

Annexure-III Transportation & Installation procedure for ACBs

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|  Linde Kryotechnik AG | ACB 1-5 Transport and Installation Procedure | L-SD 1036 Proj. No.: K.00519 |
| Customer Nr.: | | ITER-CD15 ACB 1-5 |

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LLSPs to refer Section 4 to 10 for detailed instructions

Remark for the actual version:
 Class of confidence 3 according LS 104-03: protected

| | | | | | | |
|-----------------|-------|----------|---------|--------------------------|-------------------------------|-----------|
| | | | | | | |
| For Fabrication | 01 | 03.03.23 | | FC (alba) / F. Holzer | R. Werz / TK A. Meier / TK | F. Holzer |
| Status | Issue | Date | Remarks | Issued | Reviewed | Approved |

1. Scope

This document describe the sequence of the transport preparation and the transport from the manufacturer (SIMIC S.p.a, Camerana, Italy) to ITER, Cadarache, France.

2. General remarks

1. In brackets it is noted who is responsible for each scope.
2. When information described in this document is not clear and unambiguous, please consult Linde Kryotechnik AG for further clarification before continuation of the works.
3. Client, ITER, is responsible for transport, unloading and placement of ACB coldboxes.

3. Documents

3.1. Packing lists

| Doc. No. | Description | Rev |
|-----------|-----------------------|-----|
| L-LX 1010 | ACB-1-CS Packing List | 01 |
| L-LX 1020 | ACB-2-TF Packing List | 01 |
| L-LX 1030 | ACB-3-ST Packing List | 01 |
| L-LX 1040 | ACB-4-PF Packing List | 01 |
| L-LX 1050 | ACB-5-CP Packing List | 01 |

3.2. Drawings

| Title | ACB-1 | ACB-2 | ACB-3 | ACB-4 | ACB-5 |
|----------------------------------|-----------|-----------|-----------|-----------|-----------|
| Transport | 200104184 | 200104183 | 200104186 | 200104185 | 200103573 |
| Transport saddle | 200103717 | | | | |
| Transport lashing point with rip | 200104046 | | | | |
| Transport lashing point | 200104047 | | | | |
| Craddle | 200103575 | | | | |
| Pump Nozzle for Transport | 200104588 | | | | |
| Pressure gauge asm for Transport | 200104579 | | | | |
| ACB Datalogger | 200104618 | | | | |

For information

| | | | | | |
|-----------------------------|-----------|-----------|-----------|-----------|-----------|
| External Piping | 200103504 | 200103501 | 200103510 | 200103507 | 200102213 |
| Dripping tray | 200104196 | 200104195 | 200104198 | 200104197 | 200104194 |
| Cooling water panel | 200102217 | | | | |
| Maintenance access | 200104043 | | | | |
| Vacuum pumping nozzle DN160 | 200102233 | | | | |
| Vacuum measurement system | 200102235 | | | | |
| Vacuum connection filter | 200102256 | | | | |
| Filtersystem-DN100 | 200102119 | | | | |

4. Preparation for transport (LKT-SIMIC)

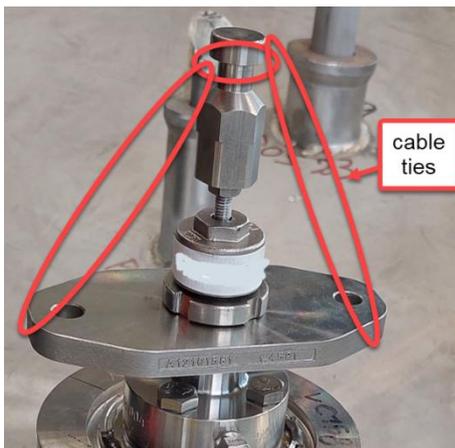
Following components (according Packing list) have to be dismantled for transport.

1. **Valves actuators, incl. tubing connection** to the instrument air header (please take pictures of the orientation of the valves and mark the tubing so it can be allocated correctly) and **manual valve (WEKA) upper part**
2. **Vacuum connection filter** (DWG 200102256)
3. **Pump Nozzle** (DWG 200102233),
4. **Cooling Water Panel** (DWG 200102217),
5. **Dripping Tray** (mark each segment for reassembly - e.g. numbers on drawing, vacuum vessel, pictures)
6. **Grid** of maintenance access
7. **Junction boxes and cable trays** (to make the deinstallation / installation of the tubing connections easier)
8. Dismount **PT100 Temperature sensor** MTC-0412 and MTC-0422. Close the opening with tape.
9. Remove Temperature He-Guard Dwg. no 200102271 (only Guard housing, not temperature sensor)

Fill pipe spools according chapter 5 with Nitrogen. Filling positions are shown on transport drawing.

4.1. Transport preparation Cryogenic valves

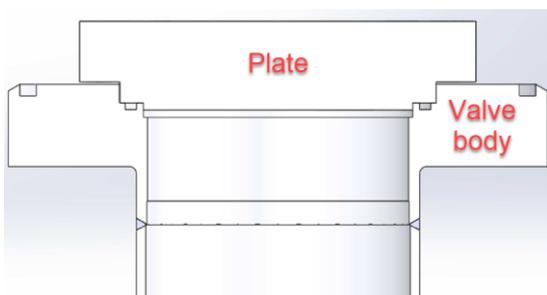
1. Spindles of Cryogenic valves have to be secured with cable ties to actuator plate (only after filling with Nitrogen!).



2. Spindles of guarded valves have to be removed for rework by Flowserve and have to be closed with flange plates (follow separate Flowserve specification for dismantling and packing of valves).

Following valves are concerned:

| TAG | ACB-1-CS | ACB-2-TF | ACB-3-ST | ACB-4-PF | ACB-5-CP |
|---------|----------|----------|----------|----------|----------|
| VC-3600 | DN100 | DN100 | DN100 | DN100 | DN100 |
| VC-3650 | DN65 | DN80 | DN80 | DN65 | DN65 |
| VC-3660 | DN32 | DN32 | DN32 | DN32 | DN25 |
| VC-3680 | DN15 | DN15 | DN15 | DN15 | DN15 |
| VC-4100 | DN15 | DN15 | DN15 | DN15 | DN15 |



5. Nitrogen filling (LKT-SIMIC)

The vacuum shell and the piping have to be filled with nitrogen for the transport to prevent ingress of impurity from ambient.

Nitrogen shall be filled up to following pressures:

Vacuum vessel 0.1 bar.g
Piping: 0.3 bar.g

To ensure that piping is completely filled with nitrogen it is recommended to manually lift the spindles of the cold valves during the N2 filling process to allow the nitrogen to distribute equally in the piping system.

Use additional equipment

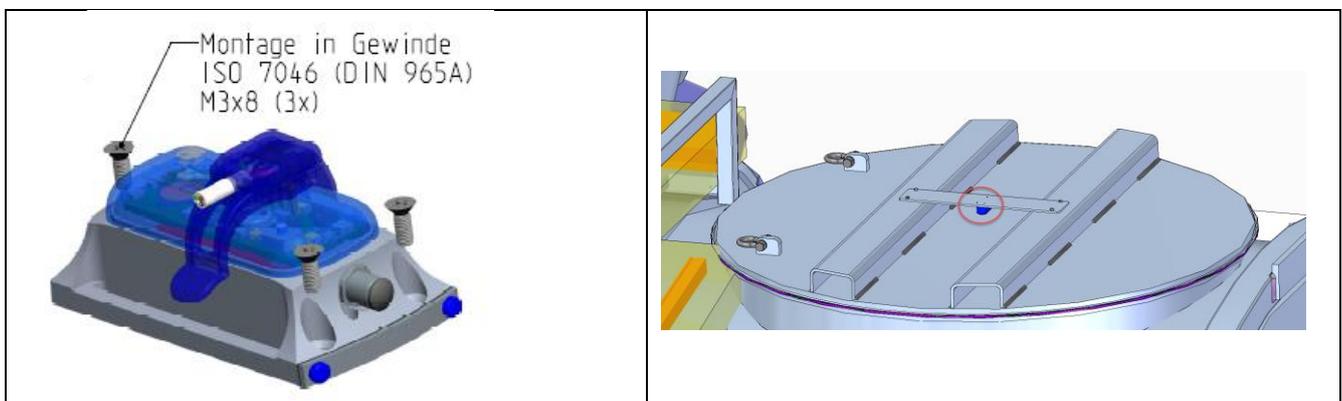
| | |
|--|--|
| <p>Vacuum vessel 200104588 Pump Nozzle for Transport</p> <p>Second pump port has be closed with blind flange ISO-K DN160</p> | |
| <p>Piping 200104579 Pressure gauge asm for Transport</p> | |

6. Accelerometers - Datalogger (LKT-SIMIC)

Datalogger will be provided by LKT and has to be returned to LKT afterwards (property of LKT).

The 3-axis accelerometers (Data logger) will be placed at upper access HX.

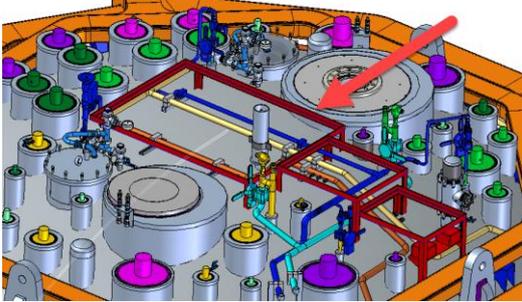
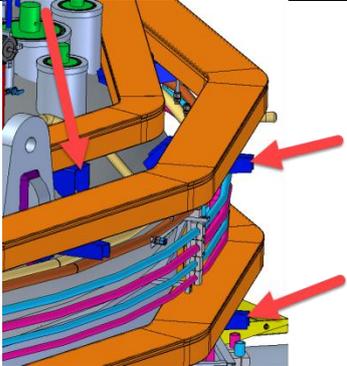
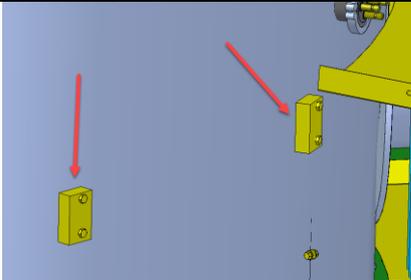
Datalogger has to be fixed on the coldbox before tilting and has to be removed when the coldbox is at its final position in Tokamak building.

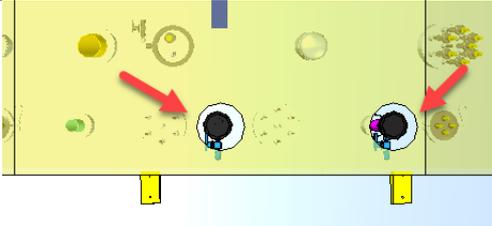
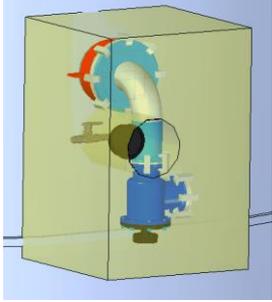
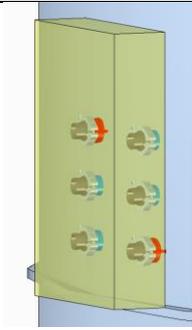


7. Protection for Transport (LKT-SIMIC)

1. Close flanges (e.g. manhole, filter) by tape to protect sealings.

2. Fix Datalogger on coldbox.
3. Seal sleeves with shrinking foil.
4. Protect sleeves (including piping) with wooden boxes (the wooden box of the top sleeve shall be removable and should stay within the maximum transport height of 4.7m as requested by ITER – if final measured height is higher than 4.7m LKT has to be informed)
5. Tilt coldbox to horizontal before further preparation for transport.
6. Cover valve plate with foil
7. Cover measurement and all other feed through with foil
8. Build the wooden protection hood. Take care to recess in protection hood for lashing.
 - a. Wooden protective hood protect valve plate, all remaining cable trays, connectors and pump nozzle.
 - b. To fix protective hood use following structures:

| | |
|---|---|
| <p>Frame Maintenance access</p> |  <p>Cable trays will be removed for transport.</p> |
| <p>Cable tray supports</p> <p><i>You can drill additional holes if required</i></p> |  <p>Cable trays will be removed for transport.</p> |
| <p>Fixing points of dripping tray 2x M10 thread</p> |  |
| <p>Piping filling ports (DWG 200104579)</p> | <p>Make window for checking nitrogen filling at manometer.</p> |

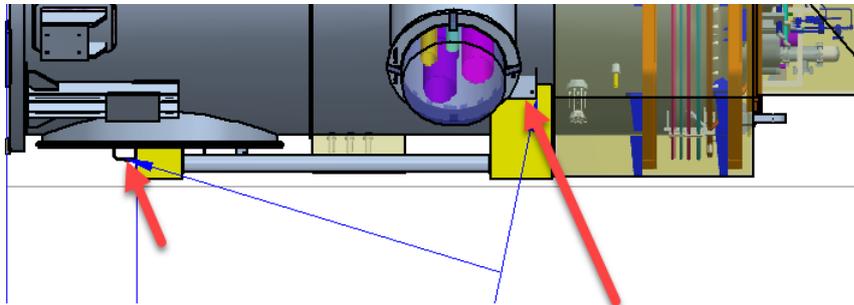
| | | |
|----------------------------------|--|--|
| |  | |
| <p>Pump Nozzle for transport</p> | <p>Use pipe clamp to fix wooden protective hood. (Pipesize: Ø154x2.0 mm) Make window for checking nitrogen filling at manometer.</p> |  |
| <p>Heater connectors</p> | <p>Use pipe clamp to fix wooden protective hood. (Pipesize: Ø44.5x2.0 mm)</p> |  |



**Create documentation for disassembly of wooden protection hood!
Mark position of screws for disassembly.**

8. Transport saddle (LKT-SIMIC)

Transport saddle (dwg 200103717) to be screwed to weld sheets at vacuum vessel.



9. Lifting and tilting (LKT-SIMIC-ITER)

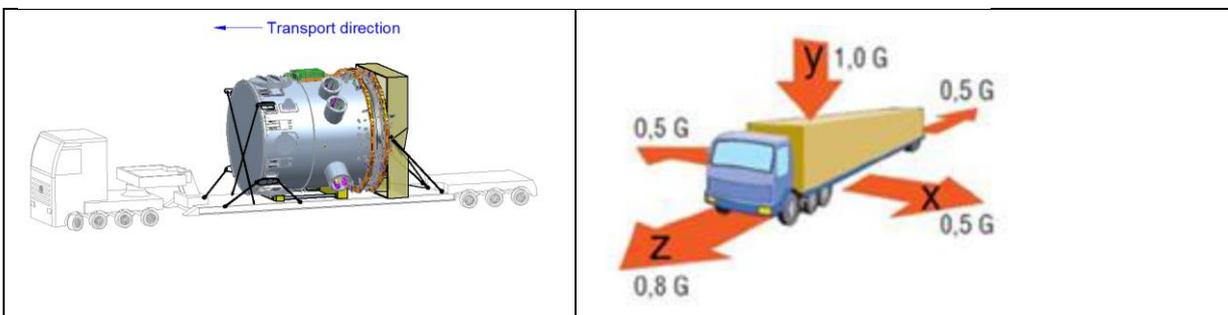
Lifting device must be provided by carrier.
Lifting and tilting information are shown on Transport drawing.

10. Transport road / sea (ITER)

(According: Specification_v0_2021-11-12)

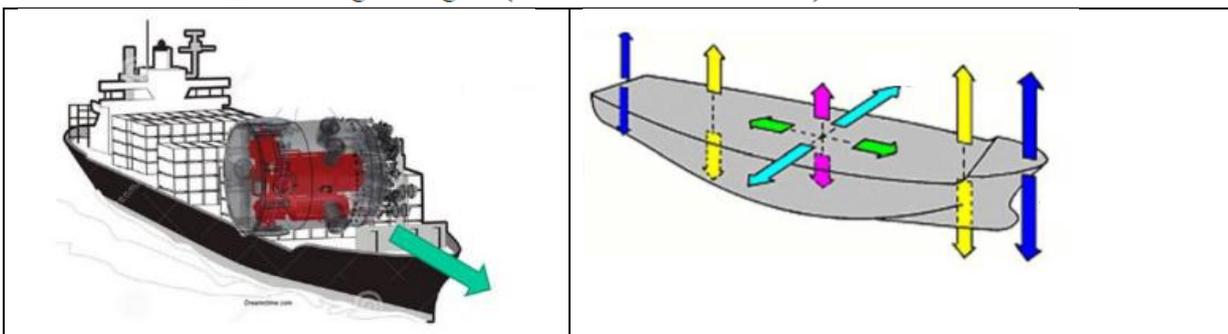
Road Transport Accelerations (4 combinations):

- $a_{x'} = + 0.5 \text{ g} / -0.5\text{g}$ (lateral direction 1)
- $a_{y'} = - 1.0 \text{ g}$ (lateral direction 2, gravity load)
- $a_{z'} = - 0.8 \text{ g} / +0.5\text{g}$ (axial direction of vessel)



Sea Transport Accelerations (8 combinations):

- $a_{x'} = + 0.5 \text{ g} / -0.5\text{g}$ (lateral direction 1)
- $a_{y'} = - 1.0 \text{ g} \pm 0.5 \text{ g}$ (lateral direction 2, gravity load included)
- $a_{z'} = + 0.5 \text{ g} / -0.5\text{g}$ (axial direction of vessel)



Lashing has be done according transport drawing.
Refer to protection notice ISO 16016.

11. Unloading (ITER)

1. Unload from road truck. For further information see transport drawing.
2. Coldbox has to be unpacked **according documentation**.
3. Bring coldbox to its final position. Use cradle (dwg 200103575) for lifting with hydro jack.

12. Internal Transport (ITER)

The procedure for transport inside the facility shall be defined by ITER, who is responsible for safe transportation within regulation.

13. Installation (LKT)

1. Install all actuators incl. tubing.
2. Install cable trays
3. Install junction boxes
4. Install cooling water panels, use new sealing.
5. Install wiring
6. Install vacuum pump nozzle, some parts are used in 200104588 Pump Nozzle for transport
7. Install vacuum connection filter
8. Install CRMs (to be done by ITER)
9. Install dripping tray