

# DA DOCUMENT DELIVERABLE

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## DA QA Deviation Request Deviation request related to cobalt content in chemical composition of Inconel 718 bolts

Deviation request related to cobalt content in chemical composition of Inconel 718 bolts

| Approval Process                                                    |                                                                                                                                                                                                                                                                                                                 |                         |                                        |
|---------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------|----------------------------------------|
|                                                                     | Name                                                                                                                                                                                                                                                                                                            | Action                  | Affiliation                            |
| Author                                                              | Joshi J.                                                                                                                                                                                                                                                                                                        | 04 May 2023:signed      |                                        |
| Co-Authors                                                          | Yadav A.                                                                                                                                                                                                                                                                                                        | 04 May 2023:signed      | IN DA (Supplier and DA) (IN)           |
| Reviewers                                                           | Beaudoin V.                                                                                                                                                                                                                                                                                                     | 12 May 2023:recommended | IO/DG/SQD/NS                           |
|                                                                     | Gohil G.                                                                                                                                                                                                                                                                                                        | 08 May 2023:recommended | IPR - Institute for Plasma Research... |
|                                                                     | Graceffa J.                                                                                                                                                                                                                                                                                                     | 12 May 2023:recommended | IO/DG/EDD/HCD/NB                       |
|                                                                     | Le Tonqueze Y.                                                                                                                                                                                                                                                                                                  | 24 May 2023:recommended | IO/DG/SQD/NS                           |
|                                                                     | Perrin J.- L.                                                                                                                                                                                                                                                                                                   | 05 May 2023:recommended | IO/DG/CIO/PFI/DIS                      |
|                                                                     | Torcy D.                                                                                                                                                                                                                                                                                                        | 10 May 2023:recommended | IO/DG/EDD/HCF/HCR                      |
|                                                                     | Vertongen P.                                                                                                                                                                                                                                                                                                    | 10 May 2023:recommended | IO/DG/SQD/QMD                          |
| Approver                                                            | Veltri P.                                                                                                                                                                                                                                                                                                       | 25 May 2023:approved    | IO/DG/EDD/HCD/NB                       |
| Document Security: Non-public - Unclassified<br>RO: Graceffa Joseph |                                                                                                                                                                                                                                                                                                                 |                         |                                        |
| Read Access                                                         | LG: INDA DNB Team, LG: F4E_NB_PS, AD: ITER, AD: External Collaborators, AD: IO_Director-General, AD: External Management Advisory Board, AD: IDM_Controller, AD: OBS - Neutral Beam Section (NB) - EXT, AD: OBS - Neutral Beam Section (NB), AD: Auditors, AD: ITER Management Assessor, project administrat... |                         |                                        |

# Deviation Request (DR)

## 1. General

|                                                                         |                                                                                                                                                                                                                                 |                                                             |                                                                                                                                                                                                                                                                                                             |                                     |                          |                          |                          |                          |   |   |    |     |    |                                                                                                                                                                                |                          |                          |          |          |
|-------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------|--------------------------|--------------------------|--------------------------|--------------------------|---|---|----|-----|----|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------|--------------------------|----------|----------|
| Type of DR                                                              | <del>IO</del> / <b>DA</b> / <del>CON</del>                                                                                                                                                                                      |                                                             | Issue Date                                                                                                                                                                                                                                                                                                  | 10.04.2023                          |                          |                          |                          |                          |   |   |    |     |    |                                                                                                                                                                                |                          |                          |          |          |
| DA/ CON / ref. num.                                                     | <a href="#">Manufacturing, testing and delivery of third Heating Neutral Beam (HNB) Vessel (6GSERA v1.4) (current)</a><br><a href="#">HNB3 vessel Technical Specification (4NQYTZ v1.2)</a><br>Task Number: IO/21/TA/4500000170 |                                                             |                                                                                                                                                                                                                                                                                                             |                                     |                          |                          |                          |                          |   |   |    |     |    |                                                                                                                                                                                |                          |                          |          |          |
| DR Title                                                                | Deviation request related to cobalt content in chemical composition of Inconel 718 bolts                                                                                                                                        |                                                             |                                                                                                                                                                                                                                                                                                             |                                     |                          |                          |                          |                          |   |   |    |     |    |                                                                                                                                                                                |                          |                          |          |          |
| Item/ Component identification                                          | HNB3 Vessel: Bolts (384 nos.) used for connecting BLV flange and its top lid flange & BSV flange and its cover flange.                                                                                                          |                                                             |                                                                                                                                                                                                                                                                                                             |                                     |                          |                          |                          |                          |   |   |    |     |    |                                                                                                                                                                                |                          |                          |          |          |
| Work Activity:                                                          | Material specification for the procurement of the Inconel 718 for the above mentioned bolts                                                                                                                                     |                                                             |                                                                                                                                                                                                                                                                                                             |                                     |                          |                          |                          |                          |   |   |    |     |    |                                                                                                                                                                                |                          |                          |          |          |
|                                                                         | PBS description                                                                                                                                                                                                                 |                                                             |                                                                                                                                                                                                                                                                                                             | PBS number                          |                          |                          |                          |                          |   |   |    |     |    |                                                                                                                                                                                |                          |                          |          |          |
| Main PBS                                                                | Heating & Current drive systems                                                                                                                                                                                                 |                                                             |                                                                                                                                                                                                                                                                                                             | PBS 53                              |                          |                          |                          |                          |   |   |    |     |    |                                                                                                                                                                                |                          |                          |          |          |
| Quality class (QC)                                                      | QC 1: <input checked="" type="checkbox"/> QC 2: <input type="checkbox"/> QC 3: <input type="checkbox"/> QC 4: <input type="checkbox"/>                                                                                          |                                                             |                                                                                                                                                                                                                                                                                                             |                                     |                          |                          |                          |                          |   |   |    |     |    |                                                                                                                                                                                |                          |                          |          |          |
| Safety self - assessment by RO                                          | PIC/SIC-1                                                                                                                                                                                                                       | PIC/SIC-2                                                   | Non-SIC                                                                                                                                                                                                                                                                                                     | PIA                                 |                          |                          |                          |                          |   |   |    |     |    |                                                                                                                                                                                |                          |                          |          |          |
|                                                                         | <input checked="" type="checkbox"/>                                                                                                                                                                                             | <input type="checkbox"/>                                    | <input type="checkbox"/>                                                                                                                                                                                                                                                                                    | <input checked="" type="checkbox"/> |                          |                          |                          |                          |   |   |    |     |    |                                                                                                                                                                                |                          |                          |          |          |
| IO Manufacturer of the Pressure Equipment or Nuclear pressure Equipment | Yes <input type="checkbox"/><br>No <input checked="" type="checkbox"/>                                                                                                                                                          | PE <input type="checkbox"/><br>NPE <input type="checkbox"/> | Pressure Category<br><table border="1"> <tr> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> </tr> <tr> <td>0</td> <td>I</td> <td>II</td> <td>III</td> <td>IV</td> </tr> </table> | <input type="checkbox"/>            | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | 0 | I | II | III | IV | Radioactive level<br><table border="1"> <tr> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> </tr> <tr> <td>Level N2</td> <td>Level N3</td> </tr> </table> | <input type="checkbox"/> | <input type="checkbox"/> | Level N2 | Level N3 |
| <input type="checkbox"/>                                                | <input type="checkbox"/>                                                                                                                                                                                                        | <input type="checkbox"/>                                    | <input type="checkbox"/>                                                                                                                                                                                                                                                                                    | <input type="checkbox"/>            |                          |                          |                          |                          |   |   |    |     |    |                                                                                                                                                                                |                          |                          |          |          |
| 0                                                                       | I                                                                                                                                                                                                                               | II                                                          | III                                                                                                                                                                                                                                                                                                         | IV                                  |                          |                          |                          |                          |   |   |    |     |    |                                                                                                                                                                                |                          |                          |          |          |
| <input type="checkbox"/>                                                | <input type="checkbox"/>                                                                                                                                                                                                        |                                                             |                                                                                                                                                                                                                                                                                                             |                                     |                          |                          |                          |                          |   |   |    |     |    |                                                                                                                                                                                |                          |                          |          |          |
| Level N2                                                                | Level N3                                                                                                                                                                                                                        |                                                             |                                                                                                                                                                                                                                                                                                             |                                     |                          |                          |                          |                          |   |   |    |     |    |                                                                                                                                                                                |                          |                          |          |          |

## 2. Description of Deviation

|                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|---------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Introduction</b>                                           | This DR is to relax the requirement of the restricted Cobalt content in chemical composition of Inconel 718 bolts for HNB3 Vessel. The bolts under consideration are for connecting BLV flange and its top lid flange & BSV flange and its cover flange                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Description of the original requirements (Before)             | Co content is restricted is 0.2 wt% as per Procurement Specification ITER_D_AHMGDY for Inconel 718 bolts for the above application in the HNB3 Vessel.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Description of the proposed alternative (After)               | It is proposed to consider the Max. Co content as 1.0 wt% for the Inconel bolts under consideration.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Justification (for PIC and PIA, include safety justification) | <p><b>Background:</b> It is assessed through rigorous market survey that Inconel 718 with the reduced Co wt% is not readily available with stockiest, neither they are regularly produced by the material mills and therefore they have to be specially produced. However, considering very small quantity of the raw material (~ 2.6 tons including the 10% rejection and 10% spares), no mill manufacture is ready to produce and most of the major mills and the material traders have declined to produce / supply the material. In addition, due to on-going geopolitical situation, there is already a scarcity of Inconel in the international market (which we have experienced during the bidding process of DNB and HNB3 Vessel). In this condition, an alternative is proposed, wherein we propose to use the standard Inconel 718 (Co content 1%) without impacting the overall project requirement.</p> <p><b>Justification:</b><br/>         As per the agreement Memo (<a href="#">ITER_D_8YDRCM - Agreement memo: Use of ITER approved SS 316LN-IG material, as free issue material for HNB3 Vessel</a>), ITER India is going to provide ITER approved 316LN-IG as Free Issue Material (FIM) to manufacture some part of HNB3 Vessel. As mentioned in the Memo the raw material qty of such FIM is ~50 Tons. As per the Annexure-2 of this Memo, the average Co of this qty is 0.025 wt%. Considering 50% scrap factor (thumb rule is 30% but we are taking conservative value) from these plates, the material to be used in the HNB3 Vessel is 25 Tons for which the estimated Co qty is 6.25kg against the allowed quantity of 12.5 kg.</p> |

# Deviation Request (DR)

|  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|--|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | <p>➔ <i>This implies that due to superior quality of plates in terms of Co content (0.025wt. % instead of 0.05 wt%), we have the excess budget of 6.25 kg of Co still available with us.</i></p> <p>On the other hand, if Inconel 718 with Co of 1.0 wt % is used for the bolts, the excess Co amounts to 5.5 kg. This is less compared to 6.25 kg saving of Co in the 316 LN-IG material mentioned above and establishes compliance with the overall project requirement.</p> <p>Further, account of the actual usage of FIM plates along with other major material will be tracked and recorded to ensure that the total Co wt % is not exceeded any point of time during execution.</p> |
|--|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

### 3. Impact assessment (to be filled by initiator)

|                                                   |                                     |                                                               |
|---------------------------------------------------|-------------------------------------|---------------------------------------------------------------|
| Other technical impact                            | <input type="checkbox"/>            |                                                               |
| Cost impact                                       | <input type="checkbox"/>            |                                                               |
| Schedule impact                                   | <input type="checkbox"/>            |                                                               |
| Impact on interface, other impacted PBS, PA, etc. | <input type="checkbox"/>            |                                                               |
| Impacted documents                                | <input checked="" type="checkbox"/> | Procurement Specification ITER_D_AHMGDY for Inconel 718 bolts |
| Other impacts                                     | <input type="checkbox"/>            |                                                               |
| Follow-up of DR implementation (see note 4*)      | Required <input type="checkbox"/>   | Not required <input checked="" type="checkbox"/>              |

### 4. Safety and Environmental (Assessment by EPNS-DH – see note 2\*)

|                                |                                                                                                                                                                                     |
|--------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Assessment result and comments | <input type="checkbox"/> Escalation required to a EPNS meeting required /<br><input type="checkbox"/> Accepted (No escalation)<br><input type="checkbox"/> Rejection unless revised |
|--------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

### 5. System / Design Integration (Assessment by IO-DIRO – see note 3\*)

|                                |                                                                                                                            |
|--------------------------------|----------------------------------------------------------------------------------------------------------------------------|
| Assessment result and comments | <input type="checkbox"/> Escalation to a PCR required<br><input type="checkbox"/> Accepted (No escalation to PCR required) |
|--------------------------------|----------------------------------------------------------------------------------------------------------------------------|

### 6. Decisions

|             | Name          | Signature*                                                                          | Date       | Decision                                                                |
|-------------|---------------|-------------------------------------------------------------------------------------|------------|-------------------------------------------------------------------------|
| Initiator   | Ashish Yadav  |  | 04.05.2023 | Approve                                                                 |
| CON RO      | --            | --                                                                                  | --         | --                                                                      |
| DA RO       | Jaydeep Joshi |  | 04.05.2023 | Approve                                                                 |
| IO-Approver |               |                                                                                     |            | <input type="checkbox"/> Approve *<br><input type="checkbox"/> Reject * |

### 7. Confirmation of Implementation (if required – see section 3 – impact assessment)

|        | Name | Signature* | Date |
|--------|------|------------|------|
| CON-RO |      |            |      |

# Deviation Request (DR)

|             |  |  |  |
|-------------|--|--|--|
| DA RO       |  |  |  |
| IO-Approver |  |  |  |

## 8. List of Attachment

1. EMR of the SS316L material
2. Calculation sheet Co content compensation calculation

Note \*:

- 1- Signature of DR and confirmation of IO decision (reject/ accepted) are mandatory required. IDM system may be used for DR review and approval signatures (DR shall indicate the reviewers / approver names and date).
- 2- EPNS-DH (delegated SRO) assessment will be recorded in IDM system – with a clear resolution if DR is rejected/escalated.
- 3- DIRO assessment will be recorded in IDM system. If escalation to PCR is required then the section 5 of DR shall be mandatory filled.
- 4- The DR implementation confirmation “is required” typically for the cases when further critical actions are triggered by DR approval and/ or related documentation need to be revised to reflect the deviation implementation.