

Handling Instruction

Use and Handling of the DN30 Package

0023-HA-2015-001-Rev6


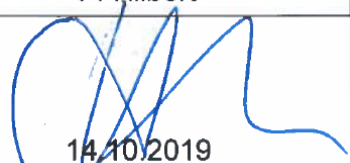
| Prepared | Checked | Released |
|---|---|---|
| S. Fels | Y. van Wijk | F. Hilbert |
|  10.10.2019 |  10.10.2019 |  14.10.2019 |

Table of Content

| | | |
|-------|--|----|
| 1 | Objective and Scope..... | 5 |
| 2 | Further Applicable Documents..... | 5 |
| 3 | Description of the DN30 PSP..... | 5 |
| 4 | Requirements Towards the 30B cylinder..... | 10 |
| 5 | General Handling Practices for the DN30 Package..... | 12 |
| 5.1 | Handling | 12 |
| 5.1.1 | Handling of a DN30 PSP | 12 |
| 5.1.2 | Handling of the Top Half | 14 |
| 5.1.3 | Handling of the Bottom Half | 15 |
| 5.2 | Storage..... | 16 |
| 5.3 | Visual Inspection..... | 16 |
| 5.4 | Functional Tests | 16 |
| 5.5 | Deviations..... | 16 |
| 6 | Handling Procedure: Loading of a 30B Cylinder..... | 17 |
| 7 | Handling Procedure: Unloading of a 30B Cylinder | 25 |
| 8 | Handling Procedure: Fastening on a Transport Vehicle | 31 |
| 8.1 | Flatrack Transportation | 31 |
| 8.2 | Other Transportation Configurations | 32 |
| 8.3 | Special Requirement for Transport by Rail..... | 32 |
| 9 | References | 33 |

Modifications

| Revision | Date of revision | Modifications |
|----------|------------------|--|
| 0 | 01.12.2016 | Original |
| 1 | 29.09.2017 | Additions to Chapter 3 New chapter 5.3 |
| 2 | 28.02.2018 | New chapters 8.3 and 9 |
| 3 | 14.11.2018 | Changes of mass Additional steps in chapter 6 Changes in chapter 8.1 |
| 4 | 15.07.2019 | <ul style="list-style-type: none"> • Editorial changes • This handling instruction now refers to the entire DN30 package instead of the DN30 PSP. • The description of the DN30 PSP has been moved to chapter 3 and has been reworked as well as made consistent with other instructions. • Previous chapter 3, now chapter 4, has been renamed and reworked to better describe the requirements towards the 30B cylinder. • The pictures in chapters 5, 6, 7 and 8 have been updated to comply with the latest design of the DN30 PSP. • In section 5.1.2, additional information has been added for handling the top half of the DN30 PSP. The possibility to use other adequate lifting means but shackles has been added. • Section 5.3 has been added describing the visual inspections to be performed before each transport. • Added information on heels of reprocessed uranium in step L.11. • Changed the order of step L.12 and L.13. • Added the assembly order of the bolt, nut and washers in step T.4 of section 8.1. |
| 5 | 26.08.2019 | <ul style="list-style-type: none"> • Because of a design change of the housing of the valve protecting device, some pictures have been updated and some handling steps needed to be modified. • Removed checking the tightening torque of the securing bolts after unloading of a 30B cylinder. • Allowed for an angle deviation of $\pm 10^\circ$ in the longitudinal direction for the handling of the loaded DN30 package with slings. • Added further details in the description of the DN30 PSP in chapter 3. • Added notes to the handling practices in chapter 5, giving the user a hint about the slight shift of the center of gravity of the DN30 PSP towards its valve side. |

| | | |
|---|------------|--|
| 6 | 10.10.2019 | <ul style="list-style-type: none">• In section 6, step L.8, a caution against working under suspended loads was added.• The tightening procedure of the securing bolts has been adopted.• The use of a wrench with center according to DIN 6912 has been prescribed.• The detailed description of the tightening procedure of the securing bolts after unloading a 30B cylinder has been removed. |
|---|------------|--|

1 Objective and Scope

The following instruction regulates the handling of the DN30 package and is intended for the operator. This instruction can further be used to train operators on using the DN30 package. In this instruction, handling situations are described, and instructions are given to comply with the certificate of approval. For the sake of a correct and safe use of the DN30 package, this instruction has to be completely read and understood by the operator prior to handling the DN30 package.

2 Further Applicable Documents

The following documents are also valid:

| | |
|--|--|
| Test instruction 0023-PA-2015-016 | Criteria for regular and periodical inspections of the DN30 package |
| Test instruction 0023-PA-2015-017 | Contamination and dose rate measurement at the DN30 |
| Test instruction 0023-PA-2015-019 | Dose rate measurement at 30B cylinders containing Heels of reprocessed uranium |
| Test instruction 0023-PA-2015-015 | Periodical inspections of the DN30 PSP |

3 Description of the DN30 PSP

The DN30 Protective Structural Packaging (PSP) is shown in Figure 1 to Figure 6. It consists of a bottom and a top half.

Lifting lugs at the feet as well as forklift pockets permit the safe handling of the DN30 package. The tie-down interfaces allow for safe stowing of the DN30 package and are compatible with existing PSP designs. The bottom half includes a valve protecting device with a separate housing, a plug protecting device, two rotation preventing devices, the bottom half of the seal holder as well as the bottom half of the closure system (composed of six closure devices).

The top half with integrated handling attachment points suitable for lifting the top half only includes the top half of the seal holder and the top half of the closure system. The information that the lifting lugs at the top half are allowed to be used only for handling of the top half is printed on both front faces of the DN30 PSP as is shown in Figure 5. Additionally, the lifting lugs at the top half have to be rendered inoperable during transport to avoid incorrect use.

The bodies of the bottom and top half are made of an inner and outer shell of stainless steel, both in the form of a tub, which are connected by a flange, respectively. The cavity between the inner and outer shells and flanges is filled with foam of different densities as well as a thermal insulation layer between the inner shells and the foam. In the flange of the top half, there is an elastomeric gasket to prevent leakage of water during routine conditions of transport. To prevent dangerous pressure build-up, nine thermal plugs are embedded into the outer shell of the bottom and top half, respectively.

All surfaces of the inner shells of the bottom and top half are covered with a layer of intumescent material. In the bottom half, two silicon pads are located on top of the layer of intumescent material to reduce wearing.

The identification number of each DN30 PSP is engraved on the top and bottom part of each closure device. That way the top half of each DN30 PSP is uniquely associated to its corresponding bottom half. Additionally, the identification number is printed onto both front faces of the bottom and top half of the DN30 PSP as well as on the nameplate.

The identification number is engraved on the separate housing of the valve protecting device as well, ensuring the housing is uniquely associated to a DN30 PSP. A highly visible label with red background color is glued onto the valve protecting device that reminds the user to not close the DN30 PSP before the housing has been put back into the valve protecting device (this is shown in Figure 6). This label is no longer visible when the DN30 PSP has been correctly prepared to be closed.

Note: The name plate (shown on the right in Figure 1) is always affixed to the front face on the plug side of a DN30 PSP. This way, the valve and plug side of a DN30 PSP can be identified without opening a DN30 PSP.

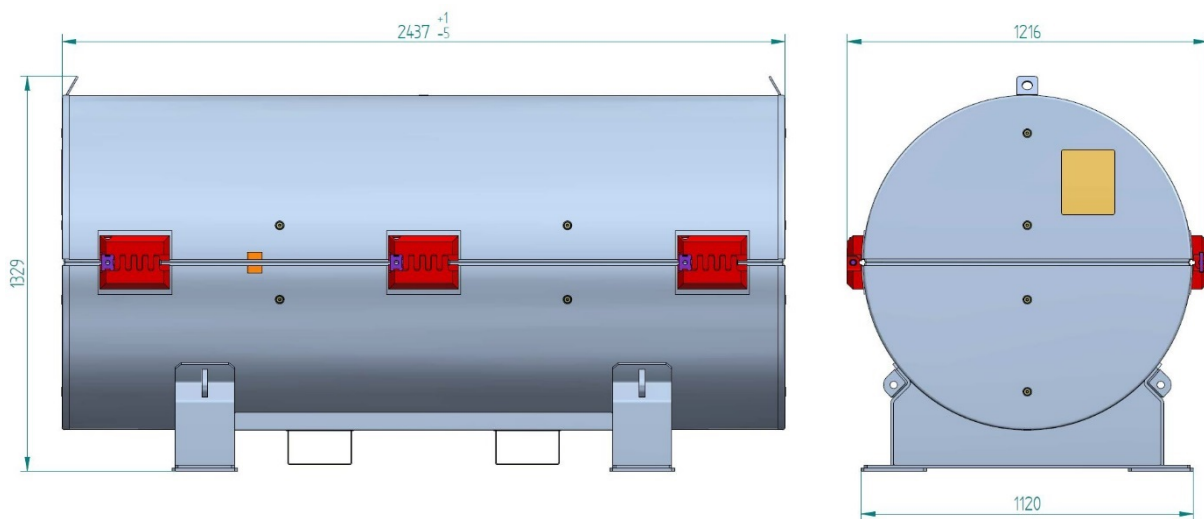


Figure 1: DN30 PSP

The main characteristics of the DN30 PSP design are summarized in Table 1.

Table 1: Main Characteristics of the DN30 Package

| <u>Masses* approx.:</u> | |
|--------------------------------|-------------|
| Total DN30 PSP empty (nominal) | Ca. 1100 kg |
| Max. Gross weight package | Ca. 4100 kg |
| <u>Dimensions:</u> | |
| Length | 2437 mm |
| Width | 1216 mm |
| Height | 1329 mm |

*The actual weights of the units are stamped on the nameplate.

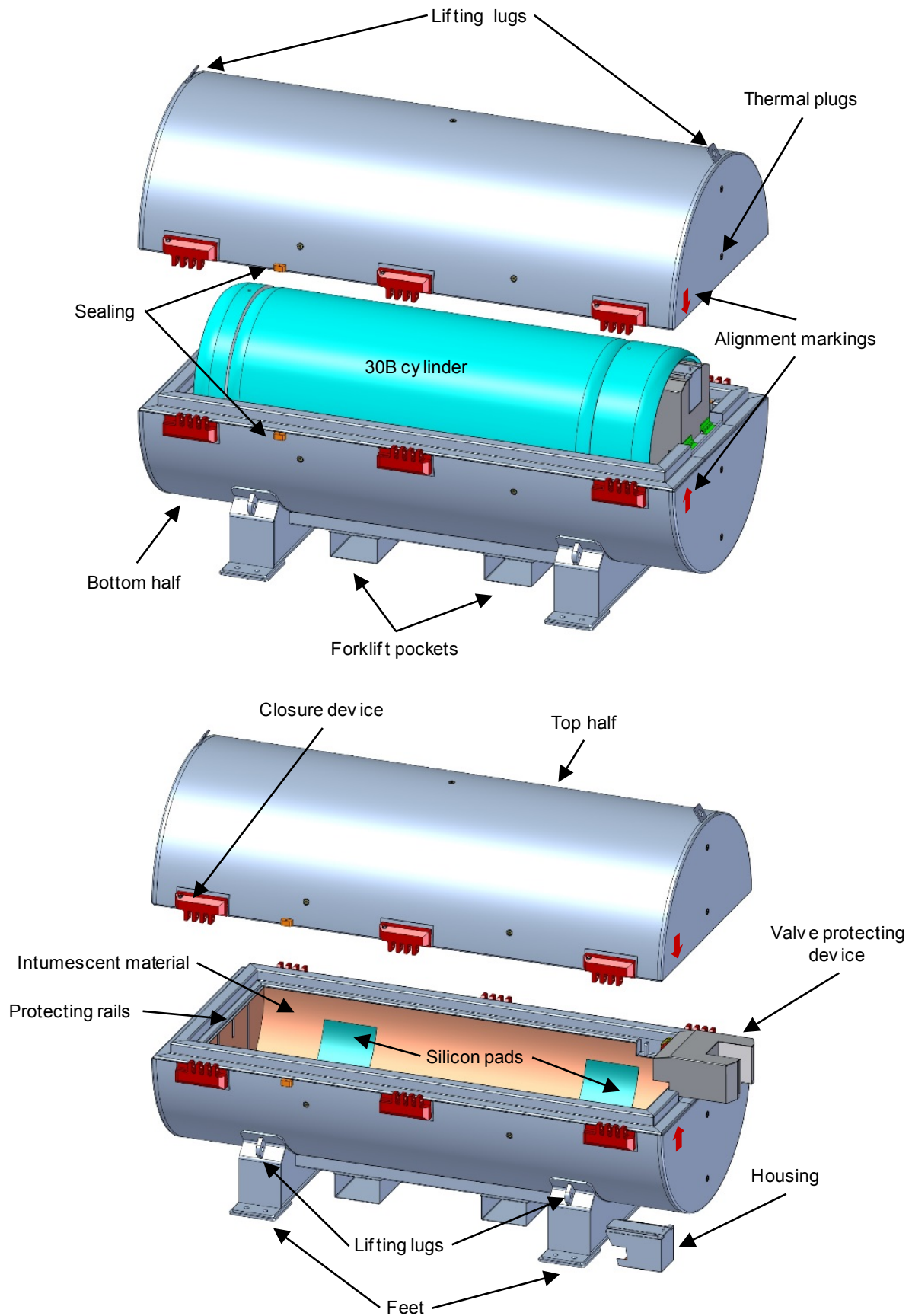


Figure 2: The DN30 PSP and its Main Parts

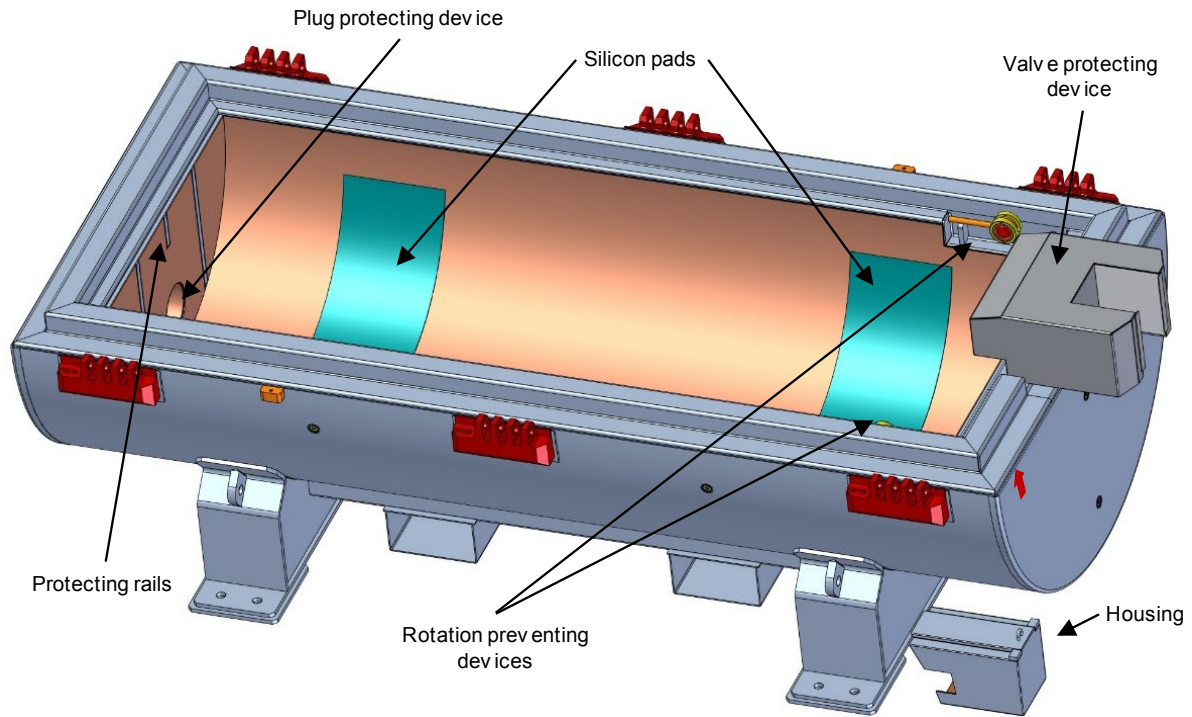


Figure 3: Details of the Bottom Half

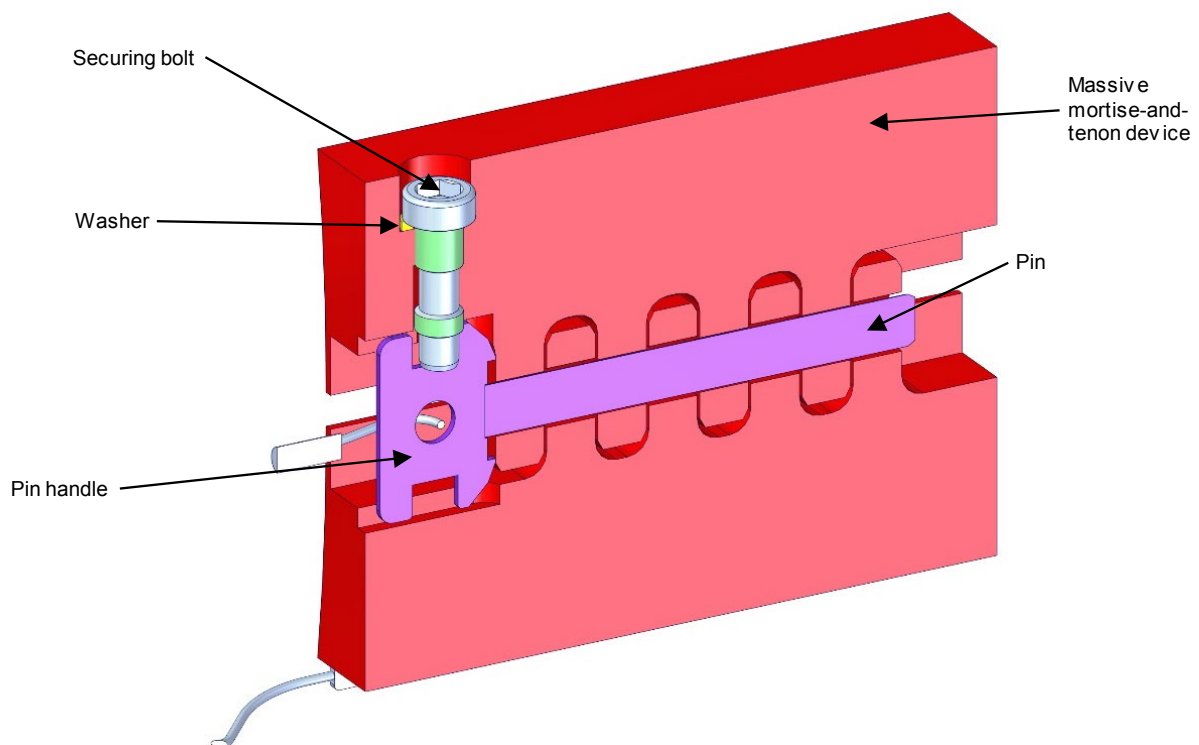


Figure 4: Detailed Section Illustration of the Closure Device



Figure 5: View of the DN30 PSP Front Face



Figure 6: Label on the Valve Protecting Device

4 Requirements Towards the 30B cylinder

The DN30 PSP is intended for the transport of certified 30B cylinders complying with [ANSI N14.1] or [ISO 7195]. Therefore, the following requirements apply towards the 30B cylinder.

Before filling the 30B cylinder, inspections in accordance with [ANSI N14.1] or [ISO 7195] and at least as described in [USEC 651] (or in equivalent plant specific instructions) shall be carried out:

- The 30B cylinder shall be handled and filled in accordance with [ANSI N14.1] or [ISO 7195] and at least as described in [USEC 651].
- A valid maintenance certificate (valid date on the 30B cylinder's nameplate) exists.
- 30B cylinders that have not been inspected and tested within the required 5-year period shall not be refilled until they are properly reinspected and retested. Prior to shipment, 30B cylinders that have not been recertified within the 5-year requirement shall be visually inspected for degradation of the cylinder wall. Any questionable conditions should be investigated. Details on the visual inspection are provided in Attachment 1 of 0023-PA-2015-016.
- Any defective condition has to be corrected before filling according to the requirements of [ANSI N14.1] or [ISO 7195]:
 - The 30B cylinder shall be routinely examined as received and prior to sampling, withdrawal, filling, or shipping to ensure that it remains in a safe and usable condition.
 - Leakage, cracks, excessive distortion, bent or broken valves or plugs, broken or torn skirts, or other conditions that may affect the safe use of the cylinder shall warrant appropriate precautions, including removing the cylinder from service until the defective condition is satisfactorily corrected.
 - Questionable conditions should be referred to a qualified inspector for evaluation and for recommendations concerning use, repair, or condemnation of the cylinder in question.
- Before filling, the cylinder is weighted to establish the net weight of the heels to ensure the fill limit will not be exceeded.
- To avoid overfilling, the 30B cylinder shall be weighted after being filled.

Before loading into the DN30 PSP, the inspection of the 30B cylinder should be carried out in accordance with [ANSI N14.1] or [ISO 7195], and at least as described in [USEC 651] (or in equivalent plant specific instructions):

- The content of the 30B cylinder has to comply with the certificate of approval of the DN30 package.
- Before shipping, the 30B cylinder shall be inspected for leak-tightness, damage, as well as other unacceptable conditions.
- UF₆ shall be shipped only in its solid state and when the vapor pressure within the 30B cylinder is below atmospheric.
- For 30B cylinders containing Heels of reprocessed uranium, it has to be ensured that the maximal dose rate at the surface of the 30B cylinder does not exceed 5 mSv/h, using the procedure prescribed in test instruction 0023-PA-2015-019.
- The safe state of the 30B cylinder shall be recorded by the UF₆ supplier and the record shall be provided to the shipper.

Special care has to be taken to ensure that the cylinder fulfills the leak-tightness criteria of [ANSI N14.1] or [ISO 7195] and the following requirements:

- The leak-tightness of the valve seat of a filled cylinder shall be verified by leak-rate testing of the pigtail before disconnection and after closing the cylinder valve seat.
- A leak-rate larger than 1×10^{-4} Pa.m³/s SLR (Standardized Leakage Rate) shall not be permitted.
- The leak-test method shall comply to the [ANSI N14.5] or [ISO 12807] standard.
- If air is used for a pressure drop test, the air supply should be clean, dry and free from oil. If it is not, or if the quality of the air supply is uncertain, the test should be performed with nitrogen to ensure reliable results.
- Alternatively, a vacuum test may be performed by attaching a pigtail to the closed cylinder valve and drawing a vacuum.

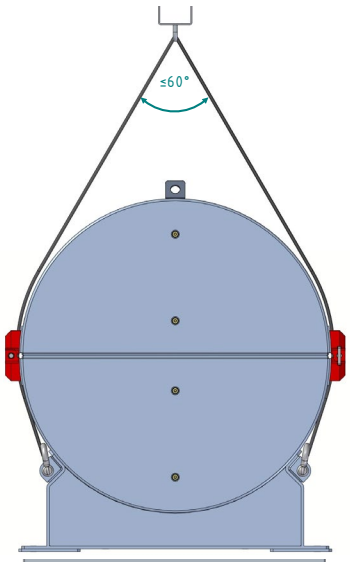
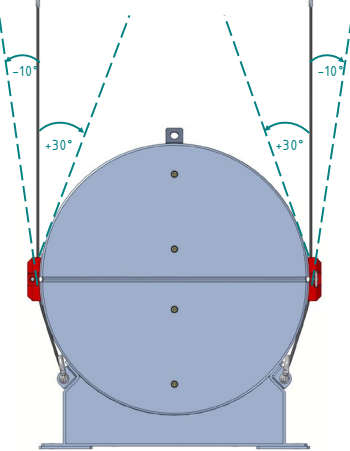
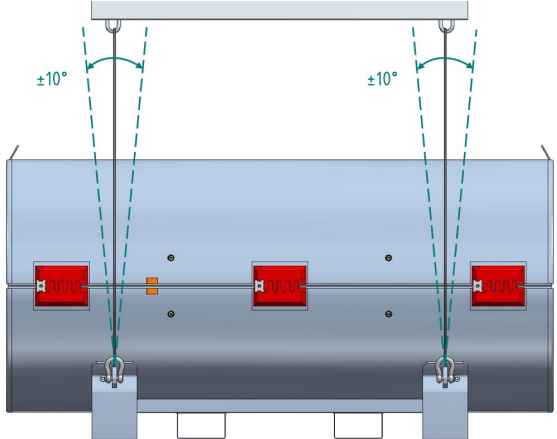
Note: The cylinder's outer surface shall be approximately at ambient temperature and its vapor pressure below atmospheric pressure.

5 General Handling Practices for the DN30 Package

5.1 Handling

5.1.1 Handling of a DN30 PSP

For lifting a **loaded** DN30 PSP options 1 and 3 are available according to the left column of the table below. For lifting an **empty** DN30 PSP, all three options are available:

| | | |
|----------|--|---|
| <p>1</p> | <p>Using the four lifting lugs at the feet and by means of a crane or a forklift with slings.</p> <ul style="list-style-type: none"> • A shackle has to be attached to each of the four lifting lugs. • Lifting capacity of each sling has to be at least 2500 kg. • Lifting capacity of each shackle has to be at least 2500 kg. • When using a traverse (1), the angle between the slings has to be equal to or less than 60°. • When using a spreader (2), the lateral angle of the slings to the vertical has to lie within -10° and 30°. • In the longitudinal direction, the shackles and the crane shall be vertically connected by the slings. A deviation of $\pm 10^\circ$ is acceptable. <p>Notes:</p> <ul style="list-style-type: none"> • Lifting chains are not allowed. • The center of gravity of a DN30 PSP is slightly shifted towards its valve side. | <p>1</p>  <p>2</p>   |
|----------|--|---|

2

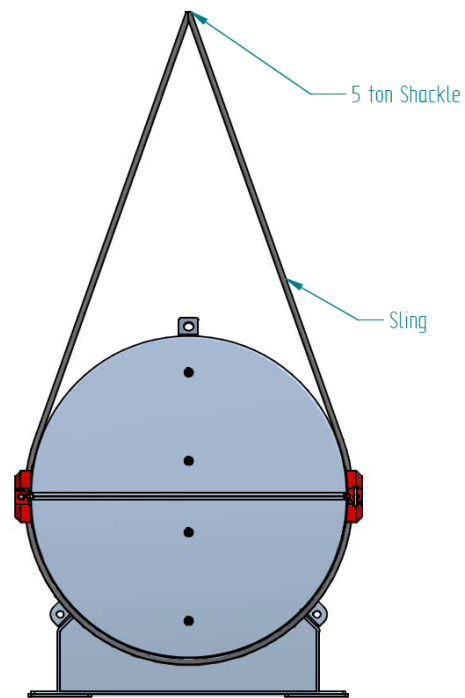
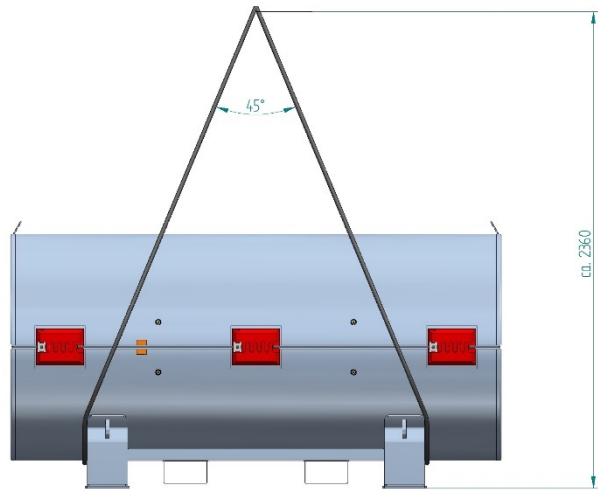
Only for empty DN30 PSP

Using appropriate slings and by means of a crane or a forklift.

- The slings have to be winded around the DN30 PSP, outside the base feet and behind the closure devices.
- Lifting capacity of each sling has to be at least 2500 kg.
- Lifting capacity of the shackle has to be at least 5 tons.
- Angle between the slings has to be equal to or less than 45°.

Notes:

- **Lifting chains are not allowed.**
- **The center of gravity of a DN30 PSP is slightly shifted towards its valve side.**



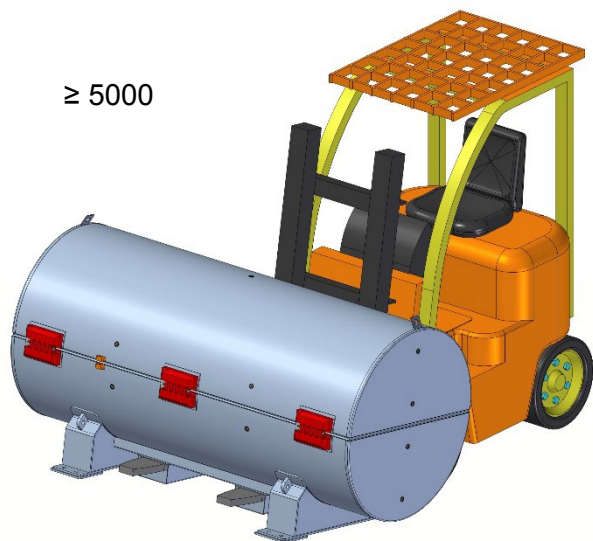
3

Using of a forklift, the forks are inserted into the forklift pockets.

For lifting the loaded DN30 package with a forklift, the distance of the forks needs to be adjustable to fit into the forklift pockets of the DN30 PSP.

Load capacity of the forklift has to be at least 5000 kg.

≥ 5000



5.1.2 Handling of the Top Half

For lifting its top half, the DN30 PSP is fitted with two lifting lugs welded to the surface of the top half of the DN30 PSP as shown in Figure 7. The lifting lugs at the top half are allowed to be used only for handling of the top half as is printed on both front faces of the DN30 PSP (see Figure 5). Additionally, the lifting lugs at the top half have to be rendered inoperable during transport to avoid incorrect use.

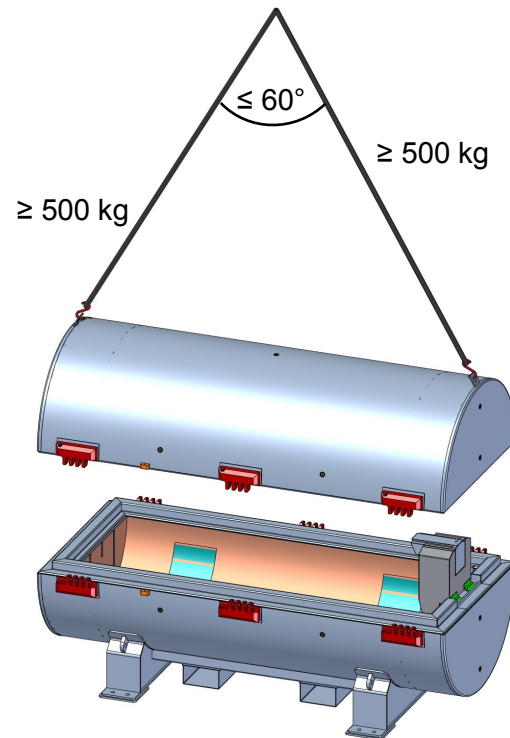


Figure 7: Lifting Lugs for Lifting the Top Half

Only a crane or forklift with appropriate lifting slings can be used to lift the top half of the DN30 PSP using the two lifting lugs of the top half. Both slings need to have a lifting capacity of at least 500 kg.

Shackles (or other adequate lifting means) have to be attached to the two lifting lugs of the top half of the DN30 PSP to handle the top half.

Before lifting the top half, the operator has to make sure that all six pins of the closure devices have been removed.

Notes:

- The angle between the slings has to be 60° or less, as shown in Figure 7.
- The center of gravity of the top half is slightly shifted towards its valve side.
- The top half has to be handled slowly and carefully.
- Never use the forks of a forklift to lift a top half being laid down directly on the floor.
- The two lifting lugs are designed for lifting the top half only. Never use them for lifting the loaded or empty DN30 PSP.

5.1.3 Handling of the Bottom Half

The bottom half of the DN30 PSP is lifted using the four lifting lugs welded at each base foot of the DN30 PSP as shown in Figure 8 or with a fork lifter using the fork lifter pockets as shown in section 5.1.1.



Figure 8: Lifting Lugs for Lifting the Bottom Half

In case the bottom half is lifted by means of a crane or a forklift using the four lifting lugs at the feet, four appropriate shackles have to be used. Each of the slings are required to have a lifting capacity of at least 500 kg.

Notes:

- **Lifting chains are not allowed.**
- **The center of gravity of the bottom half is slightly shifted towards its valve side.**

5.2 Storage

The DN30 PSP might be stored indoors or outdoors.

Note: The DN30 PSP has to be closed during storage.

5.3 Visual Inspection

The DN30 PSP shall be inspected prior to loading. Following observations shall be cause for further investigation, replacement of parts or rejection of the DN30 PSP as specified in detail in test instruction 0023-PA-2015-016:

- Structural changes of exterior or interior shells, like excessive deformations, cracks, holes, etc.
- Excessive damage of flange areas
- Missing or damaged markings of the DN30 PSP
- Missing or damaged thermal plugs
- Missing or damaged gasket
- Damage of the mortise-and-tenon closure system
- Missing or damaged seals
- Damage of the valve protecting device as well as functional issues
- Damage of the rotation preventing device as well as functional issues
- Excessive wear and tear of the intumescent material
- Damage to any welding seams like cracks, holes, excessive corrosion
- Excessive damage of the handling devices
- Excessive damage of the silicon pads

5.4 Functional Tests

Before using the DN30 PSP for the transport of a 30B cylinder, the following functional tests have to be carried out to ensure proper functionality of all movable parts:


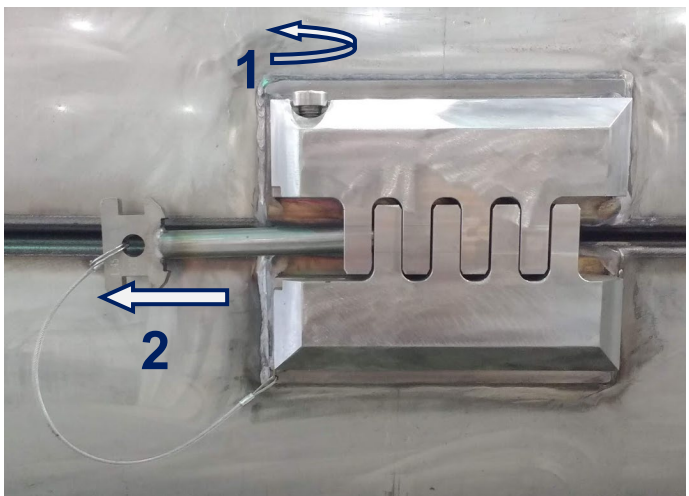
- The pin of the closure device can be inserted and extracted by hand
- The securing bolt of each closure device can be turned by hand
- Switching the handle of the rotation preventing devices traverses the pin
- The valve protecting device can easily be rotated around the hinges
- The housing of the valve protecting device can be moved




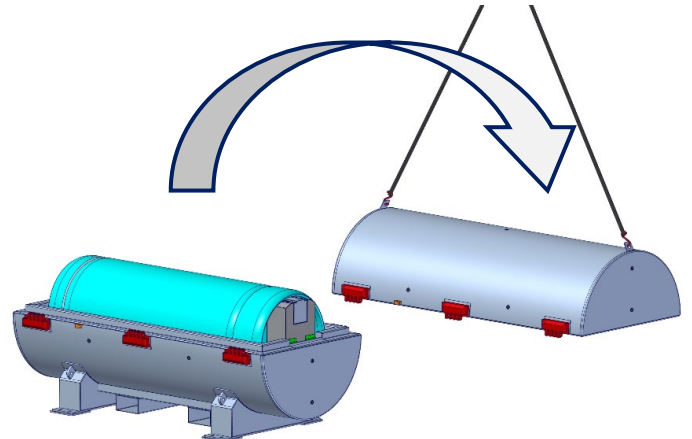
5.5 Deviations

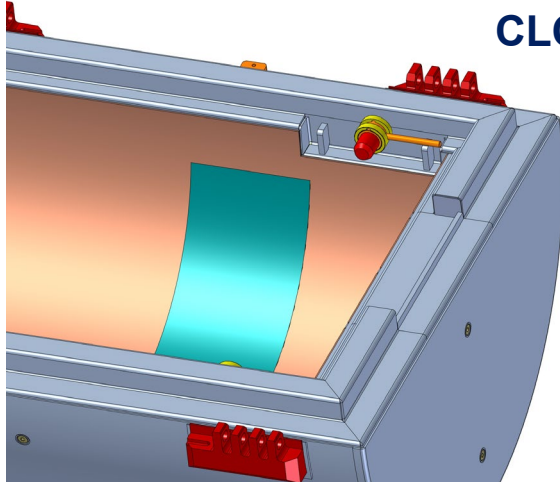
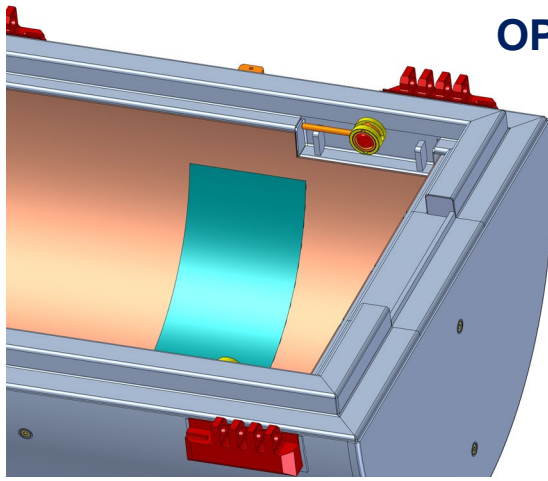
Test instruction 0023-PA-2015-016 contains in detail the criteria and measures in case of deviations during the visual inspections and functional tests. Measures could comprise cleaning, replacement of parts, minor repairs (on site) and major repairs (to be carried out by the license holder or an authorized repair shop qualified for such repair).

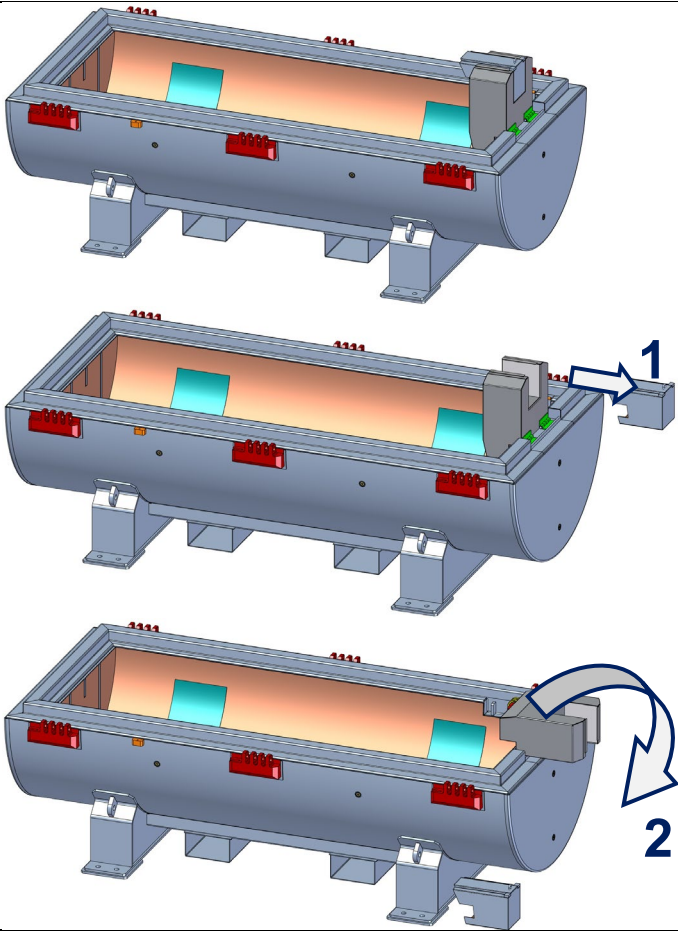
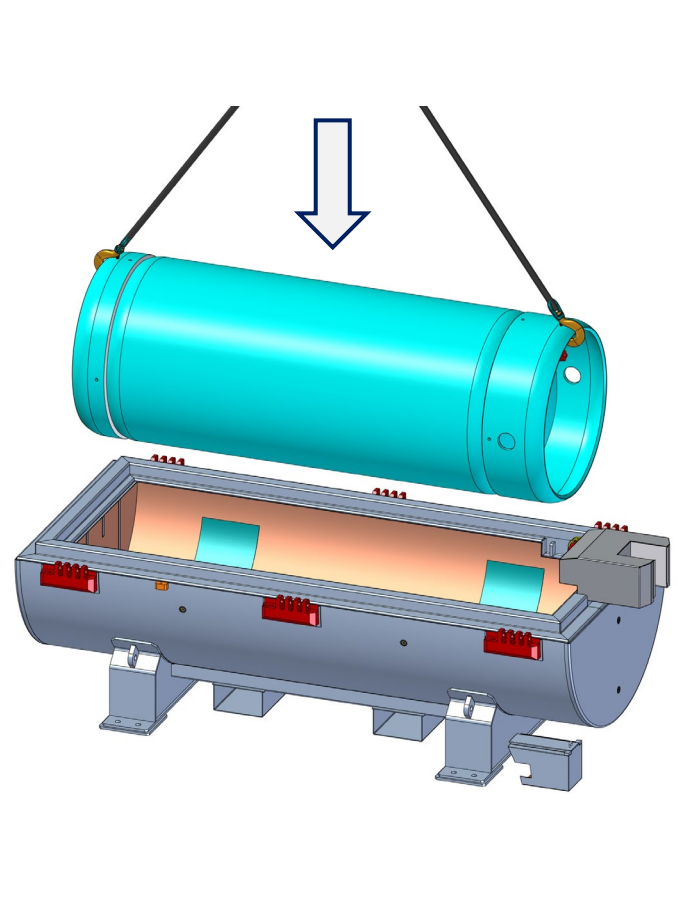
6 Handling Procedure: Loading of a 30B Cylinder

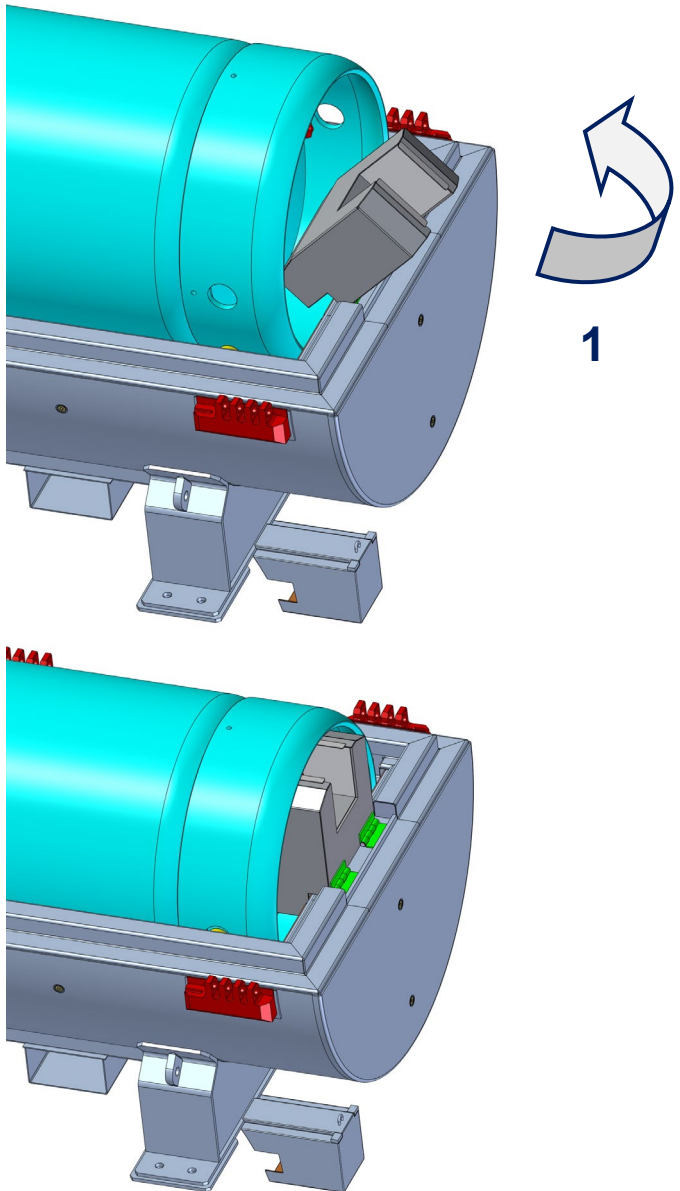
For loading the DN30 PSP with a 30B cylinder, the following handling steps have to be strictly complied with.

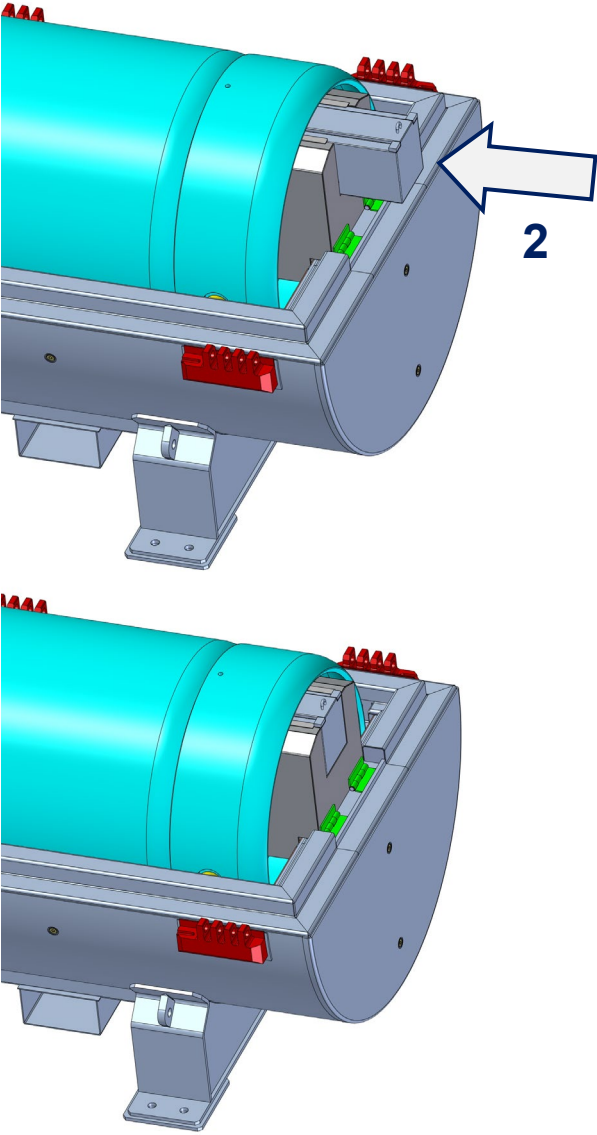
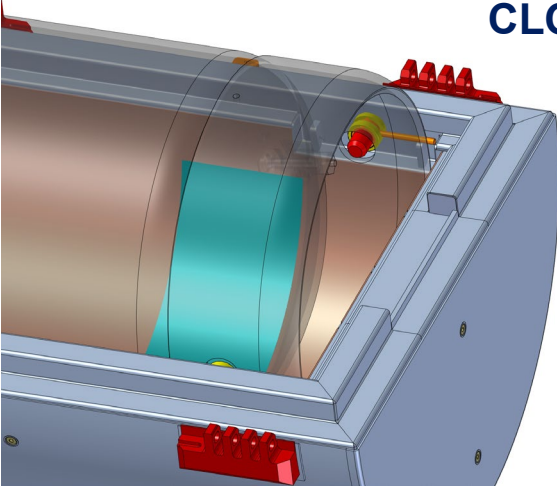
| Step | Explanation | Illustration |
|------|---|--|
| L.1 | The DN30 PSP is locked and empty. |  |
| L.2 | Visual inspections and functional tests | <ul style="list-style-type: none"> • At the reception of the DN30 PSP: check the general conditions (damaging, soiling, dirt, ...) • Check the presence of the 6 pins locking the corresponding closure devices • Check the presence of the seals (2 in total) • Check the liftings lugs (2 at the top half, 4 at the bottom half): no deformation that can interfere with the handling • Check the markings of the DN30 PSP (inspection date, ...) |
| L.3 | <p>For each closure device (6 in total):</p> <ol style="list-style-type: none"> 1. Unlock the securing bolt 2. Withdraw the pin <p>Note: The bolt cannot be completely removed.</p> <p>Remove the seals.</p> |  |

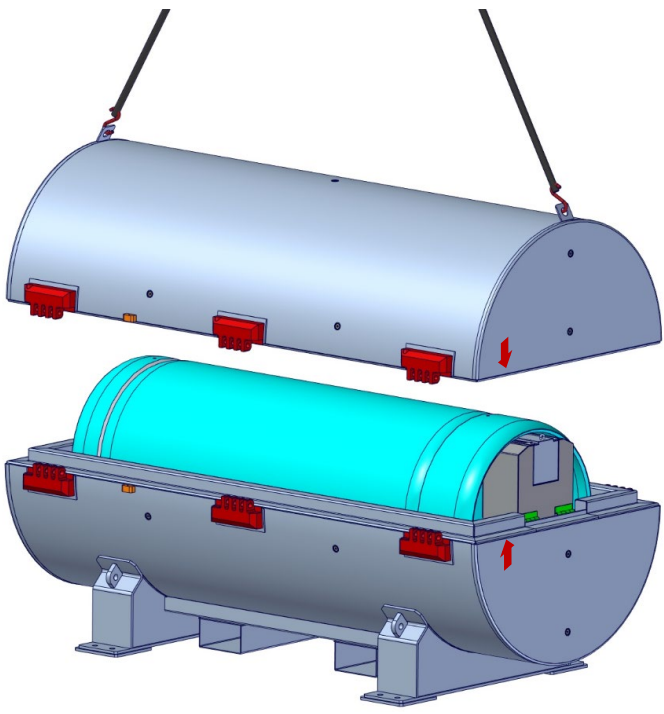
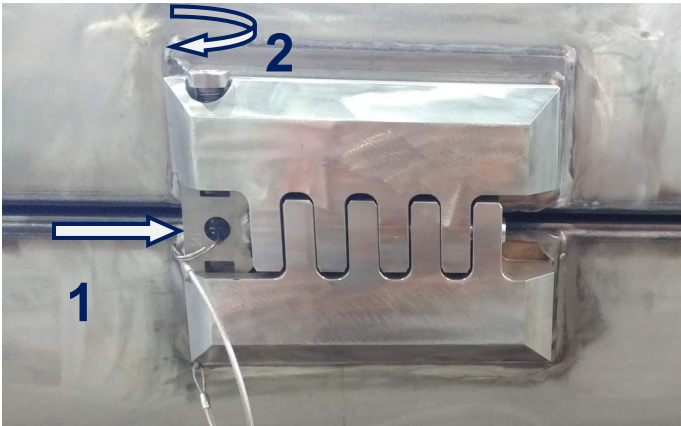

| Step | Explanation | Illustration |
|------|---|--|
| L.4 | Remove the screw and nuts from the holes in the two top half lifting lugs, which were intended to render the lifting lugs incapable of being used during transport. |  |
| L.5 | <p>Attach shackles (or other adequate lifting means) to each of the two lifting lugs at the top half of the DN30 PSP.</p> <p>Slings and shackles lifting capacity has to be at least 500 kg each.</p> |  |
| L.6 | <p><u>Now, make sure all pins (6 in total) have been removed</u></p> <p>Slowly and carefully lift (take off) the top half.</p> <p>Special care has to be taken to prevent swinging of the top half that could cause damage to the DN30 PSP.</p> |  |
| L.7 | <p>Temporarily, put down the top half next to the bottom half.</p> <p>For example, the top half can be placed on wood pieces.</p> |  |


| Step | Explanation | Illustration |
|------|---|---|
| L.8 | <p>Visual inspections and functional tests</p> <p><u>Caution: Do not work under suspended load.</u></p> <p>To check the gasket and the intumescent material on the top half, the top half may be placed on a rack or may be turned upside-down.</p> | <ul style="list-style-type: none"> • Ensure that there is no free water inside the cavity • Check the presence and proper functioning of the rotation preventing devices • Check the presence and proper functioning of the valve protecting device and the housing • Ensure that the identification numbers on the DN30 PSP and on the housing match • Check the state and presence of the silicon pads (2 in total) • Check the state and presence of the gasket on the top half • Check the state and presence of the intumescent material and its proper attachment • Check the state and presence of the thermal plugs (18 in total) |
| L.9 | <p>Switch the handles of the rotation preventing devices (2 in total) in opened position.</p> <p>The pins of the rotation preventing device should not be sticking out of the DN30 PSP bottom half.</p> |  <p>CLOSED</p>  <p>OPENED</p> |

| Step | Explanation | Illustration |
|------|--|---|
| L.10 | <p>Take out the housing (1) from the valve protecting device and put it down on the floor next to the DN30 PSP.</p> <p>Tilt back the valve protecting device (2) to its horizontal position.</p> |  <p>The illustrations show a grey rectangular housing being removed from a larger grey base. In the first, the housing is being lifted. In the second, it is placed on the floor next to the base. In the third, the base is tilted back, indicated by a curved arrow labeled '2'.</p> |
| L.11 | <p>Carefully lower the 30B cylinder into the DN30 PSP.</p> <p>Pay attention to the orientation of the 30B cylinder:</p> <ul style="list-style-type: none"> • The valve of the 30B cylinder coincides with the valve protecting device of the DN30 PSP. • The 30B cylinder has to be loaded with its valve in 12 o'clock position. Otherwise, the rotation preventing devices will not fit into the corresponding holes in the 30B cylinder skirt. <p>Note: 30B cylinders containing Heels of reprocessed uranium, can only be transported having a maximal dose rate at the surface of the 30B cylinder not exceeding 5 mSv/h, using the procedure prescribed in test instruction 0023-PA-2015-019.</p> |  <p>The illustration shows a blue cylindrical 30B cylinder being lowered into the grey DN30 PSP by two cables. A large blue arrow points downwards, indicating the direction of movement.</p> |

| Step | Explanation | Illustration |
|------|---|---|
| L.12 | <p>While the 30B cylinder is loaded into the DN30 PSP, slowly and carefully return the valve protecting device (1) to its vertical closed position.</p> <p><u>Avoid any contact between the valve protecting device and the valve of the 30B cylinder.</u></p> <p>The housing remains on the floor next to the DN30 PSP.</p> |  |


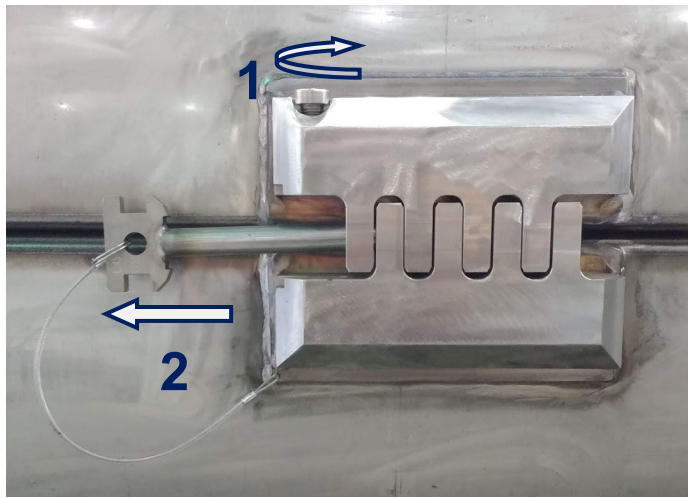
| Step | Explanation | Illustration |
|------|--|--|
| | <p>When the valve protecting device is in vertical position and once the lifting equipment has been detached from the 30B cylinder, push the housing (2) <u>slowly and carefully</u> back into the valve protecting device as far as it will go.</p> <p><u>Ensure that the identification numbers on the DN30 PSP and the housing match.</u></p> |  |
| L.13 | <p>Switch the handles of the rotation preventing devices (2 in total) to their closed position. The pins of the rotation preventing device have to be inserted into the corresponding holes in the 30B cylinder skirt.</p> <p>Afterwards, the handles have to be in horizontal position.</p> |  |





| Step | Explanation | Illustration |
|------|---|--|
| L.14 | <p>Attach shackles (or other adequate lifting means) to the two lifting lugs of the top half of the DN30 PSP.</p> <p><u>Ensure that the identification numbers on the bottom and top half of the DN30 PSP match</u></p> <p>Slings and shackles are required to have a lifting capacity of at least 500 kg each. The angle between the slings has to be equal to or less than 60°.</p> <p>Lift the top half onto the bottom half by means of a crane or a forklift.</p> <p>The markings (▲▼) on the top and bottom half have to be aligned and of the same color.</p> |  |
| L.15 | <p>Insert the six pins (1) into the corresponding closure devices.</p> <p>Secure the six pins with the corresponding securing bolts (2):</p> <ul style="list-style-type: none"> • Use a calibrated torque wrench for hexagon socket screws with center [DIN 6912]. • Apply a tightening torque of 150 Nm to each securing bolt. • Retighten each securing bolt with 150 Nm. |  |
| L.16 | <p>Attach the two seals on both sides of the top and bottom half of the DN30 PSP.</p> |  |

| Step | Explanation | Illustration |
|------|--|---|
| L.17 | Return the screws and nuts into the holes of the two lifting lugs of the top half to render them incapable of being used during transport. |  |
| L.18 | Final checks | <ul style="list-style-type: none"> • Check the presence of the 6 pins that lock the corresponding closure devices • Ensure that the securing bolts are locked with the intended tightening torque (e.g. by applying the torque retightening test method) • Check the presence of the 2 seals • Check the markings of the DN30 PSP correspond to the transport documents |
| L.19 | Contamination and dose rate measurement | <ul style="list-style-type: none"> • Prior to transport, carry out the measurements prescribed in test instruction 0023-PA-2015-017 |
| L.20 | Determination of Transport Index (TI) | <ul style="list-style-type: none"> • From the maximal dose rate in 1 m distance from the package measured in L.19, determine the TI. • Be aware that the TI can increase during the transport of full cylinders with reprocessed UF6 |

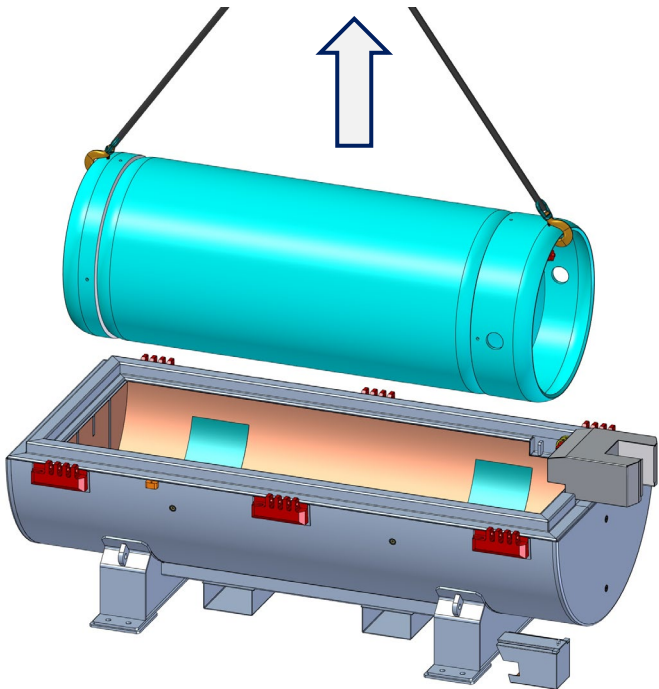
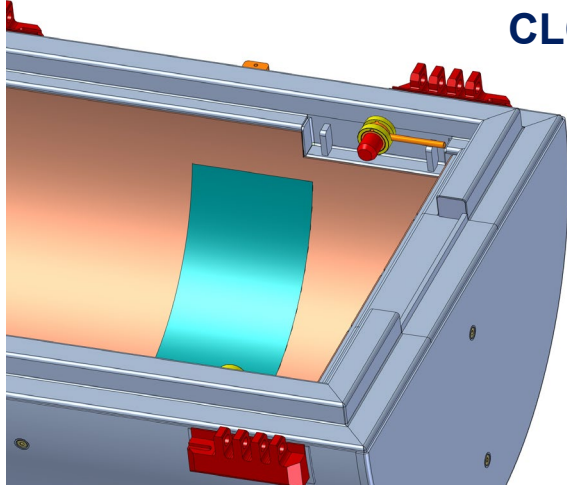
7 Handling Procedure: Unloading of a 30B Cylinder

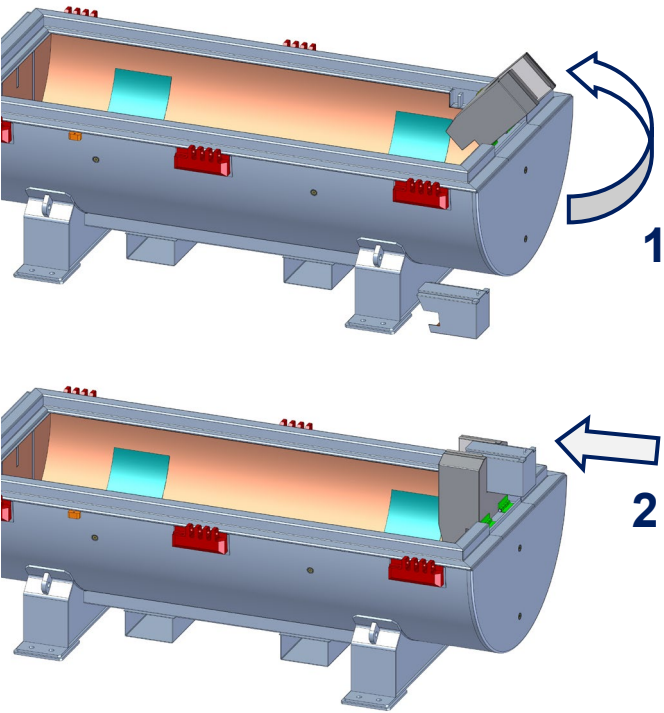

For unloading a 30B cylinder from a DN30 PSP, the following handling steps have to be strictly complied with.

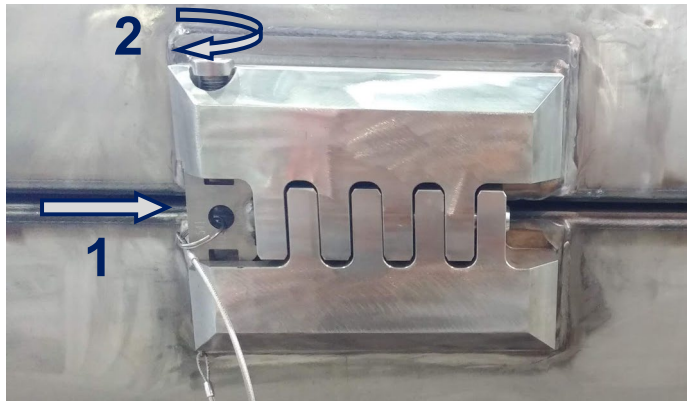

| Step | Explanation | Illustration |
|------|--|---|
| U.1 | The DN30 PSP is locked and loaded. |  |
| U.2 | Check of general condition | <ul style="list-style-type: none"> • At the reception of the DN30 PSP: check the general conditions (damaging, soiling, dirt, ...) • Check the presence of the 6 pins locking the corresponding closure devices • Check the presence and condition of the seals (2 in total) • Check the liftings lugs (2 at the top half, 4 at the bottom half): no deformation that can interfere with the handling |
| U.3 | <p>For each closure device (6 in total):</p> <ol style="list-style-type: none"> 1. Unlock the securing bolt 2. Withdraw the pin <p>Note: The bolt cannot be completely removed.</p> |  |

| Step | Explanation | Illustration |
|------|--|--|
| U.4 | Remove the two seals on both sides of the top and bottom half of the DN30 PSP. |  |
| U.5 | Remove the screw and nuts from the holes in the two top half lifting lugs, which were intended to render the lifting lugs incapable of being used during transport. |  |
| U.6 | <p>Attach shackles (or other adequate lifting means) to each of the two lifting lugs at the top half of the DN30 PSP.</p> <p>Slings and shackles lifting capacity has to be at least 500 kg each.</p> |  |
| U.7 | <p>Now, make sure all pins (6 in total) have been removed</p> <p>Slowly and carefully lift (take off) the top half.</p> <p>Special care has to be taken to prevent swinging of the top half that could cause damage to the DN30 PSP.</p> |  |

| Step | Explanation | Illustration |
|------|--|--------------|
| U.8 | <p>Temporarily, put down the top half next to the bottom half.</p> <p>For example, the top half can be placed on wood pieces.</p> | |
| U.9 | <p>Switch the rotation preventing devices (2 in total) in opened position.</p> <p>Note: The pin should not be sticking out of the DN30 PSP bottom half.</p> | |
| U.10 | <p>Take out the housing from the valve protecting device and put it down on the floor next to the DN30 PSP.</p> <p>Lift the loaded 30B cylinder out of the DN30 PSP by means of a crane.</p> <p>While lifting the 30B cylinder, carefully tilt back the valve protecting device (2).</p> | |

| Step | Explanation | Illustration |
|------|---|--|
| U.11 | Carefully lift the 30B cylinder out of the DN30 PSP. |  |
| U.12 | Switch the rotation preventing devices (2 in total) to their closed position. |  <p>CLOSED</p> |

| Step | Explanation | Illustration |
|------|---|--|
| U.13 | <p>Return the valve protecting device (1) from its horizontal to its vertical closed position.</p> <p>Push the housing (2) <u>slowly and carefully</u> back into the valve protecting device as far as it will go.</p> <p><u>Ensure that the identification numbers on the DN30 PSP and the housing match.</u></p> |  |
| U.14 | <p>Attach shackles (or other adequate lifting means) to the two lifting lugs of the top half of the DN30 PSP.</p> <p><u>Ensure that the identification numbers on the bottom and top half of the DN30 PSP match</u></p> <p>Slings and shackles are required to have a lifting capacity of at least 500 kg each. The angle between the slings has to be equal to or less than 60°.</p> <p>Lift the top half onto the bottom half by means of a crane or a forklift.</p> <p>The markings (▲▼) on the top and bottom half have to be aligned and of the same color.</p> |  |




| Step | Explanation | Illustration |
|------|---|---|
| U.15 | <p>Insert the six pins (1) into the corresponding closure devices.</p> <p>Secure the six pins with the corresponding securing bolts (2).</p> |  |
| U.16 | <p>Return the screws and nuts into the holes of the two lifting lugs of the top half to render them incapable of being used during transport.</p> |  |
| U.17 | <p>Final checks</p> | <ul style="list-style-type: none"> • Check the presence of the 6 pins locking the corresponding closure devices • Ensure that the securing bolts are locked |

8 Handling Procedure: Fastening on a Transport Vehicle

8.1 Flatrack Transportation

For fastening DN30 packages or empty DN30 PSPs on a dedicated flatrack, the following steps have to be strictly complied with.

| Step | Explanation | Illustration |
|------|---|--------------|
| T.1 | Visually inspect the loaded DN30 package for damage and make sure <u>all</u> securing bolts are inserted as well as locked and that the seals are properly set up. | |
| T.2 | Lift the DN30 packages e.g. by means of a crane and bring it into position on the transport container. Handling of the DN30 packages shall be performed as described in section 5.1.1. | |
| T.3 | Place the DN30 package on the H-Section steel of the transport container such that the drilled holes in the base feet of the DN30 PSP and the holes in the H-Section steel match as accurately as possible. | |

| Step | Explanation | Illustration |
|------|---|---|
| T.4 | <p>Each base foot is fitted with two holes. To fix the DN30 package on the H-Section steel of the transport container the following is required:</p> <ul style="list-style-type: none"> • 8x hexagon head screws ISO 4017 - M20 x 70 - 10.9 • 16x washers ISO 7089 - 20 - 300 HV or ISO 7090 - 20 - 300 HV • 8x hexagon nuts ISO 7040 - M20 - 10 <p>Hot galvanized bolts and as lubricants MoS₂, graphite or wax dispersions have to be used.</p> <p>Two assembly orders may be used:</p> <ol style="list-style-type: none"> 1. Nut, washer, base foot plate, H-section, washer and bolt. 2. Bolt, washer, base foot plate, H-section, washer and nut. <p>Torque controlled tightening with a torque wrench, a signaling wrench or a motorized nut runner with a dynamic torque measurement has to be used to tighten the bolts.</p> <p>The target tightening torque has to be 285 Nm.</p> |    |

8.2 Other Transportation Configurations

Other transport configurations, for example DN30 packages or PSPs loaded on a truck trailer, require an appropriate and valid tie-down plan. Before use, the tie-down plan shall be checked by DNT.

The DN30 packages or PSPs have to be secured with straps. Chains or other means, that could cause damage to the DN30 PSP, are not allowed.

8.3 Special Requirement for Transport by Rail

For transport by rail, label No. 15 from the RID [RID 2019] will be visibly affixed to the wagons used for the transport of the package model DN30 to forbid hump shunting.

9 References

- [ANSI N14.1] ANSI N14.1, Uranium Hexafluoride – Packaging for Transport, 2012
- [ANSI N14.5] ANSI N14.5, Radioactive Materials - Leakage Tests on Packages for Shipment, 2014
- [DIN 6912] DIN 6912:2009-06, Hexagon socket head cap screws with centre, with low head, June 2009
- [DIN EN ISO 9712] DIN EN ISO 9712:2012-12, Non-destructive testing – Qualification and certification of NDT personnel, December 2012
- [ISO 7195] ISO 7195, Nuclear Energy – Packaging of uranium hexafluoride (UF₆) for transport, Second edition, September 2005
- [ISO 12807] Safe transport of radioactive materials – Leakage testing on packages, ISO 12807, 2018
- [RID 2019] Règlement concernant le transport international ferroviaire de marchandises Dangereuses (RID) as applicable from 1 January 2019
- [USEC 651] The UF₆ Manual – Good Handling Practices for Uranium Hexafluoride, Rev. a9, USEC, 2006