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General



Provided they are correctly dimensioned in tied into the closed heating systems, Flexcon-Pro diaphragm pressure expansion vessels can be used in the following functions:

- Taking-up the expansion volume during heating-up of the plant.
- Storage of water volume to be fed back to plant on request, e.g. in case of cooling down or leak losses.
- Maintenance of minimum overpressure in the system (pressure holding).

Water and pressurized gas contained in the Flexcon-Pro diaphragm pressure expansion vessels are separated from each other by a replaceable diaphragm of high-duty butyl rubber. In the sizes for 200 to 370 liters the water is contained in the diaphragm whereas nitrogen or fully oil-free and dried compressed air is contained in the vessel. In the sizes for 430 to 1000 liters the water is contained in the vessel whereas nitrogen or fully oil-free and dried compressed air is contained in the diaphragm.

Application range

Flexcon-Pro diaphragm pressure expansion vessels of standard design are supplied as follows:
Capacity: 200 - 1000 liters.

Maximum admissible working temperature: 120 °C.

Maximum admissible continuous thermal stressing of diaphragm: 70 °C.

Maximum admissible working gauge pressure: 6 bar.

Test gauge pressure: 9.5 bar.

All vessels are equipped with a replaceable diaphragm. The diaphragm in the sizes for 770 to 1000 liters is supported by an internal bottom.

The application parameters must be strictly adhered to and never be exceeded.

Vessels have been designed in compliance with the Pressure Equipment Directive 97/23/EEC and in conformity with the German "AD-Merkblätter". In the strength calculation of standard vessels the corrosion allowance has been selected smaller than 1 mm under consideration of the specific application conditions. A corrosion allowance of 1 mm or more requires a separate agreement.

The EEC Prototype Test Certificate for the Flexcon-Pro diaphragm pressure expansion vessels may be presented on request. The vessels have the test mark CE 0045 issued by the competent authority on their nameplates thus making evident that the vessels had been subjected to a conformity assessment to Article 10 of the Directive 97/23/EG of the European Parliament and the Council for the Harmonization of the pressure vessel codes of its member countries. The EEC member countries must not prohibit, limit or impede the marketing and commissioning of vessels in the condition specified by the manufacturer by making reference to the pressure-related risks.

Installation instructions, preparations for inspection work, technical safety measures for operation

Flexcon-Pro diaphragm pressure expansion vessels are supplied completely assembled and packed in horizontal position on one-way pallets. The vessels shall be installed in closed frost-protected rooms so that they can be inspected, maintained and operated at any time without any problems. The minimum distances between the installed single vessels shall be selected during planning or erection according to the local conditions prevailing on site. The area selected for installation of vessels shall be so that stability can be ensured and maintained. The system connection at the vessel (R1" nozzle at the lower bottom) must be locally tied into the existing heating system.

The vessel must have a shut-off valve so that it may be isolated from the heating system.

The shut-off valve must have a locking facility so that the valve cannot be closed by mistake (for instance, use of cap-type stop valves). A vessel draining facility is required between the expansion vessel and the shut-off valve.

One or more heat generators may be equipped with one or more expansion vessels.

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Never fill water into the Flexcon-Pro diaphragm pressure expansion vessel prior to start-up and/or keep the vessel isolated from the network (the cap-type stop valve shall remain closed).

The inlet gas pressure will be set by the manufacturer according to order specification. If no inlet gas pressure is specified, the gas inlet pressure of vessel to be supplied will be set to 2.5 bar. A gas inlet pressure set excessively high or set too low would impair the correct function of the Flexcon-Pro diaphragm pressure expansion vessel.

Check if the gas inlet pressure is correct while the cap-type valve is closed, fill the heating system and vent it.

Operate the filling and draining valve in the expansion line so that the pressure expansion vessel receives the required make-up water filling. The make-up water filling for compensation of leak losses shall be at least 0.5% (according to DIN 4807/2 $0.5\% < v < 1.0\%$) of the water volume of the system.

The filling pressure required for water filling of the Flexcon-Pro diaphragm pressure expansion Vessel in cold condition of the system may be calculated as follows:

$$\frac{(\text{Inlet pressure} + 1) \times \text{nominal volume of diaphragm expansion vessel}}{\text{Nominal volume of diaphragm expansion vessel} - \text{Make-up water filling}} = (\text{.....} - 1) = \text{.....bar gauge pressure}$$

Once the inlet pressure has been set precisely, open the cap-type valve of the system. Safe operation of Flexcon-Pro diaphragm pressure expansion vessels in existing heat generation plants is not possible without sufficient protection against excessively high inlet temperatures and excessively high working pressures. The most essential requirements are:

- Each heat generator shall have a temperature controller so that the heating capacity can be adapted to the actual heat consumption.
- Each indirectly heated heat generator shall have a suitable safety temperature governor with its own sensor.
- Each directly heated heat generator shall have a suitable safety temperature limiter with its own sensor.
- The existing heat generators shall be equipped with safety valves for protection against excessively high working pressures. Not more than three safety valves shall be used per heat generator. Safety valves shall be installed in well accessible locations, i.e. in the highest point of the heat generator or in close vicinity to the make-up water line.
- Each heat generator with safety valves for more than 3 bar or more than 350 kW of nominal heat output shall be equipped with a pressure limiter. The pressure limiters shall be set so that pressure limiters respond prior to the response of safety valves.
- Additional national regulations regarding protection against inadmissible pressures and temperatures which might occur during operation of the Flexcon-Pro diaphragm pressure expansion vessels shall be duly considered.

Heat generation plants shall be erected only by specialized and approved contractors. Prior to initial start-up the heat generation plants shall be inspected for sound technical condition of heat generator, heating system and safety appliances. All details of the national requirements shall be met. In Germany this inspection shall be made by an approved expert. In other countries the inspection shall be made in compliance with the applicable national codes and standards valid in the user's country. The erection contractor and/or the operator of the plant shall be responsible for correct acceptance and commissioning of the plant.

Potential hazards

Potential hazards caused by use of the Flexcon Flexcon-Pro diaphragm pressure expansion vessels may be:

Improper erection, non-observance of application parameters, use of vessels for other purposes than specified, or non-observance of safety regulations applicable to heat generation plants. Gas and water chambers must be relieved from pressure before any assembly or maintenance work is carried out on the diaphragm pressure expansion vessels.

Important! Under normal conditions the water temperature in the tank reaches 70 °C. Higher temperatures may be the result of improper operation of the vessels. Caution, risk of skin burning. Never touch a vessel with naked hands while it is in service. The wall temperature may exceed 50 °C.



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Maintenance and recurrent tests and inspection

The manufacturer of the heat generation plant shall hand over to the user an operation and maintenance manual with all necessary information on the reliable function of technical safety appliances. The original of this manual shall be signed by the competent acceptance inspector in charge of the initial start-up of the plant.

The frequency of recurrent tests and inspections required for the Flexcon-Pro diaphragm pressure expansion vessels are laid down as follows:

- External inspection Once per year.
 - Internal inspection Every 5 years.
 - Hydrostatic pressure testing Every 10 years.
- Tests and inspections shall be carried out by competent persons nominated by the authorities in the user's country. The national regulations shall be observed and have priority.

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