

Please read this manual carefully before installing, commissioning or operating the WITT high-pressure vessel!



1. INTENDED USE

WITT high pressure vessels are solely intended for use in refrigeration systems, e.g. as surge drums to separate liquid and vapour or as receivers of refrigerant.

2. SAFETY REQUIREMENTS

Any work with refrigeration systems must be carried out by trained and knowledgeable personnel. All safety regulations and codes of practice concerning the use of refrigerants must be adhered to, with special attention paid to protection clothing and wearing of safety glasses.

Applicable standards and regulations for installing or operating refrigeration plants, e.g. EN 378 must be adhered to.

The legal regulations concerning the commissioning and operation of pressure equipment which are valid at the installation site of the respective country are to be observed.

Under no circumstances are the indicated temperature- and pressure limitations on the data plate to be exceeded!

Make sure emergency exits are clearly marked and escape routes are identified and not blocked.



Pressure vessels that can be isolated from other parts of the refrigeration system must be equipped with a pressure relief device according to EN 378, to prevent unacceptable pressure increase.



Any welding to the pressure vessel (except to the intended connections) is prohibited or this will void the certificates.



The refrigerant charge of the refrigeration systems must only be changed by knowledgeable personnel familiar with the legal requirements. The refrigerant charge, as indicated on the drawing, must not be exceeded!



In order to protect persons from burns or frostbite, protection must be provided depending on the temperature (below -10°C or above $+60^{\circ}\text{C}$), e.g. Isolation

Provide adequate fire protection to avoid unacceptable overheating of the pressure vessel!

Before commissioning make sure all safety equipment has been checked and works properly. Any safety equipment must be retested after disassembly or activation.

3. TERMS OF WARRANTY

To prevent accidents and for the safe operation of the refrigerant plant no modifications or alterations may be carried out to the oil drain vessel without written approval by TH. WITT Kältemaschinenfabrik GmbH.

All information for the safe operation and maintenance of WITT high pressure vessels is based on our experience and is to the best of our knowledge.

Our liability or warranty is excluded, if:

- The instructions in this manual are not adhered to
- The high pressure vessel and its equipment was operated incorrectly or the handling was not in accordance with the mentioned procedures
- The vessel is used for purposes other than that for which it was intended to



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- Safety devices were not used or disconnected
- There have been modifications made without written approval
- Additional compressor capacity was added or modifications on the evaporator side were made that exceed the intended capacity of the high pressure vessel
- During installation or operation the safety requirements were not adhered to

4. Scope of delivery

The scope of delivery is described per drawings and documentation related to the specific order.

5. Technical Data

Serial number, dimensions, year of manufacture, volume, max. filling quantity, empty weight, group of fluids to be used are contained in the appendix "technical data sheet".



The manual is only complete with this associated technical data sheet.
Materials used are noted in the drawings and certificates for the order.

Maximum pressure and temperature range of standard pressure vessels

Please see the relevant drawings to check the applicable pressure and temperature range of your specific order.

Vessel ø	273	323	355	406	559	660	813	950	1200	1400	1600	1900	2200
P _s at	12 bar												12 bar
t _o 100	-10/+50°C												-10/+50°C
P _s at	9 bar												6 bar
t _o 75/50	-10/-60°C												-10/-60°C
P _T	17,2 bar												17,2 bar
P _s at	16 bar						16 bar						
t _o 100	-10/+50°C						-10/+50°C						
P _s bei	12 bar						8 bar						
t _o 75/50	-10/-60°C						-10/-60°C						
P _T	22,9 bar						22,9 bar						
P _s at	22 bar			22 bar			22 bar			22 bar			
t _o 100	-10/+100°C			-10/+75°C			-10/+75°C			-10/+75°C			
P _s at	16,5 bar			16,5 bar			11 bar			11 bar			
t _o 75/50	-10/-60°C			-10/-60°C			-10/-60°C			-10/-60°C			
P _T	34 bar			32,5 bar			32,5 bar			32,5 bar			

The pressure vessel should be protected by appropriate means (location, insulation, etc.) to avoid unacceptable temperatures.

6. DESCRIPTION OF OPERATION

The function of the WITT high pressure vessel is determined by the way it is integrated into the refrigeration system.

When the pressure vessel is used as a surge drum, a special internal design will provide the proper separation of liquid and vapour and therefore liquid carry over to the compressor is prevented. The design engineer has to take care that the entire refrigerant charge can collect during operation with evaporators being on and off-line. He also has to take into account the expansion of the liquid refrigerant volume with increased temperatures.

When connecting refrigerant pumps to the pressure vessel, the down leg should be designed in a way that no gas bubbles are entrained in the liquid refrigerant, e.g. using vortex breakers and appropriate piping.

Due to the fact that refrigerant oil will settle in the parts of no or less turbulence, particularly when using ammonia as refrigerant, special oil collection domes should be included in the pressure vessel design, to drain oil frequently. This can be done by a combination of stop valve and quick acting valve.

WITT pressure vessels normally come with frost or stand pipe that is marked by weld-on U-brackets for minimum and maximum liquid levels. If the standpipe is equipped with an oil drain at the lowest pint, you can drain the oil (when using NH₃) as soon as the lower part does not show any frost or dew.



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7. TRANSPORT AND STORAGE

All openings (connections, etc.) are covered with yellow protection caps to prevent the intake of moisture or dirt.

Storage shall be dry and protected from any dirt or debris.

If storage is required for more than two months or shipping overseas, the WITT high pressure vessel shall be filled with an inert gas charge to prevent corrosion.

If the pressure vessel is filled with inert gas you should cut off the steel caps immediately prior (and not before) installation. Please make sure no steel chips or dirt can get into the vessel. If the vessel gets contaminated clean the internal thoroughly.

Use only the mounting brackets to lift up the pressure vessel. Ropes should not be used. When using transport straps make sure the paint does not get damaged. It is prohibited to use connections, pipe work or any valves to lift the vessel!

8. INSTALLATION

The yellow plastic protective caps and packaging material, which protect all openings (nozzles, etc.), must be removed immediately before assembly.

Please read the drawings that come with the order before installation. The responsible engineer should provide adequate safety devices and controls to match the requirements of that specific refrigeration plant.

The WITT high pressure vessel is intended for installation in buildings. Otherwise a calculation considering wind and snow loads have to be executed.

The frame has to be installed on an even and leveled ground. If not marked otherwise on the drawing, the pressure vessel should be aligned horizontally. If another arrangement is required, e.g. slope to a drain connection or pump down leg., this will be marked on the drawing.



Any vent or drain lines have to be installed according to the regulations (e.g. EN 378) and national codes of practice, so that no persons are put at risk!

Allow sufficient space for inspection, maintenance and insulation work. Provide easy access to any vent, drain, safety or relief lines.



Make sure all interconnecting pipework is stress free when welding to the connections or valves!



No additional forces may be applied to nozzles or the pressure vessel.

9. PRE-COMMISSIONING

Upon installation the vessel and the entire pipe system should be checked visually. Any screw or flange connections must be checked and tightened!

Thereupon the refrigeration system should pass a leak and pressure test and documentation relating to the testing shall be kept in a safe place. Particular attention should be paid to any welds that were done on site and to any flange respective screw connections.

When the leak and pressure testing was successful it must be ensured that the system is sufficiently dry. For this purpose the system should be drawn to a deep vacuum of less than 675 Pa (NH₃) respective less than 270 Pa (HFCs). The time the system should be hold at this vacuum is depending on the size and complexity of the system.



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Large pressure vessels are not dried by means of heated vacuum as often used for small equipment. Upon hydraulic testing the WITT pressure vessels are completely drained using utmost care by moving/rotating the vessel with a crane according to special procedures to achieve best results. Thereupon the vessel is dried with hot air for at least 5 hours. Despite all care there is always a possibility water residue may remain in lower areas. If absolute dryness is essential (e.g. when using ester oils), this must be indicated prior to placing the order!

The system should be evacuated prior to insulation work and the pressure drop should be observed. If the pressure remains at the vapour pressure of water (see table 1) you may proceed as follows:

Warm up all low spots where you expect any water residue to a temperature of approximately 30 bis 40°C (and not higher!) with a soft flame or hot water. (Take care the coating will not get damaged!) If the pressure raises the heating must be continued until all remaining water is evaporated.



Please consider water or condensate residue may have also remained in the pipe work during installation, so that vacuum drying may take up to 24 hours or more until the system is sufficiently dry and the deep vacuum of less than 675 Pa respective 270 Pa can be hold for a longer period of time. A thorough vacuum testing should therefore be considered when you determine the time schedule for insulation work.

Ambient temperature	[°C]	5	10	20	40
Vapour pressure of water	[mbar]	9,0	12,3	23,4	73,8

Table 1

Please make sure that

- All piping has been connected according to the drawings
- The required safety devices are installed and tested

10. INSULATION

Any insulated parts of the system are particularly prone to corrode when the temperature is close to the dew point or at varying temperatures when frost or ice can melt.

Therefore the pressure vessel has received a permanent, durable and tight elastic epoxy coating against corrosion. Any welds and defects to the coating must be repaired carefully according to the codes and regulations, e.g. DIN EN ISO 12944, prior to any insulation work!

When the WITT pressure vessel is delivered with prime coating only, the additional required coatings have to be applied according to DIN EN ISO 12944.

Any insulation work has to be executed and sealed according to the regulations (e.g. DIN 4140) so that a sufficient tightness is guaranteed towards moisture intake (vapour barrier). Any brackets or supports should not protrude or damage the insulation.

If the pressure vessel has been insulated in our works, special care must be taken during transportation to avoid damages.

11. START-UP

Start up is prohibited until it has been proven that the refrigeration system has undergone a safety analysis.

Approved fluids

Die WITT pressure vessels are suitable for the common refrigerants, such as NH₃, R 404, R134a, R 22, R 507.



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Allowable liquid charge

The pressure vessel should be charged with liquid refrigerant, as indicated on the drawings, by trained and knowledgeable personnel. The person in charge must be informed regarding the maximum charge of the entire system in order to avoid overfilling.

When filling the system, the pressure must be slowly increased with gaseous refrigerant until the vacuum is broken. Before liquid refrigerant can be filled, ensure that the pressure vessel has been slowly cooled down in order to avoid a temperature shock. (ΔT not greater than 40 K). For CO₂ pressure vessels, a minimum of 5 bar must be achieved in order to avoid the formation of dry ice.

The quantities of refrigerant charged must be documented in the operating manual.

12. OPERATION

The pressure vessel should be operated at all times within its allowable range, as indicated on the data plate. The responsible engineer and the operation personnel have to make sure by appropriate means (respecting the maximum allowable refrigerant charge, adjustment of appropriate controls, etc.) that overfilling is not possible at any time.

Safety relief devices are to be selected in such a way that the maximum allowable pressure can never be exceeded more than 10%.

The pressure device is designed for static pressure loads with a maximum of 1000 full load changes. The pressure swing width shall not exceed 10% of the maximum permissible pressure.

13. SERVICING AND INSPECTION

The pressure vessel and related safety devices have to be inspected periodically according to standards and regulations respective national codes of practice.



If maintenance work is to be done on the pressure vessel, it must be pressureless and the refrigerant must be completely sucked off before any screwed connections are loosened. Do not remove all screws when refrigerant or pressure is present.



A visual inspection of the pressure vessel shall be carried out at regular intervals according to EN 378-2. (This includes visual testing with regard to corrosion)

A corrosion surcharge of 1mm is taken into account for all pressure components made of carbon steel. The corrosion surcharge for pressure components made of stainless steel is 0 mm.

In the case of damage to the corrosion protection, this must be repaired immediately.

14. APPENDIX

Technical datasheet
(see chapter 5 _ technical data)

15. ADDRESS

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