
EXPANSION AND BALANCE TANKS

(INTERCHANGEABLE MEMBRANE)

TANKS FOR HEATING, POTABLE and DRINKING WATER



NEX Dikey Genleşme Tankları



NEQ Yatık Genleşme Tankları



NEL Ayaksız Dik Tanklar

OPERATING AND INSTALLATION MANUAL

CONTENTS

1.) Introduction

2.) For correct and safe operation;

2.1) General Instructions

2.2) Warranty

2.3) Liability

3.) Transport and Storage

4.) General Specifications and Working Principle

4.1) General Specifications for Pressure Balance Tanks

4.2) General Specifications for Expansion Tanks

5.) Advantages of Closed Expansion Tanks

5.1) Remarks

6.) Calculation of the Tank Preset Pressure

6.1) For the use in heating installations

6.2) For use in sanitary installations

7.) Installation

8.) Maintenance

8.1) Diaphragm(Membrane) No-Holder Vessels 8-60lt

8.2) Diaphragm (Membrane) Holder-Type Vessel 80-2000 lt

8.3) Diaphragm (Membrane) Holder-Type Vessels 500-3.000-
4.000 lt

8.4) Diaphragm (Membrane) Holder-Type Vessel 5.000lt

9.) Error Detection and Correction

1.) INTRODUCTION

This booklet includes the following information on **NEMA** tanks (all models);

- General technical specifications
- Warning and advice on installation
- Putting into operation
- Instructions on malfunction and maintenance.

Please act according to the information given in this book. Please follow the recommendations and instructions. Actions that do not comply with the information given in this book or its results that are contrary to our advice and instructions will be the responsibility of the corresponding person. Operation and installation of the device by incompetent persons who are not abiding by the instructions of this guide may result in dangerous consequences. **In addition, it may also result in the loss of your warranty rights.**



PLEASE

DO NOT USE THE VESSEL WITHOUT READING THIS MANUAL!

- After putting the tank into operation, please keep this booklet for future references.

2.) FOR CORRECT AND SAFE OPERATION

2.1) General Instructions

1. With proper installation and mounting, performed according to the instructions and advice given in this booklet, the expansion tanks produced by Nema Makine are designed to serve you economically and efficiently for many years.
2. After their production expansion vessels do contain a certain gas pre-pressure. However it should not be ignored that each system should have its own pre-set gas pressure.
3. Before connecting the tank to the installation please make sure that the vessel contains the necessary preset gas pressure.
4. Improper pre-gas pressure may affect the correct functioning of the device or even cause damage or injuries.
5. This booklet contains information about the procedures to be realized by your authorized service-team.
6. Due to safety and health reasons please comply with the recommendations in this booklet.
7. Further interventions regarding maintenance and repairs other than those specified in the booklet please should be realized only by an authorized service.
8. Please use only original spare parts provided by Nema Makine.
9. Before starting the mounting operation, carefully read this manual.
10. The installation connections should be realized by qualified personnel with technical

knowledge, taking into consideration the technical design of the installation area and the valid safety rules regarding mounting and maintenance.

11. By qualified personnel we mean persons that are educated and experienced about prevention of accidents, authorized by the facility security officer to perform any activity at the facility and while doing so being aware of the risks and dangers and to take necessary measures.
12. Please be sure that the good is not damaged due to shipping or storage conditions.
13. Before installing the expansion tank please make sure that the volume of the tank is checked by specialized personnel that will also confirm the calculations. (Furthermore please check whether the vessel is suitable for the pressure calculation of the corresponding country as well as installation and shipment rules.)
14. In case of a tank installation other than the calculated vessel it could cause damage to buildings, structures, systems and the tank itself. To avoid such a situation it is strictly prohibited to install a tank other than the calculated one.
15. NEMA expansion tanks cannot be used outside the pressure and temperature limits indicated on the vessel.
16. The vessel is not suitable for toxic and acidic liquids. In case of usage with glucosed water the glucose ratio should be maximum 50% of the volume.
17. The pre-set gas pressure of the tanks can be adjusted by the authorized service personnel according to the required pressure in your system. However in such a case when changing the pre-gas pressure 'pre-gas pressure was changed as X' should be written on the front-side of the tank.
18. If the expansion tank is heavier than 12 kg it should be lifted with a special lifting apparatus in order to not harm human health or the vessel itself.
19. Do not puncture, heat with open flame or open in any way the expansion vessel. Use the vessel only in accordance with label instructions for pressure, heat and purpose.
20. In order to prevent corrosion due to electrolysis the system must be grounded.
21. During the designing of the expansion vessels external voltages were not taken into consideration. Weights and tension depending on snowfall and aspects such as earthquake etc. Should be taken into account during the assembly process.

Nema Makine expansion tanks can be used for two purposes,

1. As an expansion tank for heating systems to prevent damage of the installation due to high pressure of water that expands with heating.
2. As a pressure balance tank for sanitary installations to prevent the over-operation of the water pump.

2.2) Warranty

1. In compliance with the standards and the warnings and instructions for operation, installation and use described in this manual Nema Makine expansion tanks have a **warranty of 2 (two) years against defects of material and workmanship, beginning from the date of delivery.**
2. The entire product, including its parts is covered by our warranty.
3. In case of malfunction within the warranty period, the repair time will be added to the guarantee period. The repair period of the product is 20 working days maximum. This period starts with the notification of the service station about the malfunction, in

absence of a service station, the vendor of the product, its distributor, agent, representative, importer or manufacturer – the warranty period starts with the notification of one of these parties. If the malfunction cannot be solved within 20 working days the manufacture – producer or importer; is obliged to provide a product with similar features for the consumer's use.

4. Within the warranty period no fees will be charged for defects caused by material, workmanship or installation. These defects will be repaired without charging labor costs, costs for replaced parts or costs under any other name.
5. After repair of the vessel the user may demand a replacement free of charge or a refund or a discount in the following situations ;
 - ✚ From the date of delivery, provided that it is within the specified warranty period, the vessel suffers the same defect twice within one year or when different defects occur more than four times or more than six different defects occur within the warranty period and when these defects make it impossible to make use of the vessel,
 - ✚ When the maximum period for repair is exceeded,
 - ✚ When there is no service station of the company available a report prepared by one of the following dealer, agent, representative, importer or manufacturer – producer that indicates that a repair of the product is not possible.
6. The warranty does not cover any defects caused by use that is contrary to the instructions described in this manual.
7. For any problem that may arise from the warranty certificate you may address the General Directorate of Consumer and Competition Protection at the Ministry of Industry and Commerce.

2.3) Liability

The manufacturer cannot be held liable for any damages arising from the wrong capacity selection of the vessel or incorrect installation or operation contrary to the instructions described in this manual.

3. TRANSPORT and STORAGE

- ✚ Please make sure that the vessels are not damaged during transport.
- ✚ Make sure that the expansion vessel is not subjected to impact during transport, with or without packaging, or during the removal of the packaging
- ✚ All NEMA Makine vessels should be stored in a closed, dry area that is lacking high humidity and dust. If possible humidity should be kept at a constant level in the storage area.
- ✚ Tanks should be kept in its original packaging until installation.

4. GENERAL SPECIFICATIONS AND WORKING PRINCIPLE

4.1) General Specifications for Pressure Balance Tanks

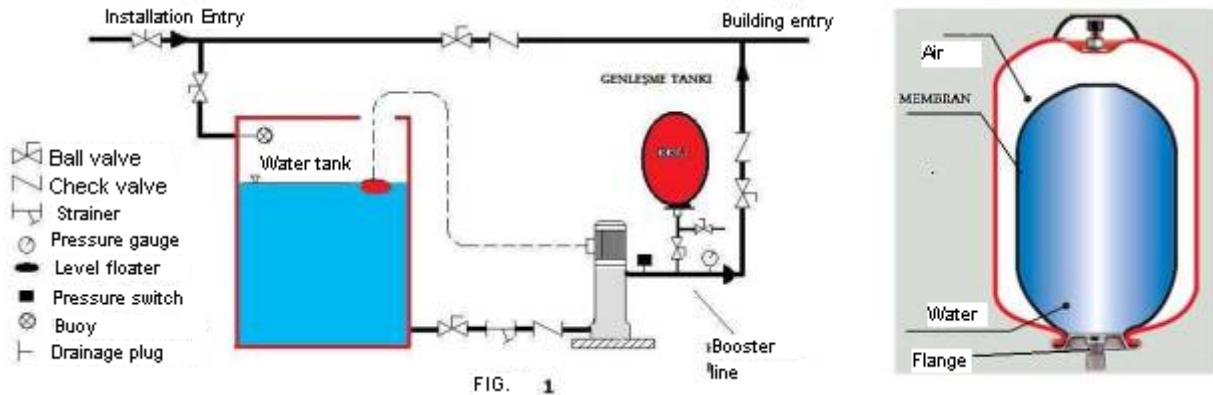


Fig. 1 CONNECTION OF BOOSTER BALANCE TANK

Reducing the running time of pumps in booster systems, preventing the water hammer in installations and storing ready-for-use pressurized water are among the main tasks of a **booster pressure tank**.

The volume and the pressure class of the booster pressure tank depends on the specifications and application requirements of the booster set. However, in determining the volume the number of motor cycles should also be taken into consideration.

The pressure vessels contain an exchangeable EPDM diaphragm (membrane) that does not make any odor in the water and that is completely suitable for human health. This diaphragm is encircled with pressurize air or nitrogen gas.

With the rise of the pressure inside the installation the fluid fills under the gas pressure in the diaphragm. Thus, a portion of the fluid in the system would be stored under pressure inside the booster pressure tank. In case where the pressure is reduced with the use of water in the installation the fluid inside the pressure tank is being pushed back into the system with the help of the pressurized air outside the diaphragm. Therefore, the greater the volume of the tank the less the pump will be activated.

All tanks are protected against corrosion and covered with electrostatic epoxy powder coated paint. The inner surface of the tank is absolutely not in contact with water unless the diaphragm is damaged.

Apart from the quality of balance tank to be used, the pressure of the diaphragm and the tank volume are also very important for the booster set. In case you select a too small sized expansion tank it would cause that the pump gets activated too often, which could result in a wear out of the tank in a short period of time. On the other hand, a tank that is sized too big would increase unnecessarily initial investment costs.

4.2) General specifications for expansion tank

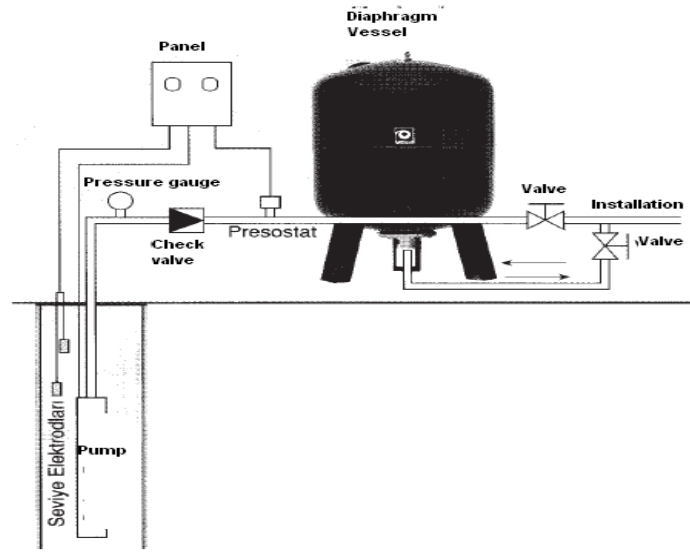


Fig. 2 CONNECTION OF EXPANSION TANK

In hot-water heating systems, when the water is being heated from 10 °C to 90 °C its volume expands by %3.55 of its initial volume. In order to absorb this expansion caused by the heat we use expansion tanks. Along with the safety of the system expansion tanks also fulfill the task to prevent pressure increase and provision of necessary water support to the system.

The volume of the expansion vessel to be used in heating system is determined by calculating the volume of the water that is going to expand. The required volume can also be determined through the catalog values provided by the boiler manufacturers.

5.) ADVANTAGES OF CLOSED EXPANSION TANKS

1. Since the heating system will turn into a closed system there will be no contact with air and corrosion will be reduced.
2. Since there is no water loss in closed heating systems due to water evaporation and therefore heat loss will be reduced. Additionally there will be no water loss and this means there will be no water in the system and thus no new calcification. For this reason there will be no heating problems due to calcification and as a result less fuel costs.
3. In a closed system the pressure distribution will be equal and thus the heating of each radiator will be more equal as well.
4. In the closed system water will be heated under pressure and this would increase the efficiency and gain additional fuel savings.
5. Since the vessel would be installed adjacent to the boiler you would save the pipe material leading to the roof, isolation material, space that would be required for the pipes and labor costs. The risk of frost would be avoided. Additionally you would gain roof space etc. and benefit from architectural aesthetics.

6. CALCULATION OF THE TANK'S PRESET PRESSURE

6.1) When used in heating systems;

1. Please calculate the vertical height (static height) from the radiator on the top floor of the building and the level where the tank is.

Static height (m) / 10 = static pressure (bar)

For example; if the height difference between the radiator on the top floor and the vessel is 25 meters; the pre-set gas pressure on the tank would be calculated as follows;

Static pressure; $P_{static} = \text{Static height[m]} / 10 \Rightarrow 25 / 10 = 2,5 \text{ bar}$

Pre-set pressure; $P_0 = P_{static} + 0,2 \text{ bar} \Rightarrow 2,5 + 0,2 = 2,7 \text{ bar}$

System operating pressure; $P_F = P_0 + 0,3 \text{ bar} \Rightarrow 2,7 + 0,3 = 3 \text{ bar.}$

2. If necessary set the air pressure of the tank to static pressure.
3. For this open the plastic cover of the valve insert nitrogen or air by using pressure reducing nitrogen tube or a compressor. Tanks between 8 - 80 liters do not contain any manometer. For this reason while inserting air into the vessel you should use a pressure gauge to measure the pressure inside the tank with short interruptions.



Important Note: In order to increase the pressure of the vessel, please contact your dealer or an authorized service. Interactions performed by unqualified staff may lead accidents.

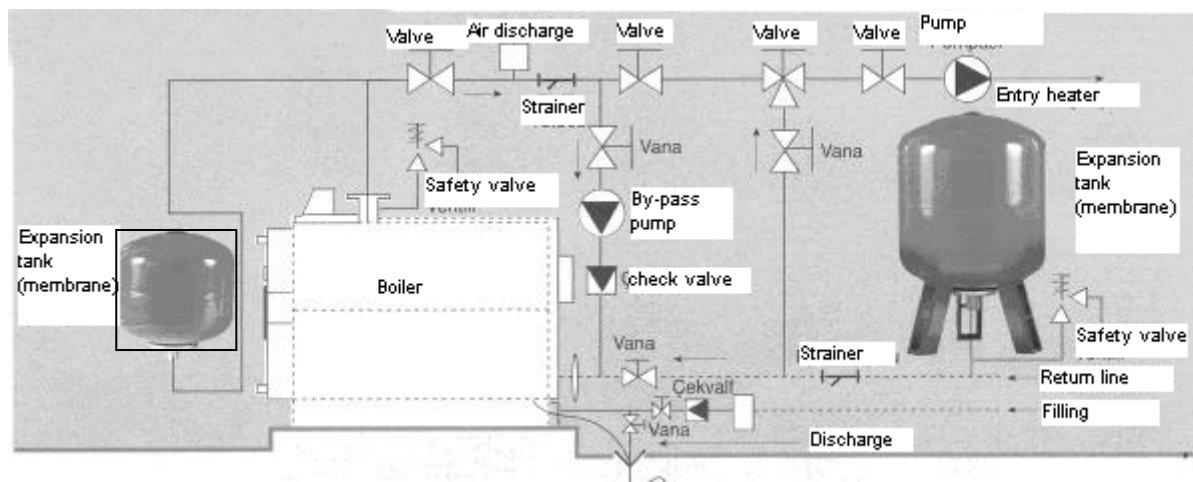


Fig. 3 Sample scheme for heating systems

Warnings

1. Expansion tanks must be used with safety valves. Valve manufacturers will give you information about the capacity limits of their valves. However the following safety valves can be used;
 - Up to 45.000 kcal/hour - 1/2"
 - Up to 90.000 kcal/hour - 3/4"
 - Up to 175.000 kcal/hour - 1"

- Up to 300.000 kcal/hour - 1 ¼"
 - Up to 500.000 kcal/hour - 1 ½"
 - Up to 750.000 kcal/hour - 2"
2. The boiler must be situated between the safety valve and the expansion tank.
 3. The pre-set gas pressure of the tank must be set equally to static pressure.
 4. Expansion tank must be situated on the return line of the boiler and should be connected at the shortest distance possible.
 5. The vessel must be at the same level as the boiler and mounted vertically to the floor.
 6. The gas pressure of the vessel must be controlled frequently (every 3 (three) months at the latest) (This matter can be seen more detailed in the chapter for maintenance).

6.2) For use in sanitary equipments;

Same calculation as heating systems can be applied here;

Static Pressure; $P_{static} = \text{Static height[m]} / 10 \Rightarrow 25 / 10 = 2,5 \text{ bar}$

Pre-set gas pressure; $P_0 = P_{static} + 0,2 \text{ bar} \Rightarrow 2,5 + 0,2 = 2,7 \text{ bar}$

System operational pressure; $P_F = P_0 + 0,3 \text{ bar} \Rightarrow 2,7 + 0,3 = 3 \text{ bar}$



Tanks should be pressurized with dry air by using a compressor with sufficient pressure capacity. When checking or adjusting the pre-set gas pressure the water inside the tank must be discharged.

7. INSTALLATION

- 1.** Installation should be realized by qualified personnel.
- 2.** Our company cannot be held liable for damages that may occur due to incorrect setting of the pre-set gas pressure by mounting personnel. The deformation form of the membrane will give us visual results here.
- 3.** Please check carefully whether the pre-set gas pressure is suitable for your system.
- 4.** If necessary pre-set gas pressure must be adjusted.
- 5.** If you apply a pre-set gas pressure that is higher than the maximum operation pressure of the tank, or when the tank is filled with pressurized water from the installation, that is higher than the maximum operation pressure of the tank; this may lead to damage to the tank or the people and goods around it. Our company cannot be held liable for such accidents and damages.
- 6.** The permitted values given for operation and pre-set gas filling must not be exceeded under no condition. During the filling of the pre-set gas no other gas must be used other than air or nitrogen.
- 7.** Please install the NEMA expansion tank in a no-frost area, where valve and label is perfectly visible. If necessary fix the feet of the vessel with the help of screws on the floor.
- 8.** In heating systems the expansion tank must be connected to the return line of the boiler. It should be situated near to the boiler as well.
- 9.** Please leave sufficient room on both sides of the vessel for any service application.
- 10.** If the pipe between the vessel and the boiler is removable it will facilitate the service application.
- 11.** The diameter of the pipe between the expansion tank and the boiler must be equal to the tank connection diameter. A safety valve that is suitable with the boiler operation pressure should be installed. (If there is no safety valve on other point of the installation then one must be installed in any case.)
- 12.** Placing a ball valve and a discharge opening between the expansion vessel and the boiler enables a much easier service. In order to dismantle the line easily when necessary, it is recommendable to use threaded type removable connectors.
- 13.** Do not bury the feet of the vessels into concrete because in some cases the vessel must be laid down to perform a service application.
- 14.** EPDM membranes can be advised for use with water/glycol mixtures up to 50%.

8. MAINTENANCE

1. Maintenance should be realized by qualified personnel and in accordance with the instructions in this manual.
2. Protect your vessel against temperatures less than zero.
3. Your vessel should be inspected for its pre-set gas pressure at least two times a year preferably once in every 3 months. In cases where there is a necessity gas should be inserted (only air or nitrogen).



- **When checking or adjusting the pre-set gas pressure make sure that the vessel does not contain any water. Otherwise the measurement would result incorrect.**
- **The air pressure quantity inside the vessel can be read from the pressure gauge.**
- **For models without pressure gauge the tank pressure can be measured by a pressure gauge that measures from the valve.**

8.1) Diaphragm(Membrane) No-Holder Type Vessels 8-60lt

With these models the applied diaphragm is a bag type membrane and there is no membrane holder but only a valve on top of the vessel. These vessels do not contain a pressure gauge.

1. Shut down the valve between the vessel and the installation and remove the vessel.



Please arrange for necessary measures when discharging the water inside the tank.

2. Discharge the water and air inside the vessel.
3. Remove the screws on the flange cover that is placed at the water entry-exit connection on the bottom side of the vessel.
4. Remove the diaphragm from this orifice.
5. Insert the diaphragm acquired from an authorized service into the vessel.
6. Make sure that the border of the diaphragm is aligned onto the flange.
7. Fix the screws again onto the flange cover. Make sure that you fix the screws equally strong. We recommend using a torque-meter.



Screwing the bolts too tight could result in wear of the threads. However, tightening to soft could cause leakage of water.

8. After finishing the mounting procedure insert pressure through valve in form of air or nitrogen into the vessel that is suitable with operation pressure of the vessel before

- connecting it. **(Should be realized by using a pressure-gauged compressor).**
9. After inserting air into the vessel check for impermeability of the valve and the flange area by using foamed water.
 10. Connect the vessel to the installation and put it into operation.



The gas pressure of the tank may drop after putting into operation. This deviation is normal. However, if the deviation is too large then you should check the impermeability.

8.2) Diaphragm (Membrane) Models 80-2000 lt

The membranes used with these types do contain holes on both sides; therefore the vessels have an impregnation on their top. The valve is on lateral side of the vessel. These tanks do contain a pressure gauge that shows the pressure inside the tank.

1. Shut down the necessary valves and remove the vessel from the installation.



Please arrange for necessary measures when discharging the water inside the tank.

2. Please discharge the water and air inside the vessel.
3. Remove the blind flange that is situated on top of the diaphragm tank, which enables that the diaphragm is fixed by the hanger.
4. Again please remove the bolts on the hanger.
5. After this stage it would make things easier to place the vessel sideways on a flat surface or lift it with a crane etc.
6. Remove the bolts on the flange cover that is placed at the water entry-exit connection on the bottom side of the vessel.
7. Pull the diaphragm out of this orifice together with the puller. Some models contain a long puller therefore when pulling the reel will come outside along with the diaphragm.
8. You need to insert the diaphragm back inside the vessel together with a puller and a reel, obtainable from an authorized service. This is the most difficult part of the procedure. Pull the top of the diaphragm out the orifice of the vessel by using a rope or steel wire attached to the puller.
9. Tighten the bolt on the top, which enables the diaphragm to stay on the holder. .
10. Tighten the blind flange on top of the puller.
11. Make sure that the border of the diaphragm at the entry-exit zone is fitted completely onto the vessel's flange.
12. Place the previously removed flange cover back onto the flange of the vessel and screwing the bolts. Make sure to tighten the bolts equally. We recommend using a torque meter.



Screwing the bolts too tight could result in wear of the threads. However, tightening too soft could cause leakage of water.

13. After finishing the mounting procedure insert pressure through valve in form of air or nitrogen into the vessel that is suitable with operation pressure of the vessel before connecting it. **(Should be realized by using a pressure-gauged compressor).**
15. After inserting air into the vessel check for impermeability of the valve and the flange area by using foamed water.
16. Reconnect the vessel and put it into operation.

8.3) Diaphragm(Membran) Holder-Type Vessels 2.500-3.000-4.000 lt

The membranes used with these types do contain holes on both sides; therefore the vessels have an impregnation on their top. The valve is on laterals side of the vessel. These tanks do contain a pressure gauge that shows the pressure inside the tank.

1. Shut down the necessary valves and remove the vessel from the installation.



Please arrange for necessary measures when discharging the water inside the tank.

2. Discharge the water and air inside the vessel.
3. Remove the blind flange that is situated on top of the diaphragm tank, which enables that the diaphragm is fixed by the hanger.
4. Again please remove the bolts on the hanger.
5. After this stage it would make things easier to place the vessel sideways on a flat surface or lift it with a crane etc.
6. Remove the bolts on the flange cover that is placed at the water entry-exit connection on the bottom side of the vessel.
7. Pull the diaphragm out of this orifice together with the puller. Some models contain a long puller therefore when pulling the reel will come outside along with the diaphragm.
8. You need to insert the diaphragm back inside the vessel together with a puller and a reel, obtainable from an authorized service. This is the most difficult part of the procedure. Pull the top of the diaphragm out the orifice of the vessel by using a rope or steel wire attached to the puller.
9. Tighten the bolt on the top, which enables the diaphragm to stay on the holder. .
10. Tighten the blind flange on top of the puller.
11. Make sure that the border of the diaphragm at the entry-exit zone is fitted completely onto the vessel's flange.
12. Place the previously removed flange cover back onto the flange of the vessel and screwing the bolts. Make sure to tighten the bolts equally. We recommend using a torque meter.



Screwing the bolts too tight could result in wear of the threads. However, tightening too soft could cause leakage of water.

13. After finishing the mounting procedure insert pressure through valve in form of air or nitrogen into the vessel that is suitable with operation pressure of the vessel before connecting it. **(Should be realized by using a pressure-gauged compressor).**
14. After inserting air into the vessel check for impermeability of the valve and the flange area by using foamed water.
15. Reconnect the vessel and put it into operation.

8.4) Diaphragm(Membrane) Holder-Type Vessels 5.000lt

The membranes used with these types do contain holes on both sides; therefore the vessels have an impregnation on their top. The valve is on laterals side of the vessel. These tanks do contain a pressure gauge that shows the pressure inside the tank.

1. Shut down the necessary valves and remove the vessel from the installation.



Please arrange for necessary measures when discharging the water inside the tank.

2. Discharge the water and air inside the vessel.
3. Remove the blind flange that is situated on top of the diaphragm tank, which enables that the diaphragm is fixed by the hanger.
4. After this stage it would make things easier to place the vessel sideways on a flat surface or lift it with a crane etc.
5. Remove the bolts on the flange cover that is placed at the water entry-exit connection on the bottom side of the vessel.
6. Pull the diaphragm out of this orifice.
7. You need to insert the diaphragm back inside the vessel, obtainable from an authorized service. This is the most difficult part of the procedure. Pull the top of the diaphragm out the orifice.
8. Place the upper flange cover and tighten the bolts.
9. Make sure that the border of the diaphragm at the entry-exit zone is fitted completely onto the vessel's flange.
10. Place the previously removed flange cover back onto the flange of the vessel and screwing the bolts. Make sure to tighten the bolts equally. We recommend using a torque meter.



Screwing the bolts too tight could result in wear of the threads. However, tightening too soft could cause leakage of water.

11. After finishing the mounting procedure insert pressure through valve in form of air or nitrogen into the vessel that is suitable with operation pressure of the vessel before connecting it. (Should be realized by using a pressure-gauged compressor).
12. After inserting air into the vessel check for impermeability of the valve and the flange area by using foamed water.
13. Reconnect the vessel and put it into operation.

9. ERROR DETECTION AND CORRECTION



The gas pressure of the tank may drop after putting into operation. This deviation is normal. However, if the deviation is too large then you should check the impermeability.

DEFECTS	REASONS	SUGGESTIONS
There is no air inside the vessel (pressure gauge shows less pressure than the supposed pre-set gas pressure and pressure is dropping despite air insert)	Diaphragm(membrane) is burst	Change the diaphragm and check for impermeability
	Air leakage in the flange area - flange cover bolts might be too loose	Tighten the flange bolts and check for impermeability
	Diaphragm (membrane) hanger has a air leakage - hanger bolt might be loose	Tighten the hanger bolts and check for impermeability
	Air valve leaks air- valve bolt might be too loose	Tighten the valve bolts and check for impermeability
	Valve might be damaged	Change the valve and check for impermeability
	Air leakage in welding area- welding area might have punctures, missing welding or ruptures	Please call an authorized technical service immediately before performing any procedure
Diaphragm(membrane) bursts too often	Installation pressure is too high	Tank might be subjected to installation pressure. Please check your installation.
	Tank volume too small	Change the tank with a correct sized vessel
	Tank pre-set gas pressure is insufficient	Set the pre-set gas pressure
Pressure gauge is defect	Might be damaged during transport	Replace the pressure gauge with a suitable dimension and capacity.
Tank does not fill with water	The pre-set gas pressure inside the vessel is too high	Reduce the pre-set gas pressure in accordance with your installation
Water comes from the blind closing plugs	Sealing is not enough (installer responsibility)	After installation to prevent water leakage, sealing teflon tape etc. should be used and should be tightened with 45-50 Nm.