

TECHNICAL BULLETIN

# **TECHNICAL INFORMATION**

# **FOR INSTALLERS AND TECHNICIANS**



# INTRODUCTION

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Dear installer and technician,

We send you this technical bulletin to inform you of the latest developments, changes and useful tips coming from Spirotech.

In this edition we update you on the following topics:

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Of course we wish you a lot of reading pleasure, but above all that you can make good use of the information we offer in your daily work.

# 1. TAKING THE STRESS OUT OF PRESSURISATION

Suboptimal pressure build-up in an installation has negative consequences for the performance and lifespan of a heating system. Here, *Michael Pitt, UK Technical Advisor at Spirotech*, explains why it is therefore essential to invest in high quality expansion vessels to ensure optimal pressure and keep heating systems in good health.

Depending on the size of the property in which installers work, the expansion vessel in the boiler itself may not be sufficient\*. While often suitable for the average home, larger multi-storey houses and light commercial buildings are likely to require an additional expansion vessel, such as the Spirotech EVN expansion vessel.

Expansion vessels are often overlooked and are more than just temporary storage for water that has expanded when heating up and needs to go somewhere. Without an expansion vessel or with a vessel of the wrong size, pressure would increase and can cause persistent problems in the heating system.

Usually, this can cause the boiler to fail and activate the safety valve to release water from the system, and can also result in the need to refill the system regularly; all of which results in air entering the system, which can reduce performance and efficiency.

## CHOOSING THE RIGHT SIZE OF VESSEL

So it has been established that an expansion vessel is needed, but how do technicians know what size vessel to choose? To determine this, there are a number of factors to consider:

- The volume of water in the system
- The static height above the expansion vessel
- The heating capacity in kW of the boiler
- The maximum temperature.

*The Spirotech EVN pressure expansion vessel is available in sizes from 4 to 140 litres. Thus, a suitable model is available for every job.*



## SETTING THE GAS FILLING CORRECTLY

With any expansion vessel, one of the most important steps in installation is making sure the gas fill (the pre-pressure) is set correctly, as this ultimately determines performance.

If the gas fill is set too low, the bladder will fill with water before the minimum pressure is reached, reducing the vessel volume that can be used to store the expansion water. If there is no overpressure in the entire heating system and underpressure is created in some places (especially at the top of the building), there is a very good chance that air will be sucked in, with all the negative consequences.

If the gas filling is set too high, the expansion water cannot enter the bladder. If the vessel has a higher pre-pressure than the system pressure, before expansion water can enter the vessel, the system pressure will first have to increase above the vessel pre-pressure. This could mean that the pressure in the system could rise above the opening pressure of the safety valve. This will cause water to be lost from the system, which could mean that when the system cools down, there is too little water in the system and thus the pressure at the top of the system becomes sub-atmospheric and air is sucked in.

When setting up the gas charge of the expansion vessel, we do so with an overpressure in mind (according to EN 12828). This way, should the vessel reserve be depleted, and the system pressure equal the gas charge pressure, there will still be a positive pressure at the highest point of the system.

During annual maintenance, it is important not to overlook the expansion vessel. The expansion vessel should be disconnected from the system and then the water should be let out of the expansion vessel. Only then can the pre-pressure be checked and adjusted if necessary. This is necessary because the pre-pressure can change over time, and it cannot be checked when the vessel is connected to the system. This is a good reason for using a maintenance unit because it avoids having to dismantle the vessel to adjust the pre-pressure.

#### **CORRECT POSITIONING ON THE SYSTEM**

A pressure expansion vessel should be installed in the return of the system, before the circulation pump. The cooler water in the return is better for the diaphragm, but more importantly, placing the vessel in the suction side of the pump ensures that the pump has a stable, constant suction pressure, and also that no underpressure can occur in the rest of the system.

The point where the expansion vessel is connected is therefore called the neutral point because the pressure does not change here. Upstream of the expansion vessel, the pressure will become relatively higher, and downstream, i.e. towards the pump, relatively lower.

#### **WHAT TO LOOK OUT FOR WHEN SELECTING AN EXPANSION VESSEL**

The Spirotech EVN pressure expansion vessel is designed with an easily accessible Schrader valve to make maintenance and service easier for heating engineers, and also comes with a mounting bracket for easy installation. The compact design of the vessel makes it ideal for installation in tight spaces. Spirotech's EVN pressure expansion vessel comes with a unique five-year warranty.

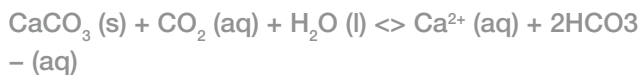


# 2. SYSTEM WATER QUALITY - HARDNESS



## SYSTEM WATER QUALITY - HARDNESS

Hardness is mainly determined by calcium and magnesium salts. Water hardness is created by contact with soluble, divalent metal cations. The two most important cations that determine water hardness are calcium ( $\text{Ca}^{2+}$ ) and magnesium ( $\text{Mg}^{2+}$ ). Calcium dissolves when water flows over and through limestone deposits. Magnesium, on the other hand, dissolves when water flows over and through dolomite and other magnesium-containing rocks. Because groundwater is in contact with these geological formations for a longer period than surface water, it is generally harder.



Although strontium, aluminum, barium, iron, manganese and zinc also make water hard, their concentrations are generally not high enough to significantly affect the total hardness. The total water hardness, expressed as equivalent  $\text{CaCO}_3$ , can be calculated using the following formula:

$$\text{Total hardness } [\text{CaCO}_3] = 2,5 [\text{Ca}^{2+}] + 4,1 [\text{Mg}^{2+}]$$

Hard water causes scale, usually calcium carbonate, which causes various problems. When hard water is heated, scale forms even faster. Boilers, water heaters and hot water pipes are, as it were, insulated from the inside and energy costs increase. Scale in appliances, pumps, valves and water meters leads to wear of moving parts. The hardness levels are defined as follows:

Hardness range	Calcium carbonate ( $\text{CaCO}_3$ )	°dH
Soft	< 1,5 mmol/l	0 – 8,4
Medium	1,5 – 2,5 mmol/l	8,4 – 14
Hard	> 2,5 mmol/l	14 – 21

## HARDNESS TYPES

Temporary (transient) hardness is a form of water hardness that can be traced back to the presence of dissolved bicarbonate minerals (calcium bicarbonate and magnesium bicarbonate). In a dissolved state, these minerals provide calcium and magnesium cations ( $\text{Ca}^{2+}$ ,  $\text{Mg}^{2+}$ ) and carbonate and bicarbonate anions ( $\text{CO}_3^{2-}$ ,  $\text{HCO}_3^-$ ). The presence of metal cations makes the water hard. Unlike permanent hardness, which is caused by sulphate and chloride compounds, this 'transient hardness' can be reduced by boiling the water or by adding lime (calcium hydroxide), the so-called lime decarbonation. Boiling stimulates the formation of carbonate from bicarbonate and calcium carbonate disappears from the solution. What remains is water that is softer after cooling. Due to the low solubility in water,  $\text{CaCO}_3$  is deposited in the system. This hardness can then be removed from the water and is therefore called temporary hardness. Permanent (lasting) hardness is the hardness (mineral content) that cannot be removed by boiling. This can usually be traced back to the presence of calcium sulphate and/or magnesium sulphates in the water. These do not disappear by increasing the temperature. Ions, which cause permanent water hardness, can be removed with a water softener.



# 3. FREQUENTLY ASKED QUESTIONS FROM INSTALLERS AND TECHNICIANS

**Q** **When do I need a pressure maintenance system?**

**A** According to the **EN12828** standard, every heating system needs some form of pressure maintenance system is required: *"4.6.2.4 Pressure maintenance systems: Each heat generator should be connected separately to a pressure maintenance system by means of an expansion line. If several heat generators are connected to the same pressure maintenance system, unintentional circulation within the expansion lines should be prevented."*

**Q** **Is the automatic make-up unit already installed in Spill sets?**

**A** If the automatic make-up unit is ordered together with the pressure maintenance system, it will be pre-installed at the factory. No additional installation is needed on-site.

**Q** **What information is required for the design of an expansion system?**

**A** To properly design an expansion system, you need the following data:

- Output of the entire heat generator
- Total system capacity
- Flow and return temperatures
- Static height
- Blow-off pressure of the safety valve
- Type of medium (water or glycol)
- For glycol mixtures, the percentage of glycol

**Q** **How does a degasser measure the gas content in the fluid?**

**A** Degassers don't measure the gas content directly. Instead, they monitor whether gases have been removed using a smart switch on the outlet of the automatic air vent (AAV). If no gases are detected being expelled over a 10-minute period, the system will shut down and attempt to degas again the next morning at 08:00, as per the default setting.

## VACUUM DEGASSING

**Did you know?**

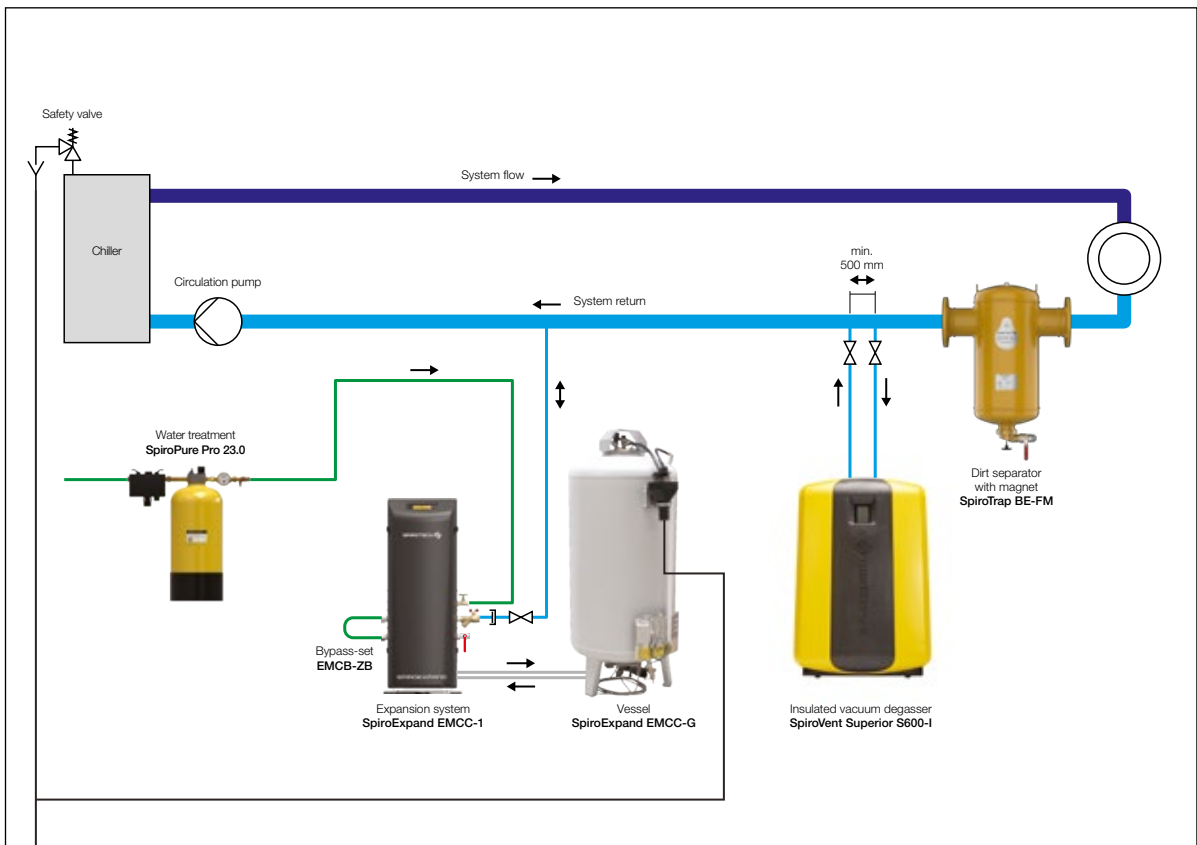
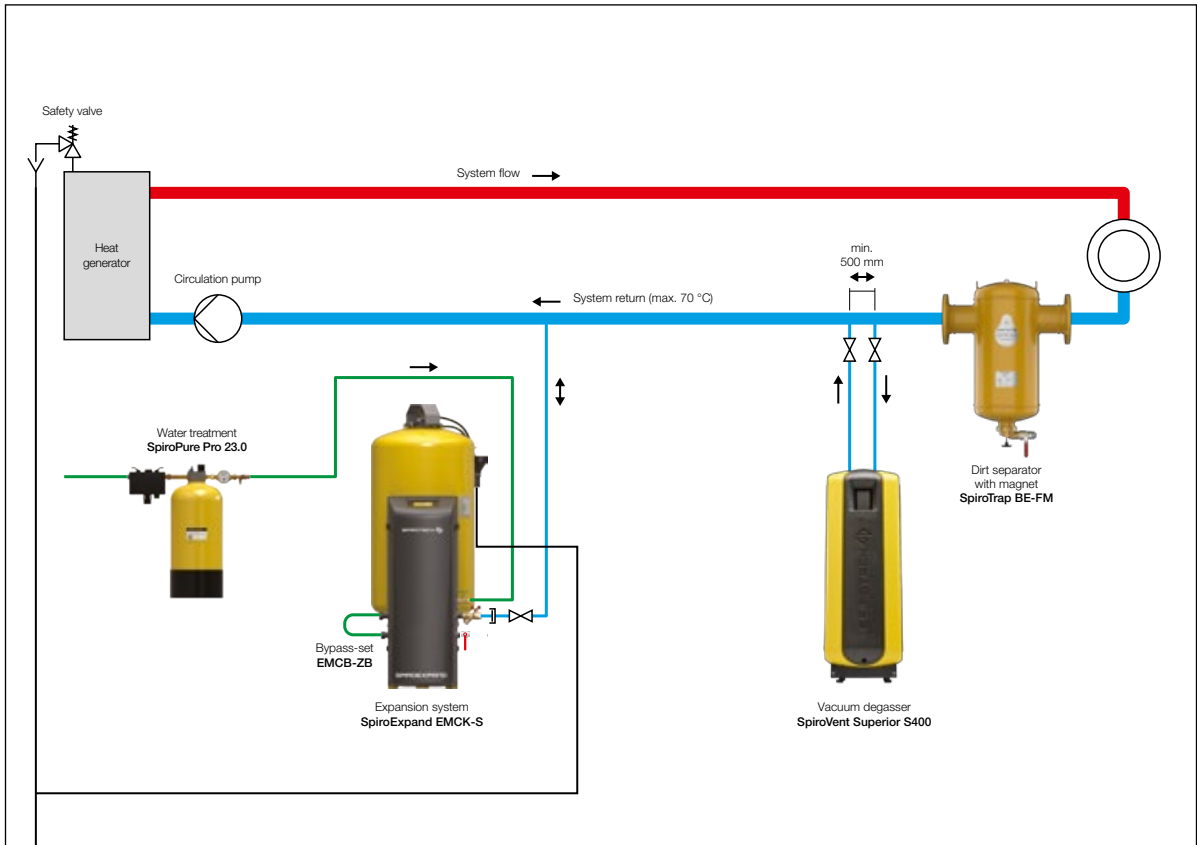
You can use the data logged in the HMI (Human-Machine Interface) to diagnose and track trends within the system.

For example, if the vacuum degasser has only been degassing for 10 minutes a day for the past year and suddenly operates for hours at a time, this may indicate air entry or a rising gas content in the liquid. This could indicate a bad connection, a faulty automatic air vent (AAV), a faulty or improperly set expansion vessel, or a leakage that is compensated by overfilling tap water.

If the Superior detects low pressure every time the heating system cools down, it could mean that the expansion system is 1- not correctly sized, 2- not correctly set up, 3-not open to the system, 4- has become damaged/faulty.

Conversely, you can observe high-pressure problems when the system starts heating, but the expansion system does not have the capacity to collect the expansion water. The reasons for this are the same as above, i.e. wrong selection, too high pre-pressure or a broken membrane.

# 4. CONNECTION DIAGRAMS FOR PRESSURISATION UNITS



# MAXIMISING PERFORMANCE FOR YOU

Spirotech is a leading expert in improving the efficiency of heating and cooling systems. Our family business has over 60 years of experience in developing solutions for removing and preventing the accumulation of air and sludge deposits in energy systems. Our products save energy, increase comfort, avoid wear and tear and maximise operating periods. Reliable and customer-oriented products that help you get top performance and protect investment in capital assets. We develop high-value solutions with our partners and suppliers that improve the operation of residential and commercial properties. Our comprehensive network of selected importers in over 70 countries means there is always a Spirotech expert near to you.

Heating and cooling systems are highly complex, particularly when they are run in conjunction with other systems and installations. So locating and analysing faults when they occur is never easy, especially with the clock ticking in the event of a system failure. Spirotech is here to support you with practical advice and solutions, helping you to pinpoint causes and rectify them. Please feel free to contact us.

**IF YOU WOULD LIKE TO KNOW  
MORE ABOUT OUR SOLUTIONS,  
PLEASE VISIT OUR WEBSITE  
[WWW.SPIROTECH.COM](http://WWW.SPIROTECH.COM) OR  
[WWW.SPIROTECH.CO.UK](http://WWW.SPIROTECH.CO.UK)**

