Test Instruction

Periodical Inspections of the DN30 PSP

0023-PA-2015-015-Rev4

Prepared	Checked	Released
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Modifications

Revision	Date of revision	Modifications
0	01.12.2016	Original
1	29.09.2017	Numbering of chapters Addition to chapter 6.2.1 New chapter 6.3 New chapter 8.4 Additions/Modifications to Attachment 1 New Attachment 2, Table 2, Table 3
2	29.10.2018	Modifications to chapter 5
3	15.07.2019	• Editorial changes • Reworked chapter 1: definition of the terms regular and periodical inspections, regular inspections are part of the handling instruction 0023-HA-2015-001. One-year inspection has been renamed to annual inspection. • The checklist CH-0596/00-TBS has been removed from the further applicable documents as it is now included as an attachment to this instruction. • The description of the DN30 PSP has been moved to chapter 3 and has been reworked as well as made consistent with other instructions. • The qualification of personnel has been moved to chapter 4 and has been supplemented with more specific requirements for each inspection and for certain tests to be performed during the inspections. • Added a reference to Attachment 1 for the annual inspections as well. • Added a description for the weight check equipment in chapter 7. • Added the check for “presence or absence of parts” to the visual inspections in section 8.1 • The sections describing the dimensional checks have been combined to section 8.2. • Added descriptions of the weight check in section 8.3, of the soap bubble test for the thermal plugs in section 8.6 and of the dye penetrant test in section 8.7. • Added further information to chapter 9 • Added the possibility to use alternative checklists in chapter 10 that are approved by DAHER NT. • Inspection of the DN30 PSP: ○ Consistently used the term structural changes instead of structural damages ○ Added further aspects to the step B-5 (gasket) ○ Added further aspects to the step B-6 (support pads)

		○ Reformulated the aspects for step B-7 (thermal plugs) ○ Added “integrity” to aspects of step C-7 (Pins String) ○ Added a description of the functional tests in step C-8 (closure devices) ○ Added “coating with intumescent material” to aspects of step D-3 (housing) ○ Reformulated the aspects for step F-1 (intumescent material) ○ Reformulated the aspects for step H-1 (welds)
4	11.10.2019	• Further details have been added to the description of the DN30 PSP in chapter 3. • The description of the soap bubble test in section 8.6 has been reworked. The possibility to perform the bubble test by applying overpressure has been added. • In section 8.7, references to standards have been added to the test criteria. Accordingly, the test criteria for not-line-like displays has been modified. • For steps D-1 to D-3 in attachment 1, “deformations” have been added in the column “Inspection with respect to”.

1 Scope, Objective and Responsibilities

These instructions describe type and extent of the annual and 5-year inspections (periodical inspections) required according to the certificate of approval for the DN30 Protective Structural Packaging (PSP). The visual inspections and functional tests of the DN30 package performed before each transport are described in handling instruction 0023-HA-2015-001.

The periodical inspections ensure that the DN30 PSPs are kept in an appropriate operating condition and that they always comply with the certificate of package approval.

Responsible for carrying out the periodical inspection is the user of the DN30 PSP.

2 Further Applicable Documents

The following documents are also valid:

Test instructions 0023-PA-2015-016	Criteria for regular and periodical inspections of the DN30 package
Handling instructions 0023-HA-2015-001	Use and handling of the DN30 package

The current revision of the documents mentioned in Attachment 1 shall be used. The user is informed in writing by the owner of the package approval when a new revision is available.

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 inleakage 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.

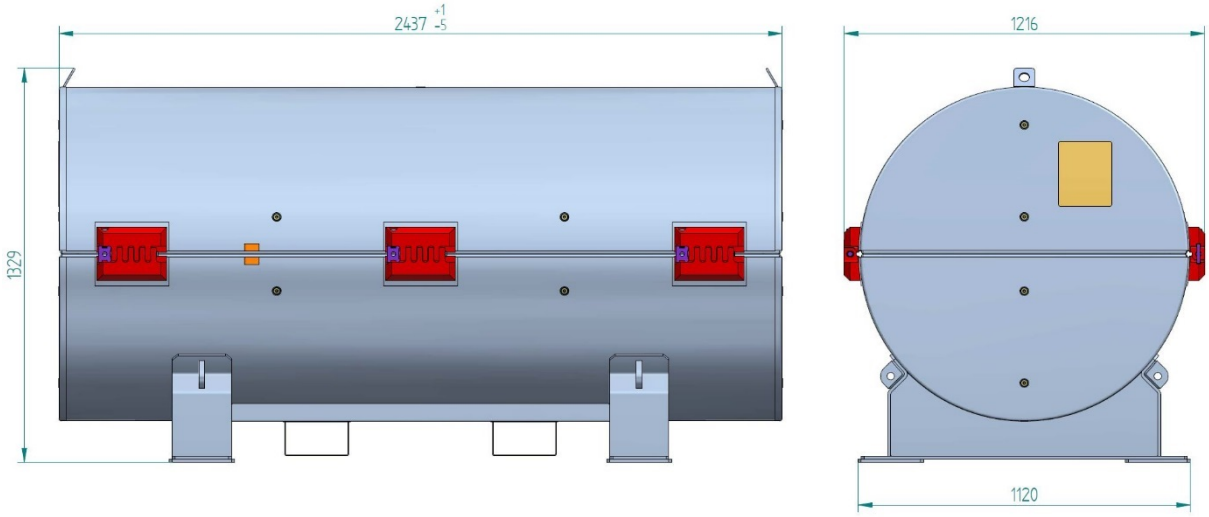

Figure 1: DN30 PSP

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

Table 1: Main Characteristics of the DN30 Package

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

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

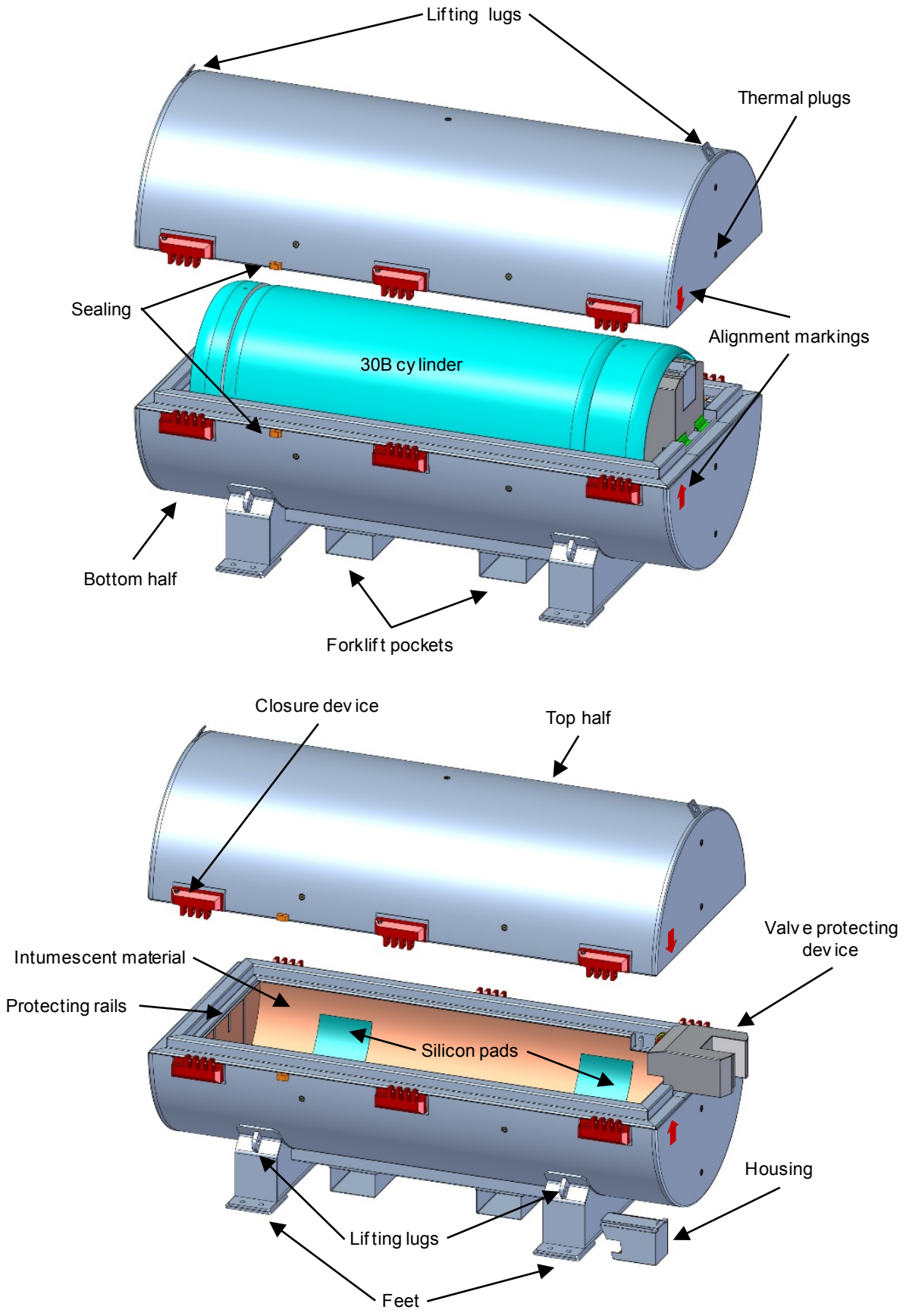

Figure 2: The DN30 PSP and its Main Parts

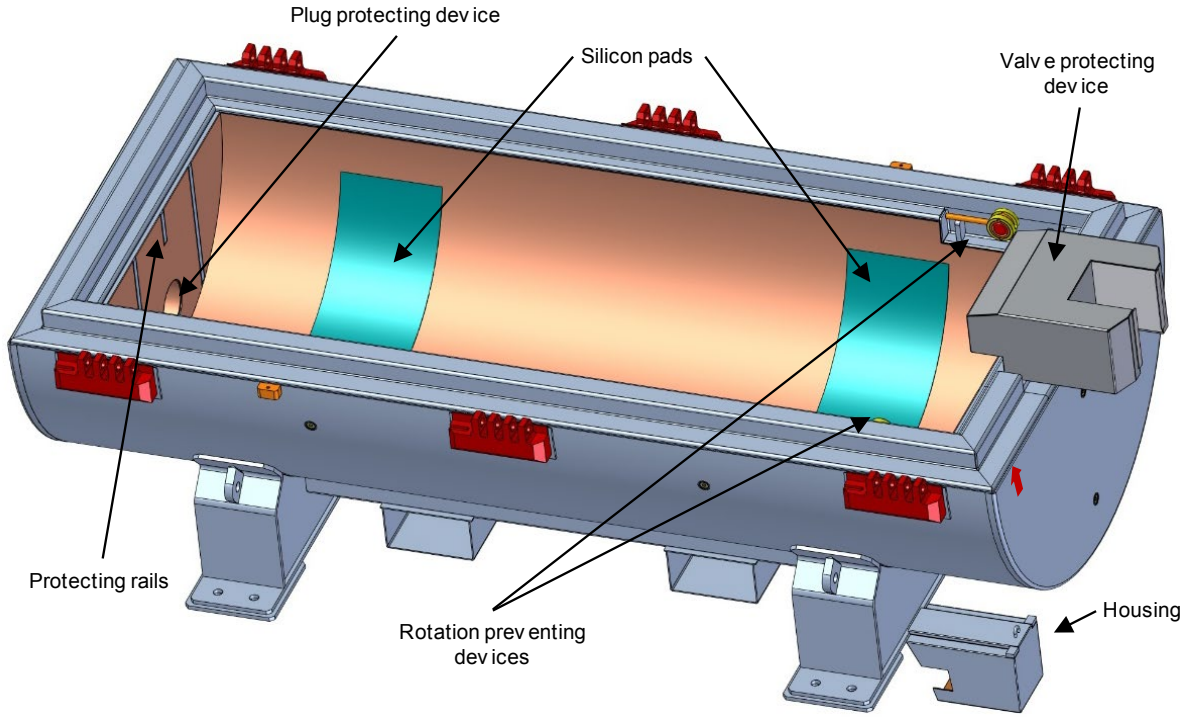

Figure 3: Details of the Bottom Half

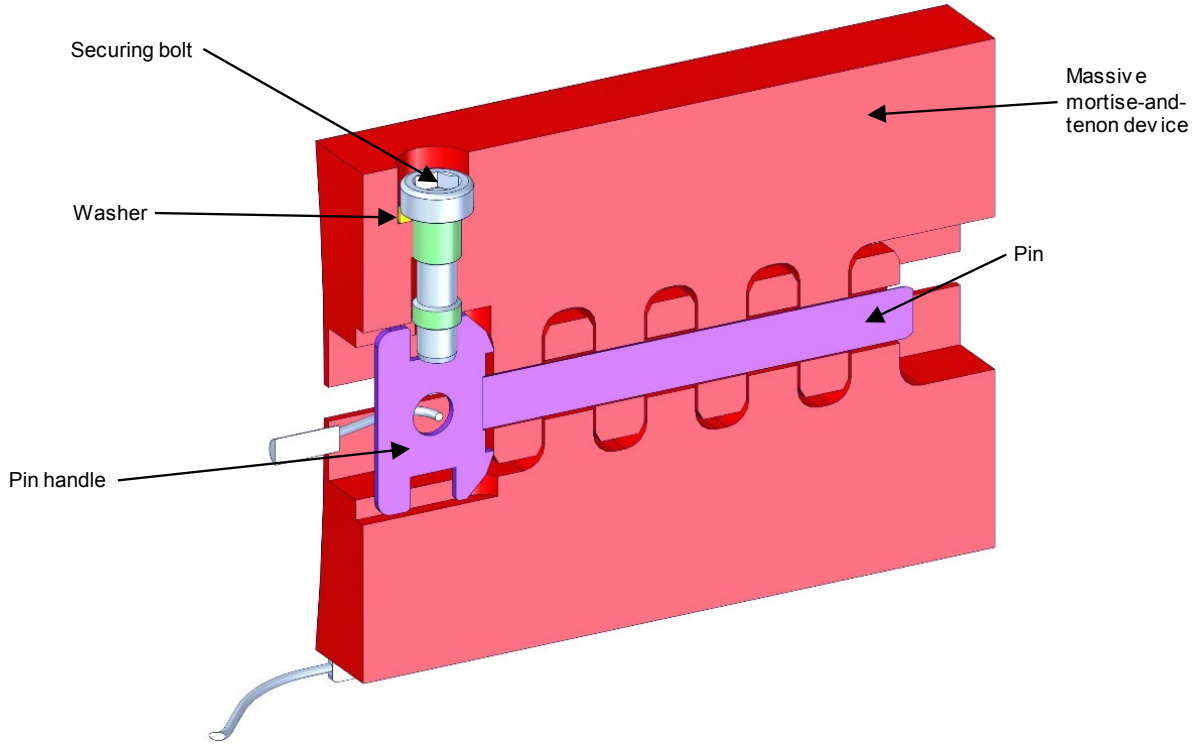

Figure 4: Detailed Section Illustration of the Closure Device

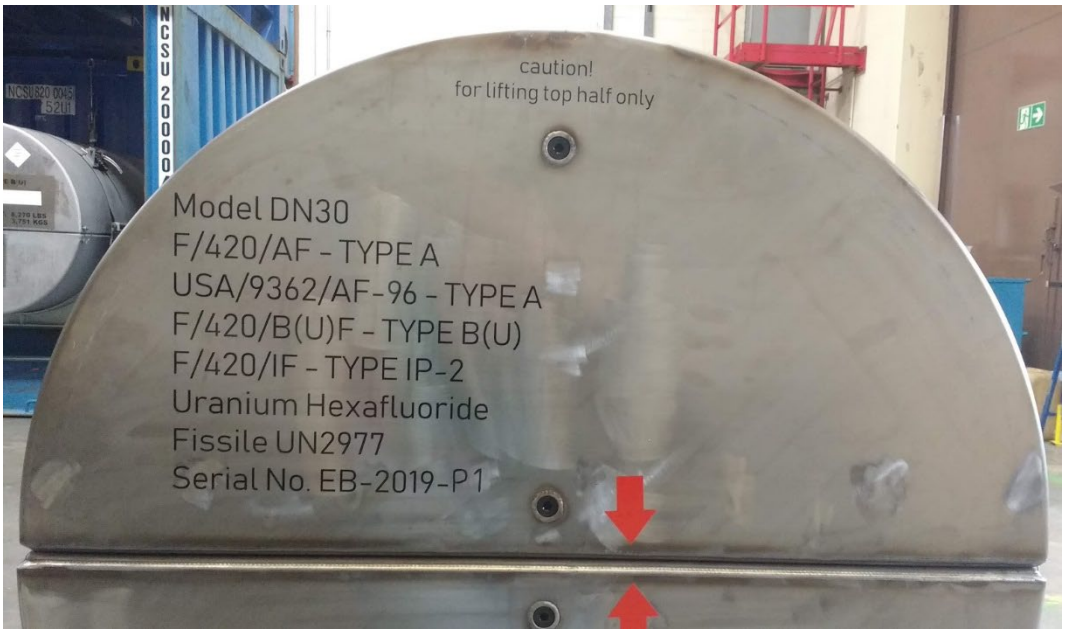

Figure 5: View of the DN30 PSP Front Face

Figure 6: Label on the Valve Protecting Device

4 Qualification of Personnel

The personnel responsible for the periodical inspections have to be familiar with this test instruction, the handling instruction for the DN30 package and the inspection criteria.

The responsible person for supervising the periodical inspections has to be appointed by the management of the user and has to be independent from operations.

In case of deviations during the annual inspection, personnel have to be consulted that is certified according to [DIN EN ISO 9712], VT2 or any equivalent standard valid in the country of the user.

For the 5-year inspection, the personnel have to be certified according to [DIN EN ISO 9712], VT2 or any equivalent standard valid in the country of the user. The dye penetrant test of welding edges and welding seams has to be performed by personnel certified according to [DIN EN ISO 9712], PT2 or any equivalent standard valid in the country of the user. The leak-tightness test of the thermal plugs has to be performed by personnel certified according to [DIN EN ISO 9712], LT2 or any equivalent standard valid in the country of the user.

5 Health Physics Clearance

Health physics clearance has to be available before the periodical inspection begins.

6 Inspections

Inspections have to be regularly and periodically performed on the DN30 PSP. The regular inspections are described in detail in the handling instructions for the DN30 package. Both the regular and periodical inspections are mandatory for a safe use of the DN30 package.

During the periodical inspections, the DN30 PSP inspection book has to be available.

6.1 Regular Inspection Before Each Transport

Before each transport, the DN30 PSP has to be inspected. These regular inspections are described in handling instruction 0023-HA-2015-001.

6.2 Periodical Inspections

6.2.1 Annual Inspection

An inspection of each DN30 PSP is conducted yearly (a deviation of one month is tolerated).

If a DN30 PSP is not used for transports, the inspection period might expire. However, before the next use, the required annual inspection has to be carried out.

The annual inspection consists of checking the presence of the pads, thermal plugs, gasket and lifting lugs as well as a functional test of the valve protecting device, rotation prevention devices and closure devices of the DN30 PSP parts. A detailed list of the tests to be performed is provided in Attachment 1.

6.2.2 Five-year Inspection

An inspection of each DN30 PSP is conducted every five years.

The requirements of Attachment 1 are valid for the performance of the five-year inspection. The chronological sequence of the inspection steps described in Attachment 1 may be adapted to optimize the 5-year inspection.

If a DN30 PSP is not used for transports, the inspection period might expire. However, before the next use, the required five-year inspection has to be carried out.

After the five-year inspection is carried out successfully, the date of the next five-year inspection is stamped on the nameplate of the DN30 PSP.

7 Equipment for Inspections

The equipment used for dimensional checks, weight checks and checks of the threads of the closure devices has to be calibrated. The calibration certificates have to be valid.

The weighing equipment shall have an uncertainty of less than ± 0.1 %.

During the periodical inspections, the inspected area has to be sufficiently illuminated, either through daylight or through artificial light of at least 500 Lux (this is the equivalent illumination 1 m away from an 80 W fluorescent lamp). Disturbing light effects such as reflections have to be avoided.

8 Inspection Performance, Evaluation and Assessment of Results

8.1 Visual Inspections

Visual inspections are carried out on different components of the DN30 PSP, with respect to the following aspects:

- presence or absence of parts
- cleanliness
- surface condition
- irregularities, damages and deformations
- corrosion
- integrity

Criteria and requirements for visual inspections are listed in Attachment 1 of this inspection instruction.

8.2 Dimensional Checks

Dimensional checks are carried out by means of adequate measuring devices. During the annual and five-year inspection, dimensional checks are only necessary if objections are raised from visual inspection. The scope of dimensional checks is regulated in Attachment 1.

8.3 Weight Check

The weight check is carried out separately for the top and the bottom half of each DN30 PSP as well as for the entire DN30 PSP. The weighing equipment has to be appropriate for the corresponding weights (approx. 610 kg and 490 kg for the bottom half and top half of the DN30 PSP, respectively, as well as 1100 kg for the DN30 PSP). Furthermore, it shall have an uncertainty of less than ± 0.1 %.

8.4 Checks of Threads of the Closure Devices

The following checks are carried out for the threads of all closure devices:

- cleanliness
- structural deviations
- dimensional accuracy of the threads

Test criteria are defined in DIN ISO 1502 and in Attachment 1 of this test instruction. All securing bolts and internal threads of the closure devices have to be tested by means of a ring gauge and plug gauge, respectively. The tolerance classes are 6H for the inner thread and 6g for the external thread. The go gauge has to suit smoothly per hand over the whole thread length. The no-go gauge can be screwed in maximum of 2 threads turns.

8.5 Functional Tests

The following functional tests have to be carried out during the annual and five-year inspection 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 lever 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 easily be moved

8.6 Soap Bubble Test for Thermal Plugs

The leak-tightness of the thermal plugs is tested by performing a soap bubble test according to [ISO 12807] or [ANSI N14.5]. Generally, two test procedures may be applied for the DN30 PSP to perform the bubble test. Both test procedures have in common that the potentially leaking areas are lathered with certified soap suds. The two test procedures are:

1. **Local soap bubble test by pulling vacuum:** After lathering the tested area, a transparent cap is mounted on top of these areas, which can be used to pull vacuum. If no bubbles are visible during pulling vacuum, the corresponding areas are certified as leak-tight.
2. **Global soap bubble test by applying overpressure:** For this test procedure, one thermal plug needs to be removed on the valve and on the plug side of the DN30 PSP, respectively. One of the opened thermal plugs is used as the test connection to apply the overpressure and the other is used to connect a pressure gauge. To perform the test, the pressure is increased step-by-step up to more than 0.25 bar. However, the test pressure must not exceed 0.3 bar. Air is used as a test gas. Then, the tested areas are lathered with certified soap suds. If no bubbles are visible, the corresponding areas are certified as leak-tight. The two removed thermal plugs have to be tested separately by applying test procedure 1.

8.7 Dye Penetrant Test

The dye penetrant test is performed according to [DIN EN ISO 3452-1] or any other equivalent international standard. The operating procedures of the test media system (the combination of penetrant, remover and developer) have to be considered.

The following times are stipulated as complement to the determinations of [DIN EN ISO 3452-1] or any other equivalent international standard:

- Time of penetration: 30 min
- Time of development: 60 min

Judgement is given immediately after the drying of the developer and after 60 min of developing time.

The following criteria are used to evaluate the penetration test:

- Indications with a diameter ≤ 2 mm are not to be included in the evaluation.
- Inadmissible indications are:
  - More than 3 indications per 100 mm seam length ([DIN EN ISO 23277], ZG 2X and [DIN EN ISO 5817], BG C) (line-like displays l > 2 mm and not-line-like displays d > 6 mm)
  - Indications pointing to cracks, doublings or lacks of fusion.
- In case of non-circular indications, an overlapping circular disk has to be used to allow for a judgement.

9 Deviations

Test instruction 0023-PA-2015-016 contains in detail the criteria and measures in case of deviations during the annual and five-year inspection. 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).

10 Documentation

The performance and results of the annual and five-year inspection have to be recorded on the checklist CH-0596/00-TBS, or an equivalent from the inspector as long as it has been approved by DAHER NT beforehand. Additional records are required in certain cases as stipulated in Attachment 1.

References

[ANSI N14.5] ANSI N14.5, 2014 Edition, Radioactive Materials – Leakage Tests on Packages for Shipment, June 2014

[DIN EN ISO 3452-1] DIN EN ISO 3452-1:2014-09, Non-destructive testing – Penetrant testing – Part 1: General principles, September 2014

[DIN EN ISO 5817] DIN EN ISO 5817:2014-06, Fusion-welded joints in steel, nickel, titanium and their alloys (beam welding excluded) – Quality levels for imperfections, June 2014

[DIN EN ISO 9712] DIN EN ISO 9712:2012-12, Non-destructive testing – Qualification and certification of NDT personnel, December 2012

[DIN EN ISO 23277] DIN EN ISO 23277:2015-06, Non-destructive testing of welds – Penetrant testing - Acceptance levels, June 2015

[ISO 12807] ISO 12807:2018-09, Safe transport of radioactive materials – Leakage testing on packages, September 2018

Attachment 1. Inspection of the DN30 PSP

Attachment 2. Checklist CH-0596/00-TBS

Inspection of the DN30 PSP

	Step	One-year insp.	Five-year insp.	Description of working or control step	Inspection with respect to	Documents containing the criteria	Controlled through *Only in case of deviations and non-conformances		
							User	DNT	Written protocol
A) General identification checks	**A-1**	X	X	Release by health physics		Acc. to site specific instructions	X		X
	A-2	X	X	Control of the DN30 PSP identification and markings, comparison with the DN30 PSP inspection book	Readability Completeness Conformance with package inspection book	0023-PA-2015-016	X		*
	A-3		X	Control and comparison of all exchangeable components with the DN30 PSP inspection book	Completeness Conformance with package inspection book	0023-PA-2015-016	X		*
	A-4		X	Control of the exchanged parts	Completeness Conformance with package inspection book	0023-PA-2015-016	X		*
B) Bottom half, top half	**B-1**	X	X	Visual inspection of general condition	Condition of surface: soiling, dirt, corrosion, cracks, deformations, dents, scratches Absence of water	0023-PA-2015-016	X		*
	B-2		X	Visual inspection of exterior and interior shells	Presence of water Condition of surface: soiling, dirt, corrosion, cracks, deformations, dents, scratches	0023-PA-2015-016	X		*

	Step	One-year insp.	Five-year insp.	Description of working or control step	Inspection with respect to	Documents containing the criteria	Controlled through *Only in case of deviations and non-conformances		
							User	DNT	Written protocol
	B-3	X	X	Visual control of the cavity	Presence of free water	0023-PA-2015-016	X		*
	B-4		X	Visual inspection of flanges and sealing areas	Presence of water Condition of surface: soiling, dirt, corrosion Structural changes: indents and incisions perpendicular to the gasket axis	0023-PA-2015-016	X		*
	B-5	X	X	Visual inspection of the gasket	Presence Structural changes: dents, holes, cracks, change of color (Systematically replaced every five years)	0023-PA-2015-016	X		*
	B-6	X	X	Visual inspection of inner cylinder support pads	Presence: 2 pieces on the bottom half Soiling, damage	0023-PA-2015-016	X		*
	B-7	X	X	Visual inspection of the thermal plugs (18 plugs)	Presence, integrity	0023-PA-2015-016	X		*
	B-8		X	Leak tightness of the thermal plugs (18 plugs)	Perform a bubble test with a vacuum-bell on each thermal plug	0023-PA-2015-016	X		X
	B-9		X	Protecting rails	Presence	0023-PA-2015-016	X		*

	Step	One-year insp.	Five-year insp.	Description of working or control step	Inspection with respect to	Documents containing the criteria	Controlled through *Only in case of deviations and non-conformances		
							User	DNT	Written protocol
C) Closure system	**C-1**	X	X	Visual inspection of the general condition	Condition of surface: soiling, dirt, corrosion Structural changes: dents, holes, cracks, corrosion, broken parts Completeness (Pin and bolt)	0023-PA-2015-016	X		*
	C-2		X	Visual inspection of the pins	Condition of surface: soiling, dirt, corrosion Structural changes: deformations, dents, holes, cracks, corrosion, broken parts	0023-PA-2015-016	X		*
	C-3		X	Inspection of threads of the mortise-and-tenons parts	Condition of surface: soiling, dirt, corrosion Structural changes: deformations, dents, holes, cracks, corrosion, broken parts	0023-PA-2015-016	X		*
	C-4		X	Thread in mortise-and-tenon part	Cleanliness: soiling, dirt, metal chips Structural changes: deformed threads	0023-PA-2015-016	X		*
	C-5		X	Inspection of the securing bolts	Cleanliness: soiling, dirt, metal chips Structural changes: deformed threads	0023-PA-2015-016	X		*

	Step	One-year insp.	Five-year insp.	Description of working or control step	Inspection with respect to	Documents containing the criteria	Controlled through *Only in case of deviations and non-conformances		
							User	DNT	Written protocol
	C-6		X	Inspection of the washers	Systematically replaced every year	0023-PA-2015-016	X		*
	C-7	X	X	Inspection of the pin strings	Presence, integrity	0023-PA-2015-016	X		*
	C-8	X	X	Functional test of closure devices	Pins and securing bolts have to be moveable by hands	0023-PA-2015-016	X		*
D) Valve protecting device	**D-1**	X	X	Visual inspection of the general condition	Cleanliness: soiling, dirt, corrosion Structural changes: deformation, dents, holes, cracks, corrosion, broken parts	0023-PA-2015-016	X		*
	D-2		X	Visual inspection of the hinges	Structural changes: deformation, holes, cracks, corrosion, broken parts	0023-PA-2015-016	X		*
	D-3	X	X	Visual inspection of the housing	Function Structural changes: deformation, holes, cracks, corrosion, broken parts, deformed parts Coating with intumescent material	0023-PA-2015-016	X		*
	D-4	X	X	Functional test of the hinges	Function	0023-PA-2015-016	X		*

	Step	One-year insp.	Five-year insp.	Description of working or control step	Inspection with respect to	Documents containing the criteria	Controlled through *Only in case of deviations and non-conformances		
							User	DNT	Written protocol
E) Rotation preventing devices	**E-1**	X	X	Visual inspection of the general condition	Cleanliness: soiling, dirt, corrosion Structural changes: deformation, dents, holes, cracks, corrosion, broken parts	0023-PA-2015-016	X		*
	E-2		X	Inspection of the bolts	Function Structural changes: deformation, dents, holes, cracks, corrosion, broken parts	0023-PA-2015-016	X		*
	E-3		X	Inspection of the lever	Function Structural changes: deformation, dents, holes, cracks, corrosion, broken parts	0023-PA-2015-016	X		*
	E-4	X	X	Functional test of the rotation preventing devices	Function	0023-PA-2015-016	X		*
F) Intumescent material	**F-1**		X	Visual inspection of the top and bottom half	Cleanliness: soiling, dirt Aspect: holes, cracks, scratches Condition of the glued joint	0023-PA-2015-016	X		*
G) Weight	**G-1**		X	Check of weight	Each half of the DN30 PSP Entire DN30 PSP	0023-PA-2015-016	X		X
H) Welds	**H-1**		X	Visual inspection and dye penetration tests	Cracks, holes, corrosion	0023-PA-2015-016	X		X

	Step	One-year insp.	Five-year insp.	Description of working or control step	Inspection with respect to	Documents containing the criteria	Controlled through *Only in case of deviations and non-conformances		
							User	DNT	Written protocol
I) Handling features	**I-1**	X	X	Visual inspection of the general condition - Lifting lugs at the top half - Lifting lugs at the bottom half (at the feet) - Forklift pockets	Presence No deformation that could interfere with the handling Cleanliness: soiling, dirt, corrosion	0023-PA-2015-016	X		*
J) Documentation	**J-1**	X	X	Record the performance and results of the periodical inspection			X		X
	J-2		X	Submit documentation to DNT for endorsement			X		
	J-3		X	Check documentation and issue endorsement				X	X
	J-4		X	Stamp DN30 PSP with the date of the next periodical inspection			X	X	

DAHER	INSPECTION OF DN30 PSP	Protocol No.: .....

Inspection type: ☐ 1-year ☐ 5-year	Owner: ..... User: .....
DN30 PSP-No.: ..... Date of manufacturing:	Date of last weight: .....

Performed inspections according to 0023-PA-2015-015			Result		Performed operations in case not acceptable according to 0023-PA-2015-016	
1-year	**5-years**	**Step**	**A**	**NA**	**Action in case of deviation** *Protocol No. required*	**A**
A-1	A-1, A-3, A-4	General identification checks				
A-2	A-2	Marking				
B-1	B-1, B-2,	Upper/lower half exterior				
B-1	B-1, B-2	Upper/lower half interior				
B-3	B-3	Water in cavity				
B-5	B-4, B-5	Gasket				
B-6	B-6	Cavity pads				
B-7	B-7; B-8	Thermal plugs				
	B-9	Protecting rails				
C-1, C-7, C-8	C-1, C-2, C-3, C-4, C-5, C-6, C-7, C-8	Closure system (pins, thread, bolts)				
D-1, D-3, D-4	D-1, D-2, D-3, D-4	Valve protecting device				
E-1, E-4	E-1, E-2, E-3, E-4	Rotation preventing device				
	F-1	Intumescent material				
	G-1	Weight				
	H-1	Welds				
I-1	I-1	Handling devices (lower and upper half)				
J-1	J-1, J-2, J-3, J-4	Documentation				

A: Acceptable

NA: Not acceptable

Weights	Top half	Bottom half	Total DN30 PSP
nominal kg			
actual kg			

Inspection result			
Use of DN30 PSP permitted	☐	Use of DN30 PSP prohibited, repair required	☐
Place of inspection	Date of inspection	Inspector (Name and signature)	