Christen & Laudon Staffelstein

OPERATING INSTRUCTIONS

for transport, installation, operation and cleaning of vessels made of

- FRP with chemical protection layer

- FRP with thermoplastic lining

- FRP pressure vessels in accordance with EU Pressure Equipment Directive

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List of abbreviations

GTA	General technical authorisation
DIBt	German Institute for Building Technology Berlin
PED	EC Pressure Equipment Directive
MD	EC Machinery Directive
AwSV	Ordinance on facilities for handling water-polluting substances (Ordinance of the Federal Republic of Germany)
WHG	Water Resources Act (Germany)

1. General

These operating instructions are valid for:

- Container with GTA of the DIBt (Germany)
- Pressure vessels according to the PED 2014/68/EU
- GFK stirring tank according to the MD 2006/42/EC
- all other GFK components from Christen & Laudon correspondingly

For containers with GTA of the DIBt in Germany the following applies additionally:

1) The specifications of the GTA regarding transport, installation, operation and cleaning must also be taken into account.
2) As of hazard level C (§ 39 AwSV), the operator is obliged to commission only those companies for assembly, commissioning, and cleaning which are specialist companies for these activities in accordance with the Water Resources Act (WHG). Christen & Laudon carries out these activities with its own expert staff.

2. Transport and Storage

2.1 General

The transport shall only be performed by companies that have experience, suitable tools, installations and means of transport as well as sufficiently trained personnel.
In order to protect workers and third parties from danger, the common accident prevention regulations shall be observed.

2.2 Transport Preparation

The vessels shall be prepared for the transport so that they will not be damaged during loading, transport, and unloading.
The loading platform of the transport vehicle must be such that damages to the vessel due to point-like collision or pressure stress is avoided.

When transporting pure thermoplastic vessels and vessels with thermoplastic inner lining, the following temperature regulations must be observed.

Work material: PVC ⇨ temperature > + 5 °C
PVDF ⇨ temperature > - 5 °C
PFA ⇨ no limit
PP ⇨ temperature > + 5 °C
E-CTFE ⇨ temperature > 0 °C

2.3 Loading and Unloading

When lifting, moving and putting down the vessels, shock strains must be avoided.
If a forklift-truck with appropriate size and lift capacity is used, the forks should be at least 12 cm wide. Otherwise means for load distribution must be used. When driving the forklift-truck, the vessels must be secured.
The provided lift eyes must be used for transporting the vessel. The rigging hardware must be attached to a cross beam.
The permissible load of the lift eye must be obtained from the static calculations.
Connectors or other protruding vessel parts must not be used for attaching or lifting. Rolling movements over connectors or flanges or sliding the vessel on the ground are not permitted.

2.4 Transport

The vessels must be secured against undesired changes in position during the transport. The vessels must not be damaged by the fastening.

2.5 Storage

If the vessels need to be stored before installation, this must be done on a solid and plane floor, from which all sharp objects have been removed. When storing outside, the vessels must be protected against damage and storm.
Temporary storage in horizontal position should be done on wooden bars of at least 300 mm width. The wooden bars should lay underneath the joints bottom-cylinder.

2.6 Damages

In the event of damage caused by transport, intermediate storage or assembly, proceed as follows, depending on the area of jurisdiction:

- For approval containers DIBt
  According to the findings of a plastics expert
- For vessels according to the Pressure Equipment Directive Module G
  According to the findings of the notified body
- For all other containers/components
  According to the findings of the manufacturer Christen & Laudon

No repairs or modifications to containers may be carried out without the written consent of Christen & Laudon. Failure to comply with this will void any warranty claims by Christen & Laudon

3. Installation Conditions for Above-Ground Vessels

3.1 General

In areas prone to floods, the vessels must be set up so that they cannot be reached by the flood unless the vessel was appraised for this load in the individual case.

3.2 Support (Foundation)

3.2.1 Flat-Bottom Vessel

(1) The bottom of the vessel or spill container must lay on a plane rigid support plate in its entirety.
(2) The foundation of vessels has to carry out acc. DIN 18353 "Floor screed works". The following dimensional tolerances acc. DIN 18202 are valid:

a) for the flatness, table 3, column 3

tolerances (lower surface bottom vessel to top surface foundation) in mm at measuring point distances in m

measuring point distances [m]	0,1	1	4	10	15
Tolerance [mm]	2	4	10	12	15

b) for the angularity, table 2, column 1

tolerances in mm at nominal sizes (e. g. vessel diameter) in m

Nominal size	< 1	1-3	> 3 to 6	> 6 - 15	> 15 - 30	> 30
Tolerance	6	8	12	16	20	30

The flatness of the foundation must checked before installation the vessel!

During the inspection of vessel foundations, it is to be proceeded as follows:

1) marking-out the vessel diameter as a ring with the nominal diameter of the vessel D
2) marking out of the foundation measuring points (measuring raster)
3) Measurement of the measuring points, and determine the highest point as zero point. Relate all measurements on this.
4) documentation of the measuring results in the test record

(3) Uneven foundations are to be compensated and the test repeated according to (2)

Special note!
The use of levelling compound is not permitted for tanks which are equipped with a membrane bottom (see tank drawing). With these containers, any unevenness in the foundations must be levelled out before installation. The thin bottom membrane is not able to distribute the levelling compound evenly when the tank is set up. Due to the manufacturing process, it can be assumed that the transition from bottom to cylinder is flat. Slightly curved membranes (tw<=D/100) are allowed as they are completely embedded on the installation surface due to their own weight or filling.

(4) For vessels that are not set up in spill containers, a one-piece PE plate of at least 2 mm thickness must be provided between the support plate and the vessel bottom as a lock and slide layer. For installations outside, the PE plate must be UV resistant.
(5) For vessels that are set up in spill containers, a PE plate of at least 2 mm thickness must be provided between the spill container and the vessel bottom as a slide layer. In this case, the PE plate may have several pieces (not welded, jointed).
(6) Below spill containers and double wall vessels, the installation of a PE plate is not necessary.

3.2.2 Support Skirt Vessel

The vessel must rest on the entire circumference of the support skirt on a plane, rigid foundation plate.
In areas that are subject to fire risk, the support skirt must be protected against the effects of fire.

3.2.3 Horizontal vessel

(1) The vessel is suspended in 2 or 3 support saddles. The number of support saddles and the distance between them are concluded from the static calculation.
(2) The bottom in the area of the foundation must be uniformly able to support weight. The foundation must be installed according to the static calculation provided and verified by the vessel operator. It must be plane and permit a horizontal installation of the vessel in the support saddles.

3.3 Distances

The vessels must have sufficient distance from walls, from other components, and from each other that a visual inspection for leaks and the verification of the system state including the receptor rooms is possible any time (observe national rules and regulations). Furthermore, the vessels must be installed that the risk of explosion is sufficiently low and that there are sufficient possibilities for fire fighting.
For support skirt vessels, it must be made sure that the revision opening in the support skirt is always accessible.

The following minimum distances must be observed:

Wall height ≤ 1.5 m distance between wall and vessel > 40 cm
Wall height > 1.5 m distance between wall and vessel > 100 cm

3.4 Installation / Assembly

3.4.1 General

The vessel must be lifted in the lift eyes with shackles and **long** ropes corresponding to the diameter of the vessel so that an **angled pull** (> 5°) at the lift eyes is avoided.
If the corresponding rope length cannot be used, it is essential to use a cross beam or a spreader.
In order to bring the vessel from the vertical into the horizontal position, a follow-up crane may be necessary. The lifting and guiding by the follow-up crane is done with the help of a corresponding belt, which is inserted approx. 500 mm above the bottom edge.

Vessels with a height of ≤ 4000 mm can be installed without a support crane with appropriate care. The vessel can be tipped over the bottom edge. However, the edge must first be protected with a soft underlay (e.g. a rubber mat). (cf. enclosure 2)

When installing the vessel without a support crane, it must be ensured that the vessel is not deflected when moving it into the vertical position and thus damaged!
If the access opening is closed when installing the vessel or when mounting the pipes to the vessel, the inside of the vessel must first be checked for installation damages. It should be ensured that the surface opposite of the access opening wasn't damaged (for example by falling tools during the assembly). The result of the check must be documented.

3.4.2 Flat-Bottom and Support Skirt Vessel

(1) The vessel and the trap system if applicable must be set up perpendicularly.
(2) If installing outdoors, the vessels must be secured against wind loads for vessels without trap systems. If the vessel has a trap system, this trap system must be secured. Anchoring the vessel inside trap systems, however, is not permitted.

3.4.3 Horizontal vessels

(1) Prior to installation, the containers, the storage saddles and the foundations must be subjected to a careful inspection. The containers must be picked up horizontally with suitable lifting devices and set down at the intended installation location without knocks.
(2) The bearing saddles must be fastened to the foundation with suitable dowels or anchor bolts in accordance with the specifications in the container drawing.
However, any remaining cavities under the foot plates must always be filled beforehand (filling with concrete or polyester concrete, underlaying with steel plates).
The distances between the bearing shells must be observed in accordance with the container drawing.

3.4.4 Vessels with Vertically Adjustable Feets

These vessels must **not be installed outdoors**.
During the installation, it must be ensured when adjusting the feet that all feet are evenly loaded and that they are perpendicular. The spindle should remain inside the foot as far as possible.

3.4.5 Vessel With Steel Pipe Substructure

These vessels may be installed indoors or outdoors.
In case of an outdoor installation, they must be anchored. The vessel may be installed over the steel pipe substructure as described under point 3.4.1.

3.4.6 Vessels With Thermoplastic Lining

Installation as described above.

Special remark!
Vessels with thermoplastic lining must be checked with a HV testing device before commissioning them (5 kV/mm wall thickness). The test must be performed and documented by a professional.

3.5 Connecting Tubes

(1) Pipelines must be designed and installed such that impermissible constraints are avoided. If possible, the pipe connections must be designed in such a way that the loads from prevented thermal expansion are decoupled from the tank nozzle via pipe loops or compensators. If external nozzle loads from pipe connections or attachments cannot be prevented, these must not exceed the values specified in Table 2, unless higher nozzle loads are expressly permitted and specified on the vessel drawing.
(2) Ventilation and exhaust pipes must be sufficiently large and must not be closable. Only those vessel may be ventilated and aired through a common pipe in which the liquids to be stored and their vapours cannot form dangerous compounds.
(3) Ventilation and aeration devices that exhaust dangerous vapours may not end in closed rooms; Their outlets must be protected against infiltration by rain water.
(4) When connecting water sluices or other pre-devices, it must be made sure that the admissible pressures are not exceeded or that the pressure does not fall below the minimum pressure.

When connecting pipes or the like, the seal provided for the flange connections, the corresponding screws and the maximum allowable tightening torque must be observed **(Table 1)**!

It is just as important that no pressure or additional external loads other than the ones provided for in the plan act on the connections of the respective vessels **(see table in arrangement drawing "permissible loading at nozzle R/2xs ≤ 250")**.

For all flanged connectors, it is essential to install washers on the FRP side!

Table 1

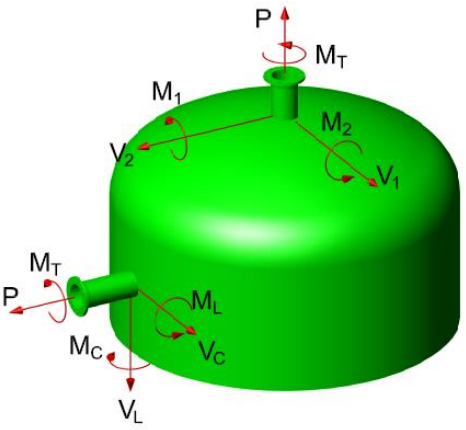
maximum tightening moment for flange joint								
DN		**DN25**	**DN32 - DN125**	**DN150 - DN300**	**DN400 - DN500**	**DN600 - DN700**	**DN800 - DN900**	**DN1000**
M	**(mm)**	**12**	**16**	**20**	**24**	**27**	**30**	**33**
$M_{a(FF)}$	**(Nm)**	**20**	**40**	**80**	**130**	**180**	**250**	**300**
$M_{a(RF)}$	**(Nm)**	**10**	**20**	**40**	**70**	**95**	**140**	**165**
For manways (ND600-ND1000) with reduced bolting thread of M16: M_a(FF) = 100 Nm, M_a(RF) = 60 Nm								
The above values should not be exceeded over a maximum of 50%								
Torque values above are valid for: μ = 0,12 → steel coated, dry. Area pressure of gasket: Q_{min} = σ_{vu} ≤ 5,0 N/mm²								
Bolt torque values M_a (FF) are for full face flanges (FF) with full face gaskets only! Bolt torque values M_a (RF) are for raced flanges or stub end flanges (RF) only!								
ND= nominal diameter M = bolt diameter M_a = bolt torque value								

If there are any discrepancies between the fabrication drawing and the operating instructions, the drawing is decisive!

Table 2

Max. allowed loads for nozzles' with external nozzle loads

DN	N			Nm		
	P	V_L V_1	V_C V_2	M_L M_1	M_C M_2	M_T
50	230	310	230	*25*	*20*	80
80	350	410	300	*70*	*45*	180
100	430	480	350	*105*	*70*	260
150	670	680	480	*200*	*130*	480
200	950	930	630	*320*	*210*	730
250	1260	1220	800	*455*	*305*	1020
300	1620	1550	980	*610*	*415*	1340
350	2010	1930	1190	*785*	*545*	1690
400	2430	2340	1400	*980*	*690*	2090
450	2900	2800	1640	*1195*	*850*	2520
500	3400	3300	1890	*1425*	*1025*	2980
600	4520	4430	2450	*1950*	*1430*	4010
700	5790	5720	3070	*2550*	*1900*	5180
800	7210	7180	3760	*3230*	*2435*	6500
900	8770	8810	4520	*3985*	*3030*	7960
1000	10490	10610	5350	*4815*	*3695*	9550



R/S ≤ 250

If there are any discrepancies between the fabrication drawing and the operating instructions, the drawing is decisive!

3.6 Mounting accessories, e.g. ladders and platforms

The individual included parts, such as ladder, roof edge railing, level indicator, etc. must be installed under consideration of the applicable accident prevention regulations and according to the instructions in the diagram. All safety devices and holders inside the vessel and outside that were provided for the transport must be removed.
If the vessel should include ladders and platforms they must be attached according to the general building permit or the vessel diagram.

3.7 Installation of the leak indicator (only for double-walled vessels)

Mounting the overpressure leak indicator with its accessories and the installation of the connection pipes between the connectors, the vessel and the leak indicator is done according to the description and assembly instructions of the respective leak indicator. The leak indicator should be installed close to the outer wall of the tank to avoid unnecessarily long connection pipes.

3.8 Leak testing of vessels according to DIBt approval

For single-walled vessels, leak testing with water is required for the DIBt (Deutsches Institut für Bautechnik: German Institute for Construction Engineering) approvals. If the operator/plant engineer is required by the contractor to carry out this test at the installation location (see also entry regarding this on the vessel drawing), they must confirm to the vessel manufacturer that this has been carried out before the vessel is put into operation. Form F/19/7 can be used for this confirmation.

3.9 Fitting of agitator elements

The agitator elements may be fitted in the vessels solely by authorised companies, following installation and, where appropriate, anchoring of the vessel. The manufacturer of the agitator must supply a Declaration of Incorporation according to the EC Machinery Directive. If Christen & Laudon is the all-in-one supplier for the vessel and agitator, an EC Declaration of Conformity will be issued for the entire machine – GFRP agitator vessel. In all other cases, the company responsible for assembling the GFRP agitator vessel as a whole is responsible for issuing a Declaration of Conformity. Please note the information in the associated risk assessment!

4. Transport and installation of underground FRP vessels

4.1 General

These FRP tanks, which are suitable to be located underground, are manufactured according to the latest technical knowledge and in line with EN 976-1 and 2. EN 976-2 contains additional information regarding transport and anchoring.

4.2 Transport

Punctiform loads, e.g. edges and pointed objects, can lead to damage and should be avoided. The tanks should be carried using the lifting eyes provided and should not be pulled or rolled. Unloading the tank and positioning it in the prepared excavation should take place in one motion. Weights can be found in the table of standard tanks or on the technical drawing. A lifting vehicle appropriate to this load should be provided in a timely manner.

4.3 Excavation

The depth of the excavation should be such that it is possible to cover the tank to the required minimum depth of 1.00m, given a bedding of at least 0.30m of fill material on the bedrock base (see Figure 1). The subsoil must have a sufficient load carrying capacity. The length of the excavation should be such that the tank can be surrounded at the ends with fill material to 0.2 x D or at least 0.45m. For a single tank, the width of the excavation should likewise be determined as above, encasing the tank to 0.2 x D or at least 0.45m (lateral rigidity of the excavation is essential).

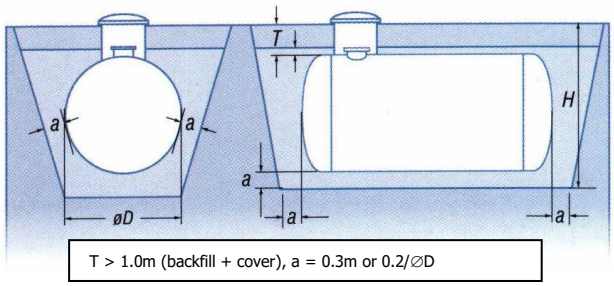


Figure 1

Group arrangement

For several tanks together, the nature of the backfill is key. When using gravel fill, the distance between tank systems that are subject to traffic loads must be at least 2.5m. If dry lean concrete is used to backfill to halfway up the tank, this distance can be reduced to a minimum of 0.5m. The distance between tank systems that do not need to absorb traffic load must be at least 0.60m when using gravel fill.

4.4 Backfill material

Non-cohesive material (gravel or grit made from natural stone) with a graduated particle size of 2–8mm or 8–18mm should be used as backfill material to form the bedding on the trench base and the lateral encasement of the tank. The bedding must be at least 0.3m thick and the tank should be encased laterally to at least 0.2 x D.

In areas at risk of a high water table or where there is a risk of flooding, the tank should be secured against upward thrust (see also EN 976-2). Excavation material can be used as backfill material for the area outside the encasement.

4.5 Installation and backfilling

Before positioning the tank, the bed should be left clear at those points at which the tank has reinforcing ribs, so that the lower portion of the tank is fully supported later. Once located on the level bed of the excavation, the tank should be checked for damage once more, as at this stage it is still possible to remedy this without significant outlay. Backfilling and consolidation must be carried out in horizontal layers of max. 0.30m (Figure 2).

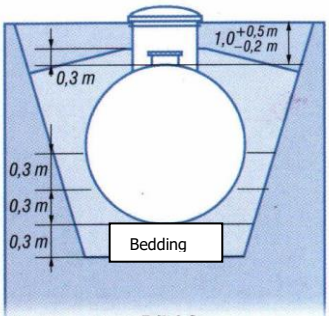


Figure 2

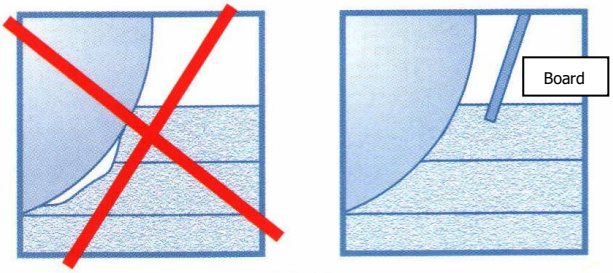


Figure 3

Backfilling can be carried out continuously **but not from one side only**. Particular care should be taken to ensure that space between the trench base and the tank wall is filled without any gaps. It is recommended to use a board to aid with consolidation (Figure 3).
Consolidation ends halfway up the tank and should not begin again until 0.50m above the top of the tank.

Particular care should be taken to ensure that the tank walls are not damaged in the process and that no inadmissibly large deformations (max. 0.02m x D) occur on the tank.

It is possible for the ends of the tanks to project through a supporting wall into a chamber. In the case of an installation such as this, care should be taken to ensure that the cylinder is positioned in such a way that the ends – here the transition from the ground to the cylinder – are not supported on a solid surface.

4.6 Deformation measurement

The vertical diameter of the tank should be measured before and after backfilling the excavation to verify whether deformations of more than 2% have ±occurred. Values outside this tolerance indicate that the backfilling of the excavation was flawed.

4.7 Traffic loads

The standard tank design is for a traffic load of a 30t HGV. Stronger designs available on request. If a dome shaft is to be fitted, the manhole cover must be designed in such a way that no loads from here act directly on the tank (see Figure 4).

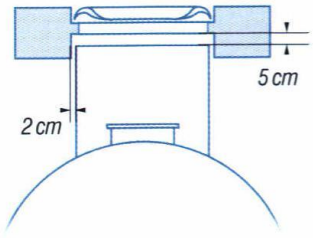


Figure 4

5. Operating instructions

For containers with GTA of the DIBt the following applies in Germany:

These instructions supplement the "Information Sheet - Operating and Behavioural Regulations for the Storage of Water-polluting Liquid Substances" to be attached in accordance with AwSV or VAwS.

The operating instructions also apply to tanks with agitators (see item 5.6). If the agitator is supplied by Christen & Laudon, the stirring tank is regarded as a complete system according to the MD and receives an EC Declaration of Conformity from Christen & Laudon.

5.1 General

The documentation (drawings etc.) provided by the manufacturer must be read carefully by the operator and the responsible persons. The following requirements must always be complied with.

The vessel may only be put into operation after a functional check according to the transport and installation instructions. If the vessel is part of a system requiring a permit, it must be checked by an authorised competent person.

After installing the vessel and mounting the operating pipes and the safety installations, a functional check by the manufacturer or the operator is required. This check includes a visual inspection, seal inspection and a verification of the ventilation and aeration, the overfill protection, and the level indicator (cf. enclosure 1).

In case of double-walled vessels, the leakage room must undergo a pressure test (manufacturer's certification).

Vessels damaged during transport or installation must not be used if the damages reduce the seal or the stability of the vessel.

5.2 Commissioning the Leak Indicator Device for Double-Wall Vessels

The leak indicators must be installed and started-up by the manufacturer or by a professional contractor in accordance with the technical description of the leak indicator manufacturer. The power supply must be installed as a permanent connection (no plug-in connection, not switchable). After the leak indicator is connected to the power supply, the functional check is performed. After all work is completed, an installation and test certification is issued by the technical expert.

5.3 Stored Substances

The tank may only be used to store the stored media mentioned on the Christen & Laudon factory nameplate, in compliance with the requirements..

Before the operation it must be verified if the medium to be stored corresponds to the permissible medium according to the characterisation on the vessel and if the filling temperature is not more than 10 K above the operating temperature. When filling and emptying the vessel, the permissible volume flow must be observed.The fill process must be constantly monitored.
Under non-atmospheric conditions, the observation of the permissible operating temperature must be checked regularly.

5.4 External fire

FRP components fulfil the fire class B2 (normally inflammable acc. DIN 4102)
Vessels with a skirt or a steel underframe don’t resist a fire of 30 minutes without impairment of the stability.

Generally

Also all parts of vessels, which are not filled with fluid, don't resist without an impairment of stability a fire of 30 minutes.

5.5 Cleaning

Cleaning the inside of the components for production reasons or for an inspection must be performed according to the following points.

5.5.1 General

- Empty vessel completely. This is particularly important for media that produce heat of reaction when diluted with water. To reduce the effects of possible heat of reaction, make sure to add large amounts of water immediately (tube diameter ≥ 2 inches).
- In case of water-soluble water-emulsifiable liquids, rinse off with water. In case of deposits, fill vessel with warm water of up to 10 K above the permissible operating temperature. Empty it after a few hours of action. Remove residues that may still be solid with a wooden or plastic spatula without damaging the inside surface of the vessel. Do not use tools or brushes made of metal.
- In case of watery storage media that cause strong osmotic effects under concentration changes (e.g. hydrochloric acid), do not clean with water.
  In case of uncertainty, ask the vessel supplier.
- Residues of greasy or oily storage media can be removed with oil-binding substances (e.g. wood shavings) after emptying the tank.
- Water of up to 60 °C with industrial detergent additives may by used briefly.
- The regulations for accident prevention and the respective regulations for processing the chemical detergents and the disposal of the residues must be observed.
- Protective clothing and possibly respiratory equipment must be used. Depending on the medium, full-body protection may be necessary. In these cases, the operator must be consulted and a vessel entry permit must be obtained.

5.5.2 Cleaning of FRP vessels with protective chemical layer for the storage of HCl

a) HCl concentration of up to 20 % (at an operating temperature < 50 °C)

1. Flushing with 1 % NaOH solution to neutralise HCl residues on walls and bottom.
2. Flushing with water

Remark: Stationary puddles around and in installed components should be avoided. NaOH solutions of higher concentration may cause tension cracks in the laminate in particular for ISO/NPG resins. For this reason the NaOH concentration during the first flushing must be observed precisely.

b) HCl concentration of up to 37 % (at an operating temperature < 40 °C)

1. Flushing with 10 % NaCl solution, 1 % NaOH. (slightly alkaline sodium chloride solution) to neutralise HCl residues.
2. Flushing with 10 % sodium chloride solution

Remark: Stationary puddles around and in installed components should be avoided. NaOH solutions of higher concentration may cause tension cracks in the laminate in particular for ISO/NPG resins. For this reason the NaOH concentration during the first flushing must be observed precisely.

c) HCl concentration of up to 25 % to 30 % (at an operating temperature < 30 °C)

1. Flushing with 10 % NaCl solution, 1 % NaOH. (slightly alkaline sodium chloride solution) to neutralise HCl residues.
2. Flushing with 10 % sodium chloride solution

Remark: Stationary puddles around and in installed components should be avoided. NaOH solutions of higher concentration may cause tension cracks in the laminate in particular for ISO/NPG resins. For this reason the NaOH concentration during the first flushing must be observed precisely.

5.5.3 Cleaning with High Pressure Cleaner

Cleaning with high pressure cleaners is possible in principle if the following points are observed:

- Do not use very concentrated spray beams. Use fan discharge nozzles (Spray angle ≥ 25 °).
- Keep a minimum distance of 15 cm between the FRP/thermoplastic surface and the spray nozzle.
- As far as possible direct the spray perpendicular to the surface.
- The temperature of the cleaning fluid should not exceed 60 °C.
- Nozzle pressure ≤ 150 bar
- Do not use rotor nozzles
- In case of uncertainty, it is recommended to consult the vessel supplier first. FRP sample plates will be provided for testing purposes.

5.6 Agitator vessels

The following aspects need to be taken into consideration when operating FRP agitator vessels:

- The vessel must not be entered while the agitator is running.
- Should cleaning or inspection require entry of the vessel, ensure that the agitator cannot be accidentally triggered. For this, disconnect the agitator from the power supply.
- The agitator must only be operated when the vessel is at one of its specified filling levels. Otherwise, undue material stress or vibrations may be caused.
- Regularly ensure that the agitator element is securely attached to the vessel.
- Should the agitator driving shaft protrude from the vessel, a suitable protective cover needs to be installed to prevent accidental touching.
- Caking and build-up can cause vibrations that make the FRP vessel resonate. To avoid this, the agitator element and the flow areas need to be checked and cleaned regularly.
- The operating instructions provided by the manufacturer of the agitator vessel are to be adhered to at all times.

5.7 Pressure vessel according to the PED 2014/68/EU

The purchaser of a tank operated with a vacuum and/or an overpressure is responsible for installing a suitable safety device which effectively prevents the impermissible exceeding or falling below of the specified pressures.
In addition to the specifications in the operating instructions, the buyer/operator must also take into account the information in the associated risk and hazard analysis of the pressure vessel.

The national test regulations must be observed for recurrent tests.

5.8 Assembly and repair work on tanks/components

Work on tanks and components may become necessary during assembly or operation. Examples include:

-Repair of assembly damage
-Repair of other damage
-Displacing nozzles or mounting parts
-Inserting additional nozzles

This work may only be carried out by external companies with the written consent of Christen & Laudon. Failure to comply with this will void any warranty by Christen & Laudon.

5.9 Assessment of GFK components

GFK components are very durable and can often be operated for many decades without maintenance. In order to maintain a long service life of the components, we recommend using the engineering services of Christen & Laudon.

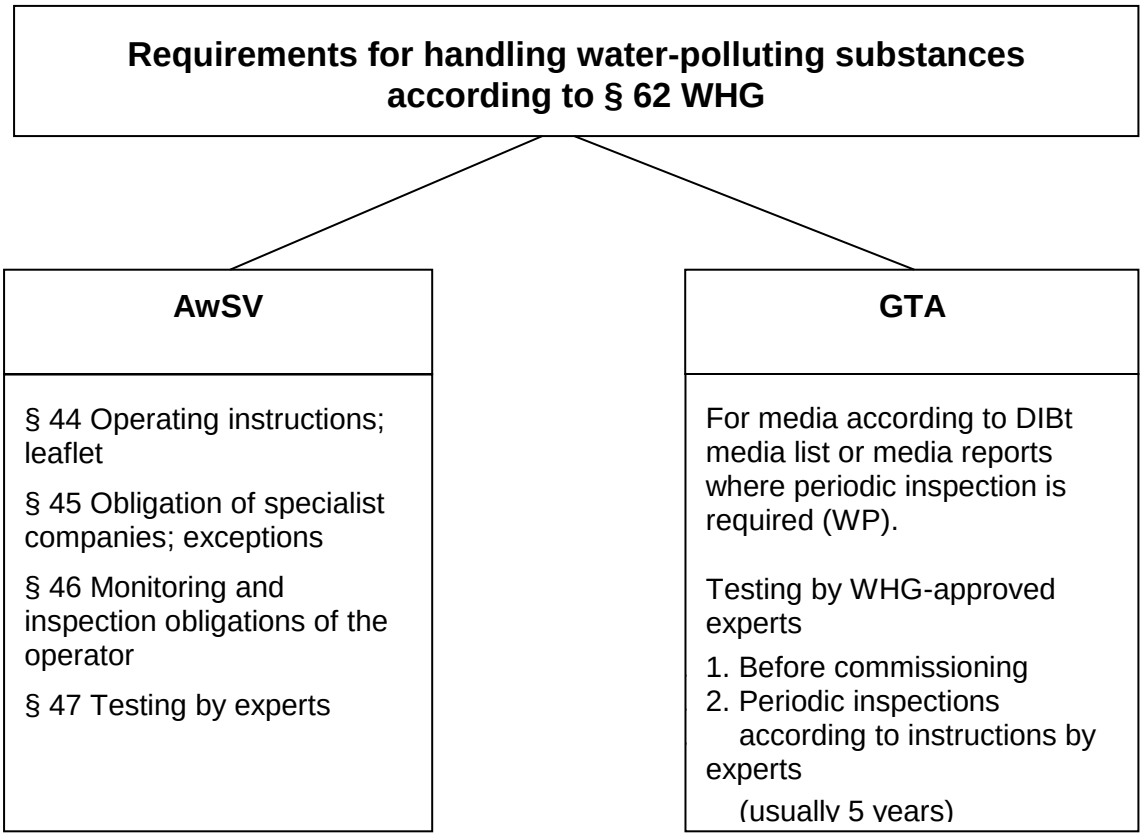
Engineering services:

- Internal assessments of tanks/plants with report generation
- Expert opinion in connection with statements on the remaining service life
- Concept development for conversion/repair
- Static calculations and FEM analyses during conversion or change of use
- Inspection of mechanical characteristic values on sections of GFK components to estimate the residual load-bearing capacity of the laminates

Contact:

phone: +49 (6563) 51-0
email: info@christen-laudon.de
web: www.christen-laudon.de

Inspection of systems/containers (Germany)



The AwSV was adopted by the Federal Council on 23/05/2014 and initiated in the notification procedure in Brussels. AwSV will replace VAwS in the medium term.

Leak test and functional test of the safety devices by the system operator for containers in accordance with GTA

single-walled containers

- Leak test with water filling after authorisation (**once** on commissioning at the place of installation or in the manufacturing plant at Christen & Laudon in Malbergweich)

- Check container and drip tray (if present) for leaks **once a week** by visual inspection.

- Have the functionality of the leakage probe, if present checked every **6 months**.

- Check overfill protection according to authorisation (Overfill protection used by Christen & Laudon **at least once a year**)

- Periodic inspections must be arranged by the operator.

double-walled containers

- Check overfill protection according to authorisation.
(Approval for the leakage warning device used by Christen & Laudo means **inspection once a year)**

Note:

- The leak test is carried out by a check of the leakage warning system in accordance with the provisions of the type approval once by Christen & Laudon before delivery.
- A water filling is not required for a leak test.
- Periodic inspections must be arranged by the operator.

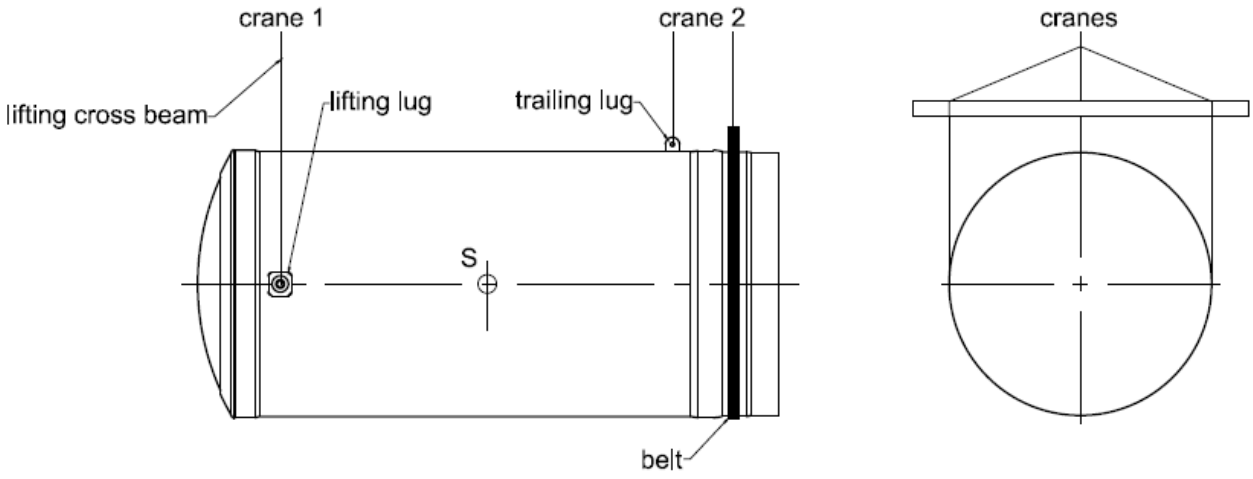
As the manufacturer, we generally recommend that you inspect the interior of the container every 5 years at the latest.

Disclaimer
The statements are not legally binding as changes in case law are not taken into account.

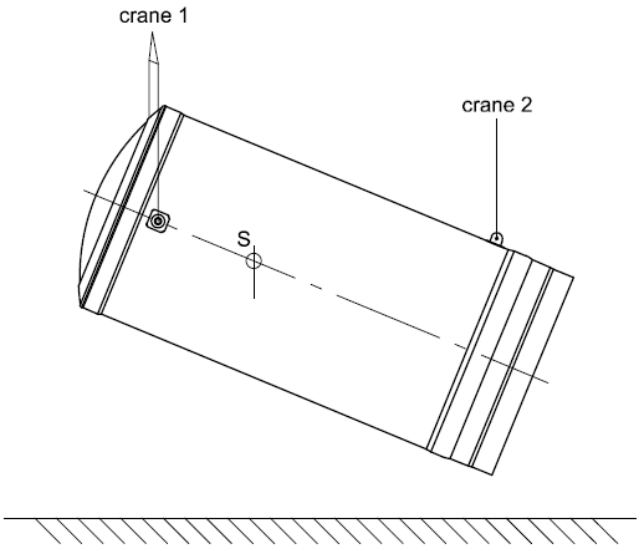
Kind of execution

a) Removing with **2 lifting trunnions**
with lifting cross beam, belt or trailing lug

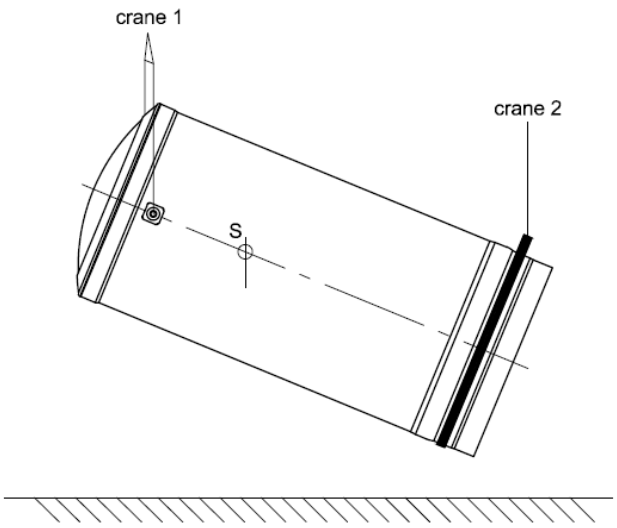
a lifting crane and a follow-up crane are necessary



Trailing lug:



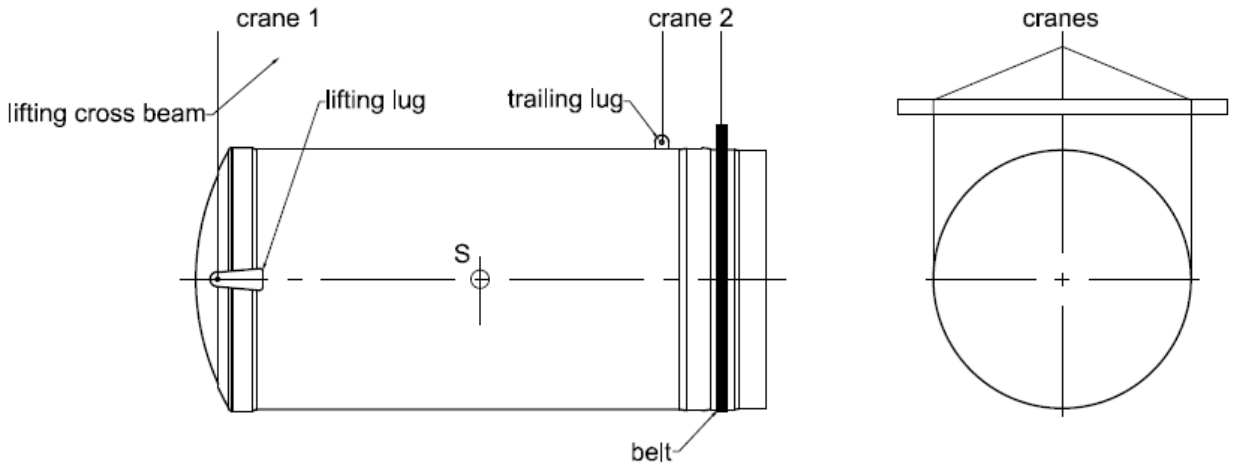
Belt:



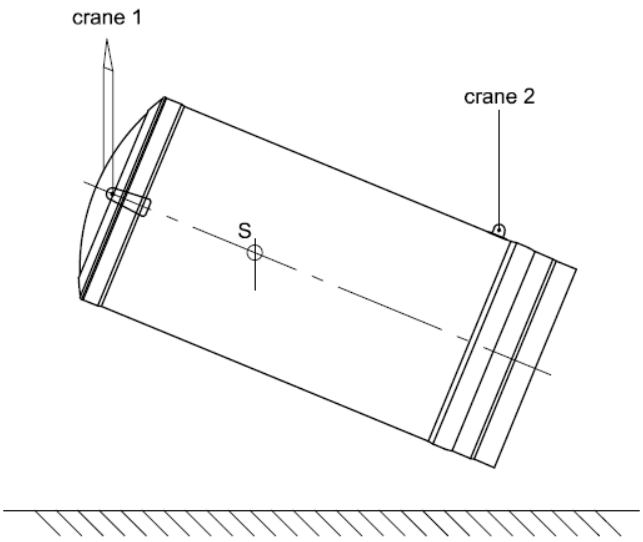
Kind of execution

b) Removing with **2 lifting lugs**
with lifting cross beam, belt or trailing lug

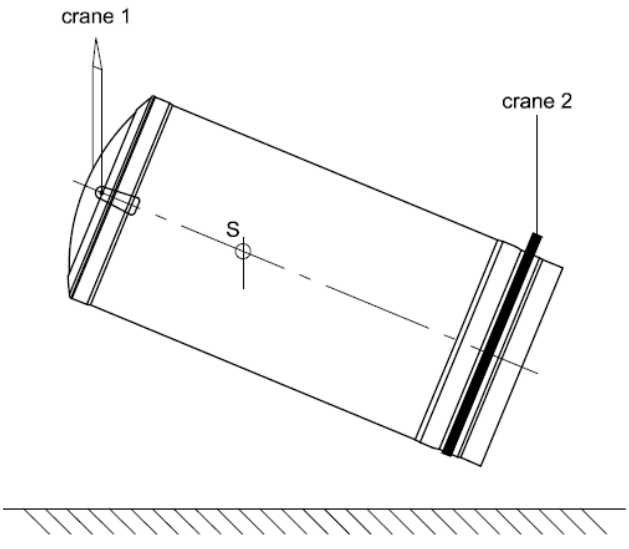
a lifting crane and a follow-up crane are necessary



Trailing lug:



Belt:



Christen & Laudon Staffelstein	**Test report** Leak test for vessels according general technical approval (DIBt)	F/19/7 page 1 of 1 revision 0 date 09/07

Christen & Laudon GmbH
Department: Quality management
Staffelstein
54655 Malbergweich

According general technical approval, annex 5.1, point 1.2, every vessel has to be subjected to a hydrostatic leak test with water.

	Operator	**Contract partner**
Name		
Address		
Contact person		

Data of vessels	
Fabrication no.:	
Year built:	
Capacity:	
Approval no.:	☐ **Z-40.11-141** single-walled standing vessel with flat bottom ☐ **Z-40.11-242** single-walled lying vessel ☐ **Z-40.11-56** single-walled vessel on FRP- skirt ☐ **Z-40.11-158** single-walled standing vessel with flat bottom and thermoplastic liner ☐ **Z-40.21-73** single-walled PE- vessel ☐ **Z-40.21-31** single-walled PE- vessel made of wrapped tube

According the contractual arrangement (order confirmation Christen & Laudon) the leak test takes place by the operator in connection with the approval of terminal equipment.

We confirm the correct realisation of the leak test:

_____ X _____
Date Company stamp / Signature

This document has to be returned to: Christen & Laudon, dept.: quality management