specified for TL camera 2:

- flange-size-CAM2
- x-position-CAM2

5.101 TL substrate manipulator stick 1

This section describes **TL substrate manipulator stick 1**. This component is a sub-component of the transfer line.

Comments

The name of this component is abbreviated as: **SM1** (Substrate ManiPulator stick 1).

Responsible stakeholder(s):

Cluster supplier

The following properties are specified for TL substrate manipulator stick 1:

- x-position-SM1

5.102 TL camera 3

This section describes **TL camera 3**. This component is a sub-component of the transfer line.

Comments

The name of this component is abbreviated as: *TC3* (Transfer line Camera 3)

Responsible stakeholder(s):

Cluster supplier

The following properties are specified for TL camera 3:

- flange-size-CAM3
- x-position-CAM3

5.103 TL gate-valve-3

This section describes **TL gate-valve-3**. This component is a sub-component of the transfer line.

Comments

The name of this component is abbreviated as: **GV3** (Gate Valve 3).

Responsible stakeholder(s):

Cluster supplier

The following properties are specified for TL gate-valve-3:

- flange-size-gate-valve-3-TL
- x-position-GV3

5.103.1 Quantitative design requirements

flange-sizes-01

Flange-size-gate-valve-3-TL shall be equal to entrance-flange-size-SAP .

Status

final

5.104 TL camera 4

This section describes **TL camera 4**. This component is a sub-component of the transfer line.

Comments

The name of this component is abbreviated as: *TC4* (Transfer line Camera 4)

Responsible stakeholder(s):

Cluster supplier

The following properties are specified for TL camera 4:

- flange-size-CAM4
- x-position-CAM4

5.105 TL gate-valve-4

This section describes **TL gate-valve-4**. This component is a sub-component of the transfer line.

Comments

The name of this component is abbreviated as: **GV4** (Gate Valve 4).

Responsible stakeholder(s):

Cluster supplier

The following properties are specified for TL gate-valve-4:

- flange-size-gate-valve-4-TL
- x-position-GV4

5.105.1 Quantitative design requirements

flange-sizes-02

Flange-size-gate-valve-4-TL shall be equal to entrance-flange-size-SPS .

Status

final

5.106 TL camera 5

This section describes **TL camera 5**. This component is a sub-component of the transfer line.

Comments

The name of this component is abbreviated as: *TC5* (Transfer line Camera 5)

Responsible stakeholder(s):

Cluster supplier

The following properties are specified for TL camera 5:

- flange-size-CAM5
- x-position-CAM5

5.107 TL blank-flange-1

This section describes **TL blank-flange-1**. This component is a sub-component of the transfer line.

Comments

The name of this component is abbreviated as: *BF1* (Blank Flange 1)

Responsible stakeholder(s):

Cluster supplier

The following properties are specified for TL blank-flange-1:

- flange-size-BF1
- x-position-BF1

5.108 TL camera 6

This section describes **TL camera 6**. This component is a sub-component of the transfer line.

Comments

The name of this component is abbreviated as: *TC6* (Transfer line Camera 6)

Responsible stakeholder(s):

Cluster supplier

The following properties are specified for TL camera 6:

- flange-size-CAM6
- x-position-CAM6

5.109 TL gate-valve-5

This section describes **TL gate-valve-5**. This component is a sub-component of the transfer line.

Comments

The name of this component is abbreviated as: **GV5** (Gate Valve 5).

Responsible stakeholder(s):

Cluster supplier

The following properties are specified for TL gate-valve-5:

- flange-size-gate-valve-5-TL
- x-position-GV5

5.109.1 Quantitative design requirements

flange-sizes-03

Flange-size-gate-valve-5-TL shall be equal to entrance-flange-size-ISS .

Status

final

5.110 TL camera 7

This section describes **TL camera 7**. This component is a sub-component of the transfer line.

Comments

The name of this component is abbreviated as: *TC7* (Transfer line Camera 7)

Responsible stakeholder(s):

Cluster supplier

The following properties are specified for TL camera 7:

- flange-size-CAM7
- x-position-CAM7

5.111 TL blank-flange-2

This section describes **TL blank-flange-2**. This component is a sub-component of the transfer line.

Comments

The name of this component is abbreviated as: *BF2* (Blank Flange 2)

Responsible stakeholder(s):

Cluster supplier

The following properties are specified for TL blank-flange-2:

- flange-size-BF2
- x-position-BF2

5.112 TL camera 8

This section describes **TL camera 8**. This component is a sub-component of the transfer line.

Comments

The name of this component is abbreviated as: *TC8* (Transfer line Camera 8)

Responsible stakeholder(s):

Cluster supplier

The following properties are specified for TL camera 8:

- flange-size-CAM8
- x-position-CAM8

5.113 TL substrate manipulator stick 2

This section describes **TL substrate manipulator stick 2**. This component is a sub-component of the transfer line.

Comments

The name of this component is abbreviated as: **SM2** (Substrate Manipulator stick 2).

Responsible stakeholder(s):

Cluster supplier

The following properties are specified for TL substrate manipulator stick 2:

- x-position-SM2

5.114 TL camera 9

This section describes **TL camera 9**. This component is a sub-component of the transfer line.

Comments

The name of this component is abbreviated as: *TC9* (Transfer line Camera 9)

Responsible stakeholder(s):

Cluster supplier

The following properties are specified for TL camera 9:

- flange-size-CAM9
- x-position-CAM9

5.115 TL gate-valve-6

This section describes **TL gate-valve-6**. This component is a sub-component of the transfer line.

Comments

The name of this component is abbreviated as: **GV6** (Gate Valve 6).

Responsible stakeholder(s):

Cluster supplier

The following properties are specified for TL gate-valve-6:

- flange-size-gate-valve-6-TL
- x-position-GV6

5.115.1 Quantitative design requirements

flange-sizes-04

Flange-size-gate-valve-6-TL shall be equal to entrance-flange-size-LAP .

Status

final

5.116 TL camera 10

This section describes **TL camera 10**. This component is a sub-component of the transfer line.

Comments

The name of this component is abbreviated as: *TC10* (Transfer line Camera 10)

Responsible stakeholder(s):

Cluster supplier

The following properties are specified for TL camera 10:

- flange-size-CAM10
- x-position-CAM10

5.117 TL substrate manipulator stick 3

This section describes **TL substrate manipulator stick 3**. This component is a sub-component of the transfer line.

Comments

The name of this component is abbreviated as: **SM3** (Substrate Manipulator stick 3).

Responsible stakeholder(s):

Cluster supplier

The following properties are specified for TL substrate manipulator stick 3:

- x-position-SM3

5.118 TL camera 11

This section describes **TL camera 11**. This component is a sub-component of the transfer line.

Comments

The name of this component is abbreviated as: *TC11* (Transfer line Camera 11)

Responsible stakeholder(s):

Cluster supplier

The following properties are specified for TL camera 11:

- flange-size-CAM11
- x-position-CAM11

5.119 TL gate-valve-7

This section describes **TL gate-valve-7**. This component is a sub-component of the transfer line.

Comments

The name of this component is abbreviated as: **GV7** (Gate Valve 7).

Responsible stakeholder(s):

Cluster supplier

The following properties are specified for TL gate-valve-7:

- flange-size-gate-valve-7-TL
- x-position-GV7

5.119.1 Quantitative design requirements

flange-sizes-05

Flange-size-gate-valve-7-TL shall be equal to entrance-flange-size-XPS .

Status

final

5.120 TL camera 12

This section describes **TL camera 12**. This component is a sub-component of the transfer line.

Comments

The name of this component is abbreviated as: *TC12* (Transfer line Camera 12)

Responsible stakeholder(s):

Cluster supplier

The following properties are specified for TL camera 12:

- flange-size-CAM12
- x-position-CAM12

5.121 The TL bake-out blanket system

This section describes **the TL bake-out blanket system**. This component is a sub-component of the transfer line.

Comments

The name of this component is abbreviated as: **BBS** (Bake-out Blanket System).

Responsible stakeholder(s):

Cluster supplier

6 System specification decomposition level 3

This chapter describes the system of interest at decomposition level 3 and introduces 48 additional components. In Figure 6.1 the associated design-structure-matrix (DSM) is shown. The DSM shows the dependencies between the elements that are relevant to this decomposition level.

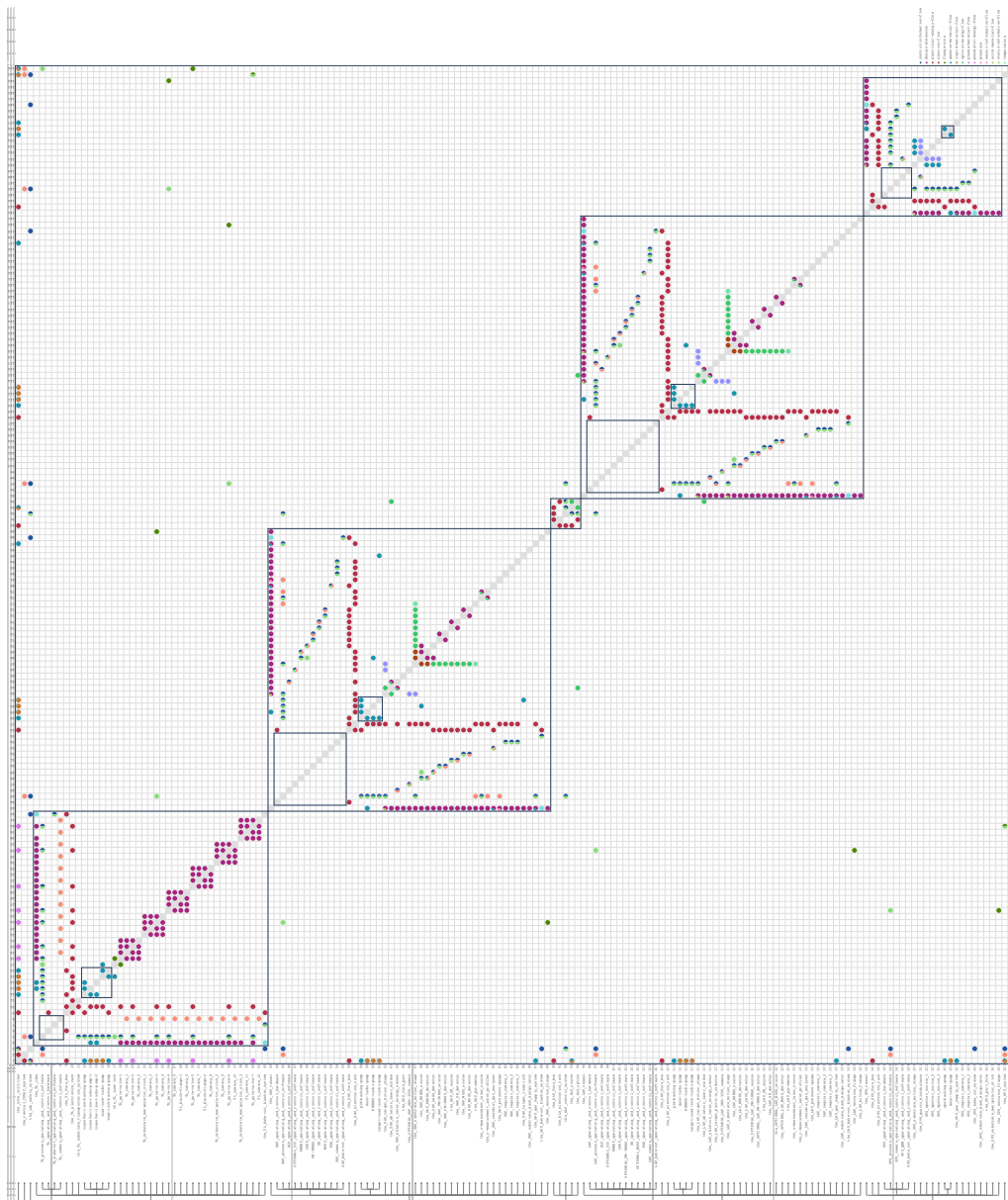


Figure 6.1: component dependency matrix of decomposition level 3.

6.1 LAP operating and control hardware

This section describes **LAP operating and control hardware**. This component is a sub-component of the large area pld system → the LAP operating and control system.

Comments

The name of this component is abbreviated as: **OCH** (Operating and Control Hardware).

Responsible stakeholder(s):

Cluster supplier

6.2 LAP process operating and control software

This section describes **LAP process operating and control software**. This component is a sub-component of the large area pld system → the LAP operating and control system.

Comments

The name of this component is abbreviated as: **POCS** (Process Operating and Control Software).

Responsible stakeholder(s):

Cluster supplier

6.2.1 Qualitative design requirements

the large area pld system → the LAP operating and control system → pocs-home-pulse

LAP process operating and control software shall be able to produce a ‘home-pulse’ on a user defined substrate position and orientation. Each time the substrate is in the specified position and orientation the system shall generate a pulse.

Comments

The home-pulse will be used to trigger external diagnostics.

6.3 ALD operating and control software

This section describes **ALD operating and control software**. This component is a sub-component of the large area pld system → the LAP operating and control system.

Comments

The name of this component is abbreviated as: **ALD-OCS** (Ablation Laser Diagnostic Operating and Control Software).

Responsible stakeholder(s):

Cluster supplier

6.4 OPTIONAL OIC operating and control software

This section describes **OPTIONAL OIC operating and control software**. This component is a sub-component of the large area pld system → the LAP operating and control system.

Comments

The name of this component is abbreviated as: **OIC-OCS** (OES and ICCD Operating and Control Software).

Responsible stakeholder(s):

DIFFER

6.5 RHEED operating and control software

This section describes **RHEED operating and control software**. This component is a sub-component of the large area pld system → the LAP operating and control system.

Comments

The name of this component is abbreviated as: **RHEED-OCS** (RHEED Operating and Control Software).

Responsible stakeholder(s):

Cluster supplier

6.6 LAXS operating and control software

This section describes **LAXS operating and control software**. This component is a sub-component of the large area pld system → the LAP operating and control system.

Comments

The name of this component is abbreviated as: **LAXS-OCS** (LAXS Operating and Control Software).

Responsible stakeholder(s):

Third party supplier

6.7 OPTIONAL PM-IRRAS operating and control software

This section describes **OPTIONAL PM-IRRAS operating and control software**. This component is a sub-component of the large area pld system → the LAP operating and control system.

Comments

The name of this component is abbreviated as: **PM-IRRAS-OCS** (PM-IRRAS Operating and Control Software).

Responsible stakeholder(s):

Third party supplier

6.8 SE operating and control software

This section describes **SE operating and control software**. This component is a sub-component of the large area pld system → the LAP operating and control system.

Comments

The name of this component is abbreviated as: **SE-OCS** (SE Operating and Control Software).

Responsible stakeholder(s):

Third party supplier

6.9 OPTIONAL MOSS operating and control software

This section describes **OPTIONAL MOSS operating and control software**. This component is a sub-component of the large area pld system → the LAP operating and control system.

Comments

The name of this component is abbreviated as: **MOSS-OCS** (MOSS Operating and Control Software).

Responsible stakeholder(s):

Third party supplier

6.10 RGA operating and control software

This section describes **RGA operating and control software**. This component is a sub-component of the large area pld system → the LAP operating and control system.

Comments

The name of this component is abbreviated as: **MS-OCS** (MS Operating and Control Software).

Responsible stakeholder(s):

Cluster supplier

6.11 LAP camera operating and control software

This section describes **LAP camera operating and control software**. This component is a sub-component of the large area pld system → the LAP operating and control system.

Comments

The name of this component is abbreviated as: **CAM-OCS** (CAMera Operating and Control Software).

Responsible stakeholder(s):

Cluster supplier

6.12 LAP bake-out operating and control software

This section describes **LAP bake-out operating and control software**. This component is a sub-component of the large area pld system → the LAP operating and control system.

Comments

The name of this component is abbreviated as: **BBS-OCS** (Bake-out Blanket System Operating and Control Software).

Responsible stakeholder(s):

Cluster supplier

6.13 Pld-backing-pump

This section describes **pld-backing-pump**. This component is a sub-component of the large area pld system → the LAP vacuum pump system.

Comments

The name of this component is abbreviated as: **PLDBP** (PLD Backing Pump)

Responsible stakeholder(s):

Cluster supplier

The following properties are specified for pld-backing-pump:

- cooling-method-PLDBP
- exhaust-flange-size-PLDBP
- foreline-flange-size-PLDBP
- lubrication-type-PLDBP
- max-pump-speed-PLDBP
- ultimate-pressure-PLDBP

6.13.1 Quantitative design requirements

the large area pld system → the LAP vacuum pump system → pldbp-max-pump-speed

Max-pump-speed-PLDBP shall be at least t.b.d. [l/s].

Status

placeholder

the large area pld system → the LAP vacuum pump system → pldbp-ultimate-pressure

Ultimate-pressure-PLDBP shall be at most t.b.d. [mbar].

Status

placeholder

the large area pld system → the LAP vacuum pump system → pldbp-cooling-method

Cooling-method-PLDBP shall be equal to convection [-].

Status

final

the large area pld system → the LAP vacuum pump system → pldbp-foreline-flange-size

Foreline-flange-size-PLDBP shall be equal to KF25 [-].

Status

final

the large area pld system → the LAP vacuum pump system → pldbp-exhaust-flange-size

Exhaust-flange-size-PLDBP shall be equal to KF25 [-].

Status

final

the large area pld system → the LAP vacuum pump system → pldbp-lubrication-type

Lubrication-type-PLDBP shall be equal to dry [-].

Status

the large area pld system → the LAP vacuum pump system → pldbp-lubrication-type

final

6.14 Main-turbo-pump

This section describes **main-turbo-pump**. This component is a sub-component of the large area pld system → the LAP vacuum pump system.

Comments

The name of this component is abbreviated as: **MTP** (MTP)

Responsible stakeholder(s):

Cluster supplier

The following properties are specified for main-turbo-pump:

- cooling-method-MTP
- foreline-flange-size-MTP
- lubrication-type-MTP
- max-foreline-pressure-MTP
- max-pump-speed-MTP
- ultimate-pressure-MTP

6.14.1 Quantitative design requirements

the large area pld system → the LAP vacuum pump system → mtp-max-pump-speed

Max-pump-speed-MTP shall be at least t.b.d. [l/s].

Status

placeholder

the large area pld system → the LAP vacuum pump system → mtp-ultimate-pressure

Ultimate-pressure-MTP shall be at most t.b.d. [mbar].

Status

placeholder

the large area pld system → the LAP vacuum pump system → mtp-max-foreline-pressure

Max-foreline-pressure-MTP shall be at most t.b.d. [mbar].

Status

placeholder

the large area pld system → the LAP vacuum pump system → mtp-cooling-method

Cooling-method-MTP shall be equal to water-cooling [-].

Status

final

the large area pld system → the LAP vacuum pump system → mtp-foreline-flange-size

Foreline-flange-size-MTP shall be equal to KF25 [-].

Status

final

the large area pld system → the LAP vacuum pump system → mtp-lubrication-type

Lubrication-type-MTP shall be equal to dry [-].

Status

final

6.15 RHEEDS-turbo-pump

This section describes **RHEEDS-turbo-pump**. This component is a sub-component of the large area pld system → the LAP vacuum pump system.

Comments

The name of this component is abbreviated as: **RTP** (RHEED source Turbo Pump)

Responsible stakeholder(s):

Cluster supplier

The following properties are specified for RHEEDS-turbo-pump:

- cooling-method-RTP

- foreline-flange-size-RTP
- lubrication-type-RTP
- max-foreline-pressure-RTP
- max-pump-speed-RTP
- ultimate-pressure-RTP

6.15.1 Quantitative design requirements

the large area pld system → the LAP vacuum pump system → rtp-max-pump-speed

Max-pump-speed-RTP shall be at least t.b.d. [l/s].

Status

placeholder

the large area pld system → the LAP vacuum pump system → rtp-ultimate-pressure

Ultimate-pressure-RTP shall be at most t.b.d. [mbar].

Status

placeholder

the large area pld system → the LAP vacuum pump system → rtp-max-foreline-pressure

Max-foreline-pressure-RTP shall be at most t.b.d. [mbar].

Status

placeholder

the large area pld system → the LAP vacuum pump system → rtp-cooling-method

Cooling-method-RTP shall be equal to water-cooling [-].

Status

final

the large area pld system → the LAP vacuum pump system → rtp-foreline-flange-size

Foreline-flange-size-RTP shall be equal to KF25 [-].

Status

the large area pld system → the LAP vacuum pump system → rtp-foreline-flange-size

final

the large area pld system → the LAP vacuum pump system → rtp-lubrication-type

Lubrication-type-RTP shall be equal to dry [-].

Statusfinal

6.16 Target-load-lock-turbo-pump

This section describes **target-load-lock-turbo-pump**. This component is a sub-component of the large area pld system → the LAP vacuum pump system.

Comments

The name of this component is abbreviated as: **TLLTP** (Target Load Lock Turbo Pump)

Responsible stakeholder(s):

Cluster supplier

The following properties are specified for target-load-lock-turbo-pump:

- cooling-method-TLLTP
- foreline-flange-size-TLLTP
- lubrication-type-TLLTP
- max-foreline-pressure-TLLTP
- max-pump-speed-TLLTP
- ultimate-pressure-TLLTP

6.16.1 Quantitative design requirements

the large area pld system → the LAP vacuum pump system → tlltp-max-pump-speed

Max-pump-speed-TLLTP shall be at least t.b.d. [l/s].

Statusplaceholder

the large area pld system → the LAP vacuum pump system → tlltp-ultimate-pressure

Ultimate-pressure-TLLTP shall be at most t.b.d. [mbar].

Status

placeholder

the large area pld system → the LAP vacuum pump system → tlltp-max-foreline-pressure

Max-foreline-pressure-TLLTP shall be at most t.b.d. [mbar].

Status

placeholder

the large area pld system → the LAP vacuum pump system → tlltp-cooling-method

Cooling-method-TLLTP shall be equal to water-cooling [-].

Status

final

the large area pld system → the LAP vacuum pump system → tlltp-foreline-flange-size

Foreline-flange-size-TLLTP shall be equal to KF25 [-].

Status

final

the large area pld system → the LAP vacuum pump system → tlltp-lubrication-type

Lubrication-type-TLLTP shall be equal to dry [-].

Status

final

6.17 SAP operating and control hardware

This section describes **SAP operating and control hardware**. This component is a sub-component of the small area pld system → the SAP operating and control system.

Comments

The name of this component is abbreviated as: **OCH** (Operating and Control Hardware).

Responsible stakeholder(s):

Cluster supplier

6.18 SAP process operating and control software

This section describes **SAP process operating and control software**. This component is a sub-component of the small area pld system → the SAP operating and control system.

Comments

The name of this component is abbreviated as: **POCS** (Process Operating and Control Software).

Responsible stakeholder(s):

Cluster supplier

6.19 ALD operating and control software

This section describes **ALD operating and control software**. This component is a sub-component of the small area pld system → the SAP operating and control system.

Comments

The name of this component is abbreviated as: **ALD-OCS** (Ablation Laser Diagnostic Operating and Control Software).

Responsible stakeholder(s):

Cluster supplier

6.20 OPTIONAL OIC operating and control software

This section describes **OPTIONAL OIC operating and control software**. This component is a sub-component of the small area pld system → the SAP operating and control system.

Comments

The name of this component is abbreviated as: **OIC-OCS** (OES and ICCD Operating and Control Software).

Responsible stakeholder(s):

DIFFER

6.21 RHEED operating and control software

This section describes **RHEED operating and control software**. This component is a sub-component of the small area pld system → the SAP operating and control system.

Comments

The name of this component is abbreviated as: **RHEED-OCS** (RHEED Operating and Control Software).

Responsible stakeholder(s):

Cluster supplier

6.22 LAXS operating and control software

This section describes **LAXS operating and control software**. This component is a sub-component of the small area pld system → the SAP operating and control system.

Comments

The name of this component is abbreviated as: **LAXS-OCS** (LAXS Operating and Control Software).

Responsible stakeholder(s):

Third party supplier

6.23 PM-IRRAS operating and control software

This section describes **PM-IRRAS operating and control software**. This component is a sub-component of the small area pld system → the SAP operating and control system.

Comments

The name of this component is abbreviated as: **PM-IRRAS-OCS** (PM-IRRAS Operating and Control Software).

Responsible stakeholder(s):

Third party supplier

6.24 SE operating and control software

This section describes **SE operating and control software**. This component is a sub-component of the small area pld system → the SAP operating and control system.

Comments

The name of this component is abbreviated as: **SE-OCS** (SE Operating and Control Software).

Responsible stakeholder(s):

Third party supplier

6.25 MOSS operating and control software

This section describes **MOSS operating and control software**. This component is a sub-component of the small area pld system → the SAP operating and control system.

Comments

The name of this component is abbreviated as: **MOSS-OCS** (MOSS Operating and Control Software).

Responsible stakeholder(s):

Third party supplier

6.26 RGA operating and control software

This section describes **RGA operating and control software**. This component is a sub-component of the small area pld system → the SAP operating and control system.

Comments

The name of this component is abbreviated as: **MS-OCS** (MS Operating and Control Software).

Responsible stakeholder(s):

Cluster supplier

6.27 SAP camera operating and control software

This section describes **SAP camera operating and control software**. This component is a sub-component of the small area pld system → the SAP operating and control system.

Comments

The name of this component is abbreviated as: **CAM-OCS** (CAMera Operating and Control Software).

Responsible stakeholder(s):

Cluster supplier

6.28 SAP bake-out operating and control software

This section describes **SAP bake-out operating and control software**. This component is a sub-component of the small area pld system → the SAP operating and control system.

Comments

The name of this component is abbreviated as: **BBS-OCS** (Bake-out Blanket System Operating and Control Software).

Responsible stakeholder(s):

Cluster supplier

6.29 Pld-backing-pump

This section describes **pld-backing-pump**. This component is a sub-component of the small area pld system → the SAP vacuum pump system.

Comments

The name of this component is abbreviated as: **PLDBP** (PLD Backing Pump)

Responsible stakeholder(s):

Cluster supplier

The following properties are specified for pld-backing-pump:

- cooling-method-PLDBP
- exhaust-flange-size-PLDBP
- foreline-flange-size-PLDBP
- lubrication-type-PLDBP
- max-pump-speed-PLDBP
- ultimate-pressure-PLDBP

6.29.1 Quantitative design requirements

the small area pld system → the SAP vacuum pump system → pldbp-max-pump-speed

Max-pump-speed-PLDBP shall be at least t.b.d. [l/s].

Status

placeholder

the small area pld system → the SAP vacuum pump system → pldbp-ultimate-pressure

Ultimate-pressure-PLDBP shall be at most t.b.d. [mbar].

Status

placeholder

the small area pld system → the SAP vacuum pump system → pldbp-cooling-method

Cooling-method-PLDBP shall be equal to convection [-].

Status

final

the small area pld system → the SAP vacuum pump system → pldbp-foreline-flange-size

Foreline-flange-size-PLDBP shall be equal to KF25 [-].

Status

final

the small area pld system → the SAP vacuum pump system → pldbp-exhaust-flange-size

Exhaust-flange-size-PLDBP shall be equal to KF25 [-].

Status

final

the small area pld system → the SAP vacuum pump system → pldbp-lubrication-type

Lubrication-type-PLDBP shall be equal to dry [-].

Status

final

6.30 Main-turbo-pump

This section describes **main-turbo-pump**. This component is a sub-component of the small area pld system → the SAP vacuum pump system.

Comments

The name of this component is abbreviated as: **MTP** (MTP)

Responsible stakeholder(s):

Cluster supplier

The following properties are specified for main-turbo-pump:

- cooling-method-MTP
- foreline-flange-size-MTP
- lubrication-type-MTP
- max-foreline-pressure-MTP
- max-pump-speed-MTP
- ultimate-pressure-MTP

6.30.1 Quantitative design requirements

the small area pld system → the SAP vacuum pump system → mtp-max-pump-speed

Max-pump-speed-MTP shall be at least t.b.d. [l/s].

Status

placeholder

the small area pld system → the SAP vacuum pump system → mtp-ultimate-pressure

Ultimate-pressure-MTP shall be at most t.b.d. [mbar].

Status

placeholder

the small area pld system → the SAP vacuum pump system → mtp-max-foreline-pressure

Max-foreline-pressure-MTP shall be at most t.b.d. [mbar].

Status

placeholder

the small area pld system → the SAP vacuum pump system → mtp-cooling-method

Cooling-method-MTP shall be equal to water-cooling [-].

Status

final

the small area pld system → the SAP vacuum pump system → mtp-foreline-flange-size

Foreline-flange-size-MTP shall be equal to KF25 [-].

Status

final

the small area pld system → the SAP vacuum pump system → mtp-lubrication-type

Lubrication-type-MTP shall be equal to dry [-].

Status

the small area pld system → the SAP vacuum pump system → mtp-lubrication-type

final

6.31 RHEEDS-turbo-pump

This section describes **RHEEDS-turbo-pump**. This component is a sub-component of the small area pld system → the SAP vacuum pump system.

Comments

The name of this component is abbreviated as: **RTP** (RHEED source Turbo Pump)

Responsible stakeholder(s):

Cluster supplier

The following properties are specified for RHEEDS-turbo-pump:

- cooling-method-RTP
- foreline-flange-size-RTP
- lubrication-type-RTP
- max-foreline-pressure-RTP
- max-pump-speed-RTP
- ultimate-pressure-RTP

6.31.1 Quantitative design requirements

the small area pld system → the SAP vacuum pump system → rtp-max-pump-speed

Max-pump-speed-RTP shall be at least t.b.d. [l/s].

Status

placeholder

the small area pld system → the SAP vacuum pump system → rtp-ultimate-pressure

Ultimate-pressure-RTP shall be at most t.b.d. [mbar].

Status

placeholder

the small area pld system → the SAP vacuum pump system → rtp-max-foreline-pressure

Max-foreline-pressure-RTP shall be at most t.b.d. [mbar].

Status

placeholder

the small area pld system → the SAP vacuum pump system → rtp-cooling-method

Cooling-method-RTP shall be equal to water-cooling [-].

Status

final

the small area pld system → the SAP vacuum pump system → rtp-foreline-flange-size

Foreline-flange-size-RTP shall be equal to KF25 [-].

Status

final

the small area pld system → the SAP vacuum pump system → rtp-lubrication-type

Lubrication-type-RTP shall be equal to dry [-].

Status

final

6.32 Target-load-lock-turbo-pump

This section describes **target-load-lock-turbo-pump**. This component is a sub-component of the small area pld system → the SAP vacuum pump system.

Comments

The name of this component is abbreviated as: **TLLTP** (Target Load Lock Turbo Pump)

Responsible stakeholder(s):

Cluster supplier

The following properties are specified for target-load-lock-turbo-pump:

- cooling-method-TLLTP

- foreline-flange-size-TLLTP
- lubrication-type-TLLTP
- max-foreline-pressure-TLLTP
- max-pump-speed-TLLTP
- ultimate-pressure-TLLTP

6.32.1 Quantitative design requirements

the small area pld system → the SAP vacuum pump system → tlltp-max-pump-speed

Max-pump-speed-TLLTP shall be at least t.b.d. [l/s].

Status

placeholder

the small area pld system → the SAP vacuum pump system → tlltp-ultimate-pressure

Ultimate-pressure-TLLTP shall be at most t.b.d. [mbar].

Status

placeholder

the small area pld system → the SAP vacuum pump system → tlltp-max-foreline-pressure

Max-foreline-pressure-TLLTP shall be at most t.b.d. [mbar].

Status

placeholder

the small area pld system → the SAP vacuum pump system → tlltp-cooling-method

Cooling-method-TLLTP shall be equal to water-cooling [-].

Status

final

the small area pld system → the SAP vacuum pump system → tlltp-foreline-flange-size

Foreline-flange-size-TLLTP shall be equal to KF25 [-].

Status

the small area pld system → the SAP vacuum pump system → tltp-foreline-flange-size

final

the small area pld system → the SAP vacuum pump system → tltp-lubrication-type

Lubrication-type-TLLTP shall be equal to dry [-].

Status

final

6.33 SPS operating and control hardware

This section describes **SPS operating and control hardware**. This component is a sub-component of the sputter system → the SPS operating and control system.

Comments

The name of this component is abbreviated as: **OCH** (Operating and Control Hardware).

Responsible stakeholder(s):

Cluster supplier

6.34 SPS process operating and control software

This section describes **SPS process operating and control software**. This component is a sub-component of the sputter system → the SPS operating and control system.

Comments

The name of this component is abbreviated as: **POCS** (Process Operation and Control Software).

Responsible stakeholder(s):

Cluster supplier

6.35 SPS camera operating and control software

This section describes **SPS camera operating and control software**. This component is a sub-component of the sputter system → the SPS operating and control system.

Comments

The name of this component is abbreviated as: **COCS** (Camera Operation and Control Software).

Responsible stakeholder(s):

Cluster supplier

6.36 SPS QMB operating and control software

This section describes **SPS QMB operating and control software**. This component is a sub-component of the sputter system → the SPS operating and control system.

Comments

The name of this component is abbreviated as: **QOCS** (QMB Operation and Control Software).

Responsible stakeholder(s):

Cluster supplier

6.37 SPS bake out operating and control software

This section describes **SPS bake out operating and control software**. This component is a sub-component of the sputter system → the SPS operating and control system.

Comments

The name of this component is abbreviated as: **BOCS** (Bake-out Operation and Control Software).

Responsible stakeholder(s):

Cluster supplier

6.38 Sps-backing-pump

This section describes **sps-backing-pump**. This component is a sub-component of the sputter system → the SPS vacuum pump system.

Comments

The name of this component is abbreviated as: **SPSBP** (sps Backing Pump)

Responsible stakeholder(s):

Cluster supplier

The following properties are specified for sps-backing-pump:

- cooling-method-SPSBP
- exhaust-flange-size-SPSBP
- foreline-flange-size-SPSBP
- lubrication-type-SPSBP
- max-pump-speed-SPSBP
- ultimate-pressure-SPSBP

6.38.1 Quantitative design requirements

the sputter system → the SPS vacuum pump system → spsbp-max-pump-speed

Max-pump-speed-SPSBP shall be at least t.b.d. [l/s].

Status

placeholder

the sputter system → the SPS vacuum pump system → spsbp-ultimate-pressure

Ultimate-pressure-SPSBP shall be at most t.b.d. [mbar].

Status

placeholder

the sputter system → the SPS vacuum pump system → spsbp-cooling-method

Cooling-method-SPSBP shall be equal to convection [-].

Status

final

the sputter system → the SPS vacuum pump system → spsbp-foreline-flange-size

Foreline-flange-size-SPSBP shall be equal to KF25 [-].

Status

final

the sputter system → the SPS vacuum pump system → spsbp-exhaust-flange-size

Exhaust-flange-size-SPSBP shall be equal to KF25 [-].

Status

final

the sputter system → the SPS vacuum pump system → spsbp-lubrication-type

Lubrication-type-SPSBP shall be equal to dry [-].

the sputter system → the SPS vacuum pump system → spsbp-lubrication-type

Statusfinal

6.39 Main-turbo-pump

This section describes **main-turbo-pump**. This component is a sub-component of the sputter system → the SPS vacuum pump system.

Comments

The name of this component is abbreviated as: **MTP** (MTP)

Responsible stakeholder(s):

Cluster supplier

The following properties are specified for main-turbo-pump:

- cooling-method-MTP
- foreline-flange-size-MTP
- lubrication-type-MTP
- max-foreline-pressure-MTP
- max-pump-speed-MTP
- ultimate-pressure-MTP

6.39.1 Quantitative design requirements

the sputter system → the SPS vacuum pump system → mtp-max-pump-speed

Max-pump-speed-MTP shall be at least t.b.d. [l/s].

Statusplaceholder

the sputter system → the SPS vacuum pump system → mtp-ultimate-pressure

Ultimate-pressure-MTP shall be at most t.b.d. [mbar].

Statusplaceholder

the sputter system → the SPS vacuum pump system → mtp-max-foreline-pressure

Max-foreline-pressure-MTP shall be at most t.b.d. [mbar].

Status

placeholder

the sputter system → the SPS vacuum pump system → mtp-cooling-method

Cooling-method-MTP shall be equal to water-cooling [-].

Status

final

the sputter system → the SPS vacuum pump system → mtp-foreline-flange-size

Foreline-flange-size-MTP shall be equal to KF25 [-].

Status

final

the sputter system → the SPS vacuum pump system → mtp-lubrication-type

Lubrication-type-MTP shall be equal to dry [-].

Status

final

6.40 TL process operating and control software

This section describes **TL process operating and control software**. This component is a sub-component of the transfer line → the TL operating and control system.

Comments

The name of this component is abbreviated as: **POCS** (Process Operating and Control Software).

Responsible stakeholder(s):

Cluster supplier

6.41 TL operating and control hardware

This section describes **TL operating and control hardware**. This component is a sub-component of the transfer line → the TL operating and control system.

Comments

The name of this component is abbreviated as: **OCH** (Operating and Control Hardware).

Responsible stakeholder(s):

Cluster supplier

6.42 TL bake-out operating and control software

This section describes **TL bake-out operating and control software**. This component is a sub-component of the transfer line → the TL operating and control system.

Comments

The name of this component is abbreviated as: **BOCS** (Bake-out Operating and Control Software).

Responsible stakeholder(s):

Cluster supplier

6.43 TL camera operating and control software

This section describes **TL camera operating and control software**. This component is a sub-component of the transfer line → the TL operating and control system.

Comments

The name of this component is abbreviated as: **COCS** (Camera Operating and Control Software).

Responsible stakeholder(s):

Cluster supplier

6.44 Transfer-line-backing-pump

This section describes **transfer-line-backing-pump**. This component is a sub-component of the transfer line → the TL vacuum pump system.

Comments

The name of this component is abbreviated as: **TLBP** (Transfer-Line Backing Pump)

Responsible stakeholder(s):

Cluster supplier

The following properties are specified for transfer-line-backing-pump:

- cooling-method-TLBP
- exhaust-flange-size-TLBP
- foreline-flange-size-TLBP
- lubrication-type-TLBP
- max-pump-speed-TLBP
- ultimate-pressure-TLBP

6.44.1 Quantitative design requirements

the transfer line → the TL vacuum pump system → tlbp-max-pump-speed

Max-pump-speed-TLBP shall be at least t.b.d. [l/s].

Status

placeholder

the transfer line → the TL vacuum pump system → tlbp-ultimate-pressure

Ultimate-pressure-TLBP shall be at most t.b.d. [mbar].

Status

placeholder

the transfer line → the TL vacuum pump system → tlbp-cooling-method

Cooling-method-TLBP shall be equal to convection [-].

Status

placeholder

the transfer line → the TL vacuum pump system → tlbp-foreline-flange-size

Foreline-flange-size-TLBP shall be equal to KF25 [-].

Status

final

the transfer line → the TL vacuum pump system → tlbp-exhaust-flange-size

Exhaust-flange-size-TLBP shall be equal to KF25 [-].

Status

final

the transfer line → the TL vacuum pump system → tlbp-lubrication-type

Lubrication-type-TLBP shall be equal to dry [-].

Status

final

6.45 Transfer-line-turbo-pump-1

This section describes **transfer-line-turbo-pump-1**. This component is a sub-component of the transfer line → the TL vacuum pump system.

Comments

The name of this component is abbreviated as: **TLTP1** (Transfer Line Turbo Pump 1)

Responsible stakeholder(s):

Cluster supplier

The following properties are specified for transfer-line-turbo-pump-1:

- cooling-method-TLTP1
- foreline-flange-size-TLTP1
- lubrication-type-TLTP1
- max-foreline-pressure-TLTP1
- max-pump-speed-TLTP1
- ultimate-pressure-TLTP1

6.45.1 Quantitative design requirements

the transfer line → the TL vacuum pump system → tltp1-max-pump-speed

Max-pump-speed-TLTP1 shall be at least t.b.d. [l/s].

Status

placeholder

the transfer line → the TL vacuum pump system → tltp1-ultimate-pressure

Ultimate-pressure-TLTP1 shall be at most t.b.d. [mbar].

Status

placeholder

the transfer line → the TL vacuum pump system → tltp1-max-foreline-pressure

Max-foreline-pressure-TLTP1 shall be at most t.b.d. [mbar].

Status

placeholder

the transfer line → the TL vacuum pump system → tltp1-cooling-method

Cooling-method-TLTP1 shall be equal to water-cooling [-].

Status

final

the transfer line → the TL vacuum pump system → tltp1-foreline-flange-size

Foreline-flange-size-TLTP1 shall be equal to KF25 [-].

Status

final

the transfer line → the TL vacuum pump system → tltp1-lubrication-type

Lubrication-type-TLTP1 shall be equal to dry [-].

Status

final

6.46 Transfer-line-turbo-pump-2

This section describes **transfer-line-turbo-pump-2**. This component is a sub-component of the transfer line → the TL vacuum pump system.

Comments

The name of this component is abbreviated as: **TLTP2** (Transfer Line Turbo Pump 2)

Responsible stakeholder(s):

Cluster supplier

The following properties are specified for transfer-line-turbo-pump-2:

- cooling-method-TLTP2
- foreline-flange-size-TLTP2
- lubrication-type-TLTP2
- max-foreline-pressure-TLTP2
- max-pump-speed-TLTP2
- ultimate-pressure-TLTP2

6.46.1 Quantitative design requirements

the transfer line → the TL vacuum pump system → tltp2-max-pump-speed

Max-pump-speed-TLTP2 shall be at least t.b.d. [l/s].

Status

placeholder

the transfer line → the TL vacuum pump system → tltp2-ultimate-pressure

Ultimate-pressure-TLTP2 shall be at most t.b.d. [mbar].

Status

placeholder

the transfer line → the TL vacuum pump system → tltp2-max-foreline-pressure

Max-foreline-pressure-TLTP2 shall be at most t.b.d. [mbar].

Status

placeholder

the transfer line → the TL vacuum pump system → tltp2-cooling-method

Cooling-method-TLTP2 shall be equal to water-cooling [-].

Status

the transfer line → the TL vacuum pump system → tltp2-cooling-method

final

the transfer line → the TL vacuum pump system → tltp2-foreline-flange-size

Foreline-flange-size-TLTP2 shall be equal to KF25 [-].

Status

final

the transfer line → the TL vacuum pump system → tltp2-lubrication-type

Lubrication-type-TLTP2 shall be equal to dry [-].

Status

final

6.47 Load-lock-turbo-pump

This section describes **load-lock-turbo-pump**. This component is a sub-component of the transfer line → the TL vacuum pump system.

Comments

The name of this component is abbreviated as: **LLTP** (Load-lock Turbo Pump 2)

Responsible stakeholder(s):

Cluster supplier

The following properties are specified for load-lock-turbo-pump:

- cooling-method-LLTP
- foreline-flange-size-LLTP
- lubrication-type-LLTP
- max-foreline-pressure-LLTP
- max-pump-speed-LLTP
- ultimate-pressure-LLTP

6.47.1 Quantitative design requirements

the transfer line → the TL vacuum pump system → lltp-max-pump-speed

Max-pump-speed-LLTP shall be at least t.b.d. [l/s].

Status

placeholder

the transfer line → the TL vacuum pump system → lltp-ultimate-pressure

Ultimate-pressure-LLTP shall be at most t.b.d. [mbar].

Status

placeholder

the transfer line → the TL vacuum pump system → lltp-max-foreline-pressure

Max-foreline-pressure-LLTP shall be at most t.b.d. [mbar].

Status

placeholder

the transfer line → the TL vacuum pump system → lltp-cooling-method

Cooling-method-LLTP shall be equal to water-cooling [-].

Status

final

the transfer line → the TL vacuum pump system → lltp-foreline-flange-size

Foreline-flange-size-LLTP shall be equal to KF25 [-].

Status

final

the transfer line → the TL vacuum pump system → lltp-lubrication-type

Lubrication-type-LLTP shall be equal to dry [-].

Status

the transfer line → the TL vacuum pump system → lltp-lubrication-type

final

6.48 Load-lock-backing-pump

This section describes **load-lock-backing-pump**. This component is a sub-component of the transfer line → the TL vacuum pump system.

Comments

The name of this component is abbreviated as: **LLBP** (Load-Lock Backing Pump)

Responsible stakeholder(s):

Cluster supplier

The following properties are specified for load-lock-backing-pump:

- cooling-method-LLBP
- exhaust-flange-size-LLBP
- foreline-flange-size-LLBP
- lubrication-type-LLBP
- max-pump-speed-LLBP
- ultimate-pressure-LLBP

6.48.1 Quantitative design requirements

the transfer line → the TL vacuum pump system → llbp-max-pump-speed

Max-pump-speed-LLBP shall be at least t.b.d. [l/s].

Status

placeholder

the transfer line → the TL vacuum pump system → llbp-ultimate-pressure

Ultimate-pressure-LLBP shall be at most t.b.d. [mbar].

Status

placeholder

the transfer line → the TL vacuum pump system → llbp-cooling-method

Cooling-method-LLBP shall be equal to convection [-].

Status

placeholder

the transfer line → the TL vacuum pump system → llbp-foreline-flange-size

Foreline-flange-size-LLBP shall be equal to KF25 [-].

Status

final

the transfer line → the TL vacuum pump system → llbp-exhaust-flange-size

Exhaust-flange-size-LLBP shall be equal to KF25 [-].

Status

final

the transfer line → the TL vacuum pump system → llbp-lubrication-type

Lubrication-type-LLBP shall be equal to dry [-].

Status

final
