Flexcon® MPR-S
Installation and operating instructions
Dear Customer,

Thank you for purchasing the Flexcon MPR-S PUMP Expansion Automat – a quality product from Flamco. This expansion automat from the proven M-P series offers you reliability, guaranteed operational readiness and ease of use.

On the following pages we will present you with technical specifications, instructions and explanations that facilitate safe use in accordance with regulations. Persons responsible for transport, installation, commissioning, re-starting; operation, maintenance, checks and repairs must have read and understood these instructions.

Please place these instructions in a place where they can be inspected at any time.

We will be happy to answer any questions that are not covered by these instructions.

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Total number of pages of this manual: 29

Supplementary manuals may be added according to the order or on request.

1. Exclusion of liability

All the technical information, data and instructions contained in these operating instructions for operations that can and are to be performed, are up to date at the time of editing. They contain our current knowledge and experience to the best of our understanding.

We reserve the right to make technical modifications arising from the further development of the Flamco product presented in these operating instructions. For this reason, no claims may be derived from technical data, descriptions and illustrations.

Required operations within the scope of Flamco delivery must be performed by trained and certified specialists. This includes such persons having knowledge of applicable safety conditions. Consequently, Flamco shall not be liable for any losses, subsequential losses, personal losses arising from the non-observance of safety conditions or as a consequence of the disregard of standard precautionary measures when performing such services as transport, installation, commissioning, re-starting, operation, maintenance, testing and repair, even in the event that these are not expressly described in these instructions.

Technical illustrations, drawings and graphs may not necessarily represent the actual module, individual components or spare parts supplied. Drawings are not to scale and contain symbols for the purpose of simplification.

-Reference symbols used in the instructions.

Hazardous voltage
Ignoring this can put your life in jeopardy, cause fires or accidents destruction

For special consideration
Ignoring this may result in reduced functioning, overload or destruction

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2. Acceptance of goods

Inspection

The items supplied (equipment, documentation) are listed in the shipping papers. The contents of the delivery must be immediately checked for completeness and transportation damage upon arrival.

Incorrect or missing items must be immediately identified. Please note the contents (e.g., for handling goods, notifications of defects...) of the general terms and conditions contained in the shipping papers.

Compare the specifications on the type plate of the expansion vessel with the specifications of your order or the details of the relevant project.

If this expansion vessel is used regardless of any differences which have been ascertained (not used in accordance with regulations), it will not be possible to exclude system faults or hazards to people, animals or objects.

Transport

The basic and ancillary vessels of the unit are packed horizontally on disposable pallets and delivered fully assembled. Accessories or additional equipment can be packed separately or as a part of the automat unit packaging. The disposable pallets are suitable for horizontal transport using permitted forklift devices (e.g. forklift trucks, forklift stackers...). Always use the largest possible fork size for the pallet to prevent the load from tipping over.

Position the object to be moved as low as possible, at right angles to the forks.

Hoist fittings on the vessel (welded lifting lugs) are to be used for lifting of the empty, uninstalled vessel that has been removed from its packaging.

Note: The transport guard (Pos. 2.12, page 9) provides necessary protection against collision during the setup of the expansion automat and must only be removed once this is complete! (Installation surface, setup)

Once the automat has been removed from its packaging, it must be set up under safety measures to avoid being damaged, tipped or shaken. Only use permitted load lifting devices.

Depending on the transport method and the size of the expansion automat, various types of packaging may be used. Unless otherwise contractually agreed, the packaging meets the packaging guidelines of Flamco STAG GmbH.

Storage

Interim storage can also take place while packed. Conditions for this are: a closed, frost free room (dry...60...70 % relative humidity), free of vibrations, protected against heat and direct sunlight.

The stability is to be ensured and the stacking of equipment should be avoided.

3. Working Method

The system pressure, set under the influence of temperature fluctuations in heating or climate-control units, is the value that is continuously measured and transmitted via a signal line to the control unit. A comparison of these actual parameters with the desired parameters, programmed into the control unit, leads to the energising of the pump(s) or the intakevalve(s) in the event of any deviation. The pump and overflow valve are linked to the membrane vessel. The intakevalve is opened to govern excess pressure during system warm-up, as is the pump during cool-down (pressure maintenance). A negligible pressure discrepancy between energising the valve or the pump ensures that the pressure is maintained within a very small tolerance.
### Flexcon MPR-S Expansion Automat

**Instruction manual, start-up protocol.**

3. **Working Method (continued)**

   The readings taken by the vessel-capacity sensor and evaluated by the control unit form part of the parameter, as is the case with system pressure. When the programmed (desired) parameters are reached, this leads to control signals that prevent the pumps from running dry, the vessel from overfilling, and enables the refill function to compensate for water loss (and equalise the pressure). The water taken from the system during expansion duty is subsequently de-aerated because of the pressuredrop principle. The separated gas is automatically released via the automatic floatvent into the ambient air.

   Our choice for a range of vessel sizes, several vessels being able to be connected together, the choice of a number of pump modules and the ability to program desired parameters into the control unit means that the Flamcomat can be configured to your operating needs: it can be a heating or climate-control installation.

4. **Safety**

   **Intended area of use**

   Closed water-powered heating or climate-control units, in which temperature-dependent volume fluctuations in the system fluid can be equalised and the required operating pressure can be fixed across separate systems with a separate pressure governor. Operation in installations with feedline temperatures exceeding 120 °C is not permitted. Configuration is as in figures ?? pages ? and ?, technical data, figures, installation diagram and example in appendix ?. The heating water shall not constitute a hazard in its composition, does not limit operation and does not damage or adversely affect parts of the agreed and supplied configuration (e.g. load-bearing parts). This means that use of solids or long-fibred parts, or excessive additives is not permitted. Note: The Flexcon MPR-S configuration allows physical de-aeration of the system water.

   **Directions for safe use**

   The latest, valid edition of product information, instructions and technical information issued by the manufacturer contains directions on how to operate the equipment safely within the use parameters described. Use other than that specified, use for purposes other than intended, individual reconstruction initiatives or alterations not authorized by the manufacturer are not covered by the terms of the warranty and may form a danger to man, animals or intangible property values. It is a condition of use that installations operating this vessel for pressure control, de-aeration and feeding guarantee that the operating excess pressure and permissible operating temperature cannot be exceeded.

   Water-side under and excess pressure valves for operating the heating installation (e.g. pressure limiter) do not form part of this Flamco configuration.

   The figures for permitted operating excess pressure and those for permitted maximum operating temperature are stated on the type plate (fig. 1 and 2, page 3).

   **How to avoid exceeding the maximum pressure**

   When using this pressure expansion vessel in water-heating or climate-control installations, it is a condition of use that the systems can prevent the permitted excess pressure being exceeded.

   Suitable units for pressure-limiting in the pressure expansion vessel are safety valves which open at the maximum operating excess pressure at the latest and are able to work within a factor of 1.1 times the permitted operating excess pressure stipulated by the manufacturer. Feed and blow-off pipes for safety valves must not be closable and must not contain any parts which can form a constriction in the required flow. The suitability for use must be proven or otherwise certified. The safety valves’ manufacturer’s figures and national regulations must be observed.

   **How to prevent exceeding the maximum temperature**

   When using this pressure expansion vessel in water-heating or climate-control installations, it is a condition of use that the installations can prevent the permitted feedline temperature being exceeded.

   Such devices must be equipped and constructed so that during practical operation the permitted working temperature is not exceeded at any part of the system or unit. A part’s suitability for use and quality must be demonstrable or certified. National regulations must be observed.

   The configuration of these pressure vessels in a heating system must be such that the permitted sustained temperature does not (or only briefly) exceed 70 °C. This means that the installation should primarily be in return line configuration. If the heating installation is one with returnline temperatures in excess of 70 °C, an intermediate vessel must be positioned before the pressure expansion vessel to cool the expansion water.

   **Residual danger**

   - Exceeding the system’s permitted parameters due to non-functioning safety devices (temperature and pressure). Carry out regular tests to check the function of the relevant limiting devices. If this is not done, there is a danger of component overload.
   - Pressure and temperature levels. Work should solely be carried out on expansion vessels if the water area is not under pressure. Please note that certain contact areas may be as hot as 70 °C (and if not used properly even hotter). For your safety, please do not touch said areas.
   - Exposure to fire. Please protect against fire.
   - Electrical voltage. Please ensure that work on the electrical systems is carried out solely by qualified personnel. Bodily contact with live parts (230 V, 50 Hz) may be fatal.
5. Installation

Use and the installation location are subject to binding regulations and provisions. Particular reference is made to the obligation to inform test or certification agencies prior to the installation and starting of systems. In this case, the person responsible is to initiate the procedure with these agencies. Documents, conditions and calculations arising from the tests carried out under the procedure or other guidelines are to be observed when installing the system.

If acceptance procedures are required for the installed object, the system must only be started once it has been confirmed that the requirements imposed on the system have been satisfied.

- Perform the start/commissioning protocol.

Environmental conditions

The Flexcon MPR-S Expansion Automats are to be installed in such a way that operation, testing and maintenance can be constantly guaranteed. This automat must be installed in an enclosed, frost-free room taking into consideration minimum distances (page 11). The safe operating temperature in the vicinity of the automat is 5...40 °C. Higher temperatures can lead to function disruptions and to the overload of the pump or pumps (no expansion). The placing of the pump intake and cool-air openings must ensure that surrounding parts cannot be sucked in, an unobstructed flow of air is possible, and that no shorted flow between cool-air inlet and outlet can occur.

Ensure that the expansion automat is operated in a surrounding atmosphere that is free of electrically conducting gases, high concentrations of dust and vapours. A risk of explosion is posed by combustible gases, gas mixtures.

Base and setup.

The installation surface must be prepared so as to ensure and maintain installation safety.

When preparing this surface, take into consideration the maximum weight of the complete automat, including the weight of the water.
# Appendix 1: Start-up protocol

<table>
<thead>
<tr>
<th>No.</th>
<th>Start-up protocol</th>
<th>The sequential order of the services No. 3 - 30 correspond to the requisite initial start-up sequence.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Operator, owner.</td>
<td>Erector, Heating construction company. Location of the system.</td>
</tr>
<tr>
<td>Company, Name Object</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Street</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Location</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Authorized</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tel.-No.:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fax.-No.:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>E-mail Address:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Heating power: MW</td>
<td>Initial temperature: °C</td>
<td>Return temperature: °C</td>
</tr>
<tr>
<td>Safety valve: bar</td>
<td>Serial no.: Flexcon MPR-S:</td>
<td>Serial No. Controller:</td>
</tr>
<tr>
<td>Serial No. Base vessel MP-G</td>
<td>Serial no.: Surge vessel</td>
<td></td>
</tr>
<tr>
<td>Serial No. Base vessel MP-B:</td>
<td>Project No.:</td>
<td>Date:</td>
</tr>
</tbody>
</table>

## Workflow

<table>
<thead>
<tr>
<th>Workflow</th>
<th>Reference</th>
<th>Execution marking</th>
</tr>
</thead>
<tbody>
<tr>
<td>Allocation Safety valve output piping and channel connection. Ensuring the secured disposal of discharged volume flows on opening of the safety valve in the control-module or when draining the expansion vessel.</td>
<td>Project template</td>
<td>✔</td>
</tr>
<tr>
<td>Erection of pump control-module Flexcon MPR-S, base vessel MP-G, auxiliary vessel MP-B and surge vessel PN16 (Flexcon MPR-S PN16) at uniform height level. Alignment of these components, using a level, in two vertical positions, mutually at 90° to each other.</td>
<td>P 4...3 P 14...16 Project template</td>
<td></td>
</tr>
<tr>
<td>Ensure that no further positional changes are needed for the base vessel MP-G. Remove the transportation lock on level sensor. Prevent impact loads on this sensor, ensure a resting surface, that does not obstruct the good operation of the thrust disc.</td>
<td>Image B1</td>
<td></td>
</tr>
<tr>
<td>Assemble the automatic vent-valve (Addition to the supply). Open the red threaded cap by one turn.</td>
<td>Image B2; Item 2.7; P 4</td>
<td></td>
</tr>
<tr>
<td>Ensure that no external loads will act upon the base vessel (e.g.: Discarded tool, leaning lateral loads, installation without flexible pressure hose).</td>
<td>Item 2.10; P 4</td>
<td></td>
</tr>
<tr>
<td>Prevent fastening of the base vessel MP-G (fastening types, which have an inadmissible effect on the vessel, such as: Casting the legs with concrete or floor plaster, welding on vessel or legs, clamps and tensioners on ground body are not to be used).</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Flamco

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Instruction manual, start-up protocol.

Appendix 1:
Start-up protocol

<table>
<thead>
<tr>
<th>Workflow</th>
<th>Reference</th>
<th>Execution marking</th>
</tr>
</thead>
<tbody>
<tr>
<td>9 Remove the transportation lock from pump(s) Flexcon MPR-S PN25.</td>
<td>Image B3</td>
<td>✔</td>
</tr>
<tr>
<td>10 Arrange the connections between vessel MP-G, possibly vessel MP-B with the pumpcontrol-module Flexcon MPR-S. The NW50/2&quot; is the minimum diameter to be used. If there are several vessels, install one cap valve per vessel.</td>
<td>Item 1.21; 2.8; P.4 Item 4.20; P.5</td>
<td></td>
</tr>
<tr>
<td>11 Open the cap valves between Flexcon MPR-S and the base- and evtl. Auxiliary vessels. Close the drain valves (filling valves) on these vessels.</td>
<td>Item 1.20; 2.12; P.4 Item 4.19; P.5 Image B1</td>
<td></td>
</tr>
<tr>
<td>12 Connect the signal conduit by means of the round plug connector with the levelsensor. Ensure complete fastening of this connection (IP65) and secured line conduit.</td>
<td>Item 1.23; 1.18; P.4 Item 4.22; 4.17; P.5 P.11; P.14,...16</td>
<td></td>
</tr>
</tbody>
</table>

13 Create the refill connection on pumpcontrol-module Flexcon MPR-S. Shut check valve. Provide sufficient feeding flow pressure. Set the pressure reducer (this valve closes if the pressure rises after the valve), correction after start-up is possible. | Image 3; P.4 P.14,...16 | Flow pressure: bar |

14 Create system connection on control module Flexcon MPR-S. Ensure that this connection is made in return line, directly connected to the heat generationcircuit and no external hydraulic pressures are influencing at the point of connection. (e.g.: Hydraulic shunts, network distribution). Ensure that the installation of the expansion line is done favorably to the flow and for supply line lengths greater than approx. 8 m at least one higher nominal width is used (DN65..80). Additional loads on the system connection of the pumpcontrol-module Flexcon MPR-S (thermal expansion, flow vibrations, self-loads) are not allowed. Close the cap valve. Create the connection of the surgevessel PN16 (Flexcon MPR-S PN16) in the branch of the expansion line on pumpcontrol-module. Arrange a filling and draining valve before the surgevessel, close this valve. | Item 1.22; P.4 Item 4.21; P.5 | Image 3; P.4 P.14,...16 |

15 Create electrical connection of, pumpcontrol-module Flexcon MPR-S. The connection can be made through a conductor with CEE coupling 16A 400V 50Hz L1 L2 L3 N PE or directly to the terminal (field rotation Clockwise). | Annexure 2; P.20 Project template |  |

16 Switch off the motor protective switch (1; 2)! | Item 5.4; 5.5; P.5 |  |

17 Ensure all valves are closed until after completion of the corresponding set point value settings. Shut on the controller. (Valve 4, refill, switches on) | Item 1.23; 1.22; P.4 Item 4.22; 4.21; P.5 Image 3; P.4 P.14,...16 |  |

18 Switchover to programmingmode and start programming of the set point values. | P.18; 19 P.6; 10; 12 |  |

<table>
<thead>
<tr>
<th>System pressure:</th>
<th>Min. water level</th>
<th>Max. water level</th>
</tr>
</thead>
<tbody>
<tr>
<td>bar</td>
<td>%</td>
<td>%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Min. pressure:</th>
<th>Max. pressure:</th>
<th>Refill On:</th>
</tr>
</thead>
<tbody>
<tr>
<td>bar</td>
<td>bar</td>
<td>%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Refill Off:</th>
<th>Max. pump run time:</th>
<th>Max. refill quantity:</th>
</tr>
</thead>
<tbody>
<tr>
<td>%</td>
<td>min.</td>
<td>m³</td>
</tr>
</tbody>
</table>

Operation zero setting loading: kg (Counter reading for impulse water counter: Liters)
**Flexcon MPR-S Expansion Automat Instruction manual, start-up protocol.**

**Appendix 1:**
**Start-up protocol**

<table>
<thead>
<tr>
<th>No.</th>
<th>Start-up protocol</th>
<th>Reference</th>
<th>Execution marking</th>
</tr>
</thead>
<tbody>
<tr>
<td>19</td>
<td>Switch back into operation mode and switch off the control.</td>
<td>P.18; 17</td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>Set the manual control valve and secure it.</td>
<td>P.10; 13</td>
<td></td>
</tr>
<tr>
<td>21</td>
<td>Setting of overflow valve. Caution: The version Flexcon MPR-S 2.3* requires, after finalizing the start-up procedure the input of a system pressure plus 1 bar (0.5 + 0.5), which is to be set after reduction of the preset value (10 bar) till overflowing of this valve up to the system pressure</td>
<td>Item 1.14; 1.15; P.4 Item 4.13; 1.9 P.9; 10; 12</td>
<td>Setting: bar</td>
</tr>
<tr>
<td>22</td>
<td>Align watercushion and initial gas pressure in surgevessel PN16 (Flexcon MPR-S PN16). This vessel compensates a higher dynamic pressure component. Keep cap valve at the branch of the expansion line closed.</td>
<td>Image 3; P.4 P.11 P.14...16</td>
<td>Poc: bar Pa1; bar dp*: bar</td>
</tr>
<tr>
<td>23</td>
<td>Fill up and vent the HVAC installation.</td>
<td>Project template</td>
<td></td>
</tr>
<tr>
<td>24</td>
<td>Check the operation-readiness for refill.</td>
<td>Project template</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Tip: If another filling level than the self-aligning minimum level is required, the quantity needed according to the system state is to be filled through the drain valve on the vessel MP-G (MP-B). For this requirement, the Flexcon MPR-S system and refill valves are to be kept closed. Open the cap valve(s) between vessel(s) and Flexcon MPR-S, switch on the control. The self-aligning filling level through external filling (level ... %) is to be observed on the control. After the filling is concluded, the discharge valve (filling valve) is to be closed and the filling equipment is to be removed.</td>
<td>Display 22; P.18 Item 2; 8; P.4 Item 1.22; 1.23; 1.21; P.4 Item 4.21; 4.22; 4.20; P.5 Display 1; P.17</td>
<td>Level: %</td>
</tr>
<tr>
<td></td>
<td>Tip: If another filling level than the self-aligning minimum level is required, the quantity needed according to the system state is to be filled through the drain valve on the vessel MP-G (MP-B). For this requirement, the Flexcon MPR-S system and refill valves are to be kept closed. Open the cap valve(s) between vessel(s) and Flexcon MPR-S, switch on the control. The self-aligning filling level through external filling (level ... %) is to be observed on the control. After the filling is concluded, the discharge valve (filling valve) is to be closed and the filling equipment is to be removed.</td>
<td>Display 22; P.18 Item 2; 8; P.4 Item 1.22; 1.23; 1.21; P.4 Item 4.21; 4.22; 4.20; P.5 Display 1; P.17</td>
<td>Level: %</td>
</tr>
<tr>
<td>25</td>
<td>Open the check valve at the refill connection Flexcon MPR-S. Switch on the control. Valve 4 (refill) switches On. The refill ends when the setpoint value is attained, corresponding to the programmed value.</td>
<td>Item 1.23; 1.18; P.4 P.17 Display 22; P.18 Display 13; P.17</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Hint: If the refill quantity reaches max. (every 24h), the error report follows: &quot;MALFUNCTION refill quantity max.&quot;. Check the equipment for sealing and other deviations from the set status (e.g.: Wrong laying of the hydraulic lines to the external equipment, which are not part of the concerned project). Quitting of this error makes the same refillquantity available again.</td>
<td>Item 1.4; 1.4 Item 4.4; 1.4 Item 1.10; 1.4 Item 4.8; 1.5</td>
<td>Level: %</td>
</tr>
<tr>
<td>26</td>
<td>Pump venting (venting of suction branch and vessel supply lines). Loosen the venting screw. Level equalization takes place as a result of the existing water level in the vessel. If there is no automatic overflow, the pump is to be filled till it overflows, the bolt to be screwed in immediately and tightened. Caution: Start-up of the pump without venting must be prevented at all means!</td>
<td>Item 1.4; 1.4 Item 4.4; 1.4 Item 1.10; 1.4 Item 4.8; 1.5</td>
<td></td>
</tr>
<tr>
<td>27</td>
<td>Open cap-valve system connection Flexcon MPR-S (and possibly other valves in the expansion line up to the returnline connection). Switch on the motor protective switch (1; 2).</td>
<td>Item 1.22; 1.4 Item 4.21; 1.5 Item 5.4; 1.5 Item 5.5; 1.5</td>
<td></td>
</tr>
<tr>
<td>28</td>
<td>Quit the error: &quot;Min. water level&quot;, Vessel was empty; &quot;Min. pressure alarm&quot;, Pressure was 0 bar; &quot;Motor protection&quot;. Protection switches were switched off; possibly. &quot;Max refill quantity&quot;, Quantity was reached on vessel filling. The automatic pressurization is active!</td>
<td>Display 6; 10; 8; 13; P.17</td>
<td></td>
</tr>
<tr>
<td>29</td>
<td>Open cap valve before MAG PN16 (Flexcon MPR-S PN16), if the programmed system pressure is present in the heating unit! (System pressure + - Hysteresis)</td>
<td>P.14...16</td>
<td></td>
</tr>
<tr>
<td>30</td>
<td>End of the initial start-up. Observe No. 13; 21. Return this protocol to FAX.-No.: +31 (0)162 525557 or <a href="mailto:support@flamco.nl">support@flamco.nl</a></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Flexcon MPR-S Expansion Automat
Instruction manual, start-up protocol

Appendix 1: Technical specifications, data, hydraulic equipment

2.1 Pressure vessel (steel)
2.2 Connection, pressure equalisation to atmosphere
2.3 Lifting lug, for taking up load in transit
2.4 Bladder diaphragm (Butyl rubber), water area
2.5 Gas area, atmospheric
2.6 Flange, vessel connection, inspection opening
2.7 Vent valve, float vent with air intake preventer
2.8 Drain valve, water area
2.9 Connection, to MP-B pumpcontrol module
2.10 In-outlet pressure hose, flexible to MP-B pumpcontrol module
2.11 Condensate drain stub
2.12 Level sensor FSI
2.13 Aligning adjustment
2.14 Type plate

3.1 Pressure vessel (steel)
3.2 Lifting lug, for taking up load in transit
3.3 Bladder diaphragm (Butyl rubber), water area
3.4 Gas area, nitrogen
3.5 Flange vessel connection, inspection opening
3.6 Bladder fixing
3.7 Pressure gauge with gas return protection
3.8 Gas fill valve, pressure check stub, gas area
3.9 Diaphragm rupture probe connection, special design
3.10 Instructions for use
3.11 Type nameplate
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Appendix 1; Technical specifications, data, hydraulic equipment

Components, equipment standard.
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Appendix 1: Technical specifications, data, hydraulic equipment

Base and auxiliary vessel, surge vessel, operating parameters.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Base and auxiliary vessel</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>200 - 3500</td>
<td>0</td>
<td>8.6</td>
<td>0</td>
<td>70</td>
<td>70</td>
</tr>
<tr>
<td>5000</td>
<td>0</td>
<td>4.3</td>
<td>0</td>
<td>70</td>
<td>70</td>
</tr>
<tr>
<td>Surge vessel</td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>80</td>
<td>16</td>
<td>22.9</td>
<td>0</td>
<td>70</td>
<td>70</td>
</tr>
</tbody>
</table>

Minimum distances

Control module PN16, PN25 Dimensions and weights.

<table>
<thead>
<tr>
<th>Type</th>
<th>Height</th>
<th>Length</th>
<th>Width</th>
<th>Connection vessel</th>
<th>Connection System</th>
<th>Connection Refill</th>
<th>Empty weight (supply state, without packing)</th>
</tr>
</thead>
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<tr>
<td>Flexcon MPR-S</td>
<td>H</td>
<td>L</td>
<td>B</td>
<td>G1</td>
<td>G2</td>
<td>G3</td>
<td>[kg]</td>
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<tr>
<td>1.2/2.2</td>
<td>1716</td>
<td>1015</td>
<td>700</td>
<td>2</td>
<td>2</td>
<td>1/2</td>
<td>113/139</td>
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<td>1.3/2.3*</td>
<td>1716</td>
<td>1015</td>
<td>700</td>
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<td>1/2</td>
<td>115/143</td>
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<td>700</td>
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<td>1/2</td>
<td>124/151</td>
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<td>1015</td>
<td>700</td>
<td>2</td>
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<td>1/2</td>
<td>130/173</td>
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<td>1.7/2.7</td>
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<td>1015</td>
<td>700</td>
<td>2</td>
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<td>140/153</td>
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</table>

Control side

View from top

Diaphragm
### Base and auxiliary vessels, Dimensions and weights

<table>
<thead>
<tr>
<th>Nominal volume</th>
<th>Vessel diameter</th>
<th>Maximum-</th>
<th>Condensate drain</th>
<th>Vessel Drain/</th>
<th>Vessel Expansion-water connection</th>
<th>Bottom-flange</th>
<th>Empty weight (supply state, without packing)</th>
</tr>
</thead>
<tbody>
<tr>
<td>[mm]</td>
<td>[mm]</td>
<td>[mm]</td>
<td>[G ℓ]</td>
<td>[G ℓ]</td>
<td>[G ℓ]</td>
<td>[DN]</td>
<td>[kg]</td>
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<tr>
<td>200</td>
<td>550</td>
<td>1530</td>
<td>1/2</td>
<td>1 1/4</td>
<td>2</td>
<td>165</td>
<td>71</td>
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<tr>
<td>300</td>
<td>550</td>
<td>2030</td>
<td>1/2</td>
<td>1 1/4</td>
<td>2</td>
<td>165</td>
<td>91</td>
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<tr>
<td>400</td>
<td>750</td>
<td>1535</td>
<td>1/2</td>
<td>1 1/4</td>
<td>2</td>
<td>165</td>
<td>131</td>
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<tr>
<td>600</td>
<td>750</td>
<td>1955</td>
<td>1/2</td>
<td>1 1/4</td>
<td>2</td>
<td>165</td>
<td>161</td>
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<tr>
<td>800</td>
<td>750</td>
<td>2355</td>
<td>1/2</td>
<td>1 1/4</td>
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<td>165</td>
<td>196</td>
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<tr>
<td>1000</td>
<td>750</td>
<td>2855</td>
<td>1/2</td>
<td>1 1/4</td>
<td>2</td>
<td>165</td>
<td>227</td>
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<tr>
<td>1200</td>
<td>1000</td>
<td>2210</td>
<td>1/2</td>
<td>1 1/4</td>
<td>2</td>
<td>165</td>
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<td>1600</td>
<td>1000</td>
<td>2710</td>
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<td>1 1/4</td>
<td>2</td>
<td>165</td>
<td>346</td>
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<td>2000</td>
<td>1200</td>
<td>2440</td>
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<td>1 1/4</td>
<td>2</td>
<td>165</td>
<td>431</td>
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<tr>
<td>2800</td>
<td>1200</td>
<td>3040</td>
<td>1/2</td>
<td>1 1/4</td>
<td>2</td>
<td>165</td>
<td>516</td>
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<tr>
<td>3500</td>
<td>1200</td>
<td>3840</td>
<td>1/2</td>
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<td>2</td>
<td>165</td>
<td>626</td>
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<tr>
<td>5000</td>
<td>1500</td>
<td>3570</td>
<td>1/2</td>
<td>1 1/4</td>
<td>2</td>
<td>165</td>
<td>1241</td>
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</table>

### MAG, Surge vessel, Dimensions and weight

<table>
<thead>
<tr>
<th>Nominal volume</th>
<th>Vessel diameter</th>
<th>Maximum-</th>
<th>Vessel connection</th>
<th>Bottom-flange</th>
<th>Empty weight (supply state, without packing)</th>
</tr>
</thead>
<tbody>
<tr>
<td>[Liter]</td>
<td>[mm]</td>
<td>[mm]</td>
<td>[G ℓ]</td>
<td>[DN]</td>
<td>[kg]</td>
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<td>80</td>
<td>450</td>
<td>1025</td>
<td>1 1/2</td>
<td>120</td>
<td>80</td>
</tr>
</tbody>
</table>

View from below, Auxiliary vessel

View from below, Auxiliary vessel

View from below

View from below

View from below

200-1000 Liters

1200-5000 Liters

MAG 80 Liters

(Flexcon MPR-S 1.2 - 1.5; 2.2 - 2.5; PN 16)
### Flexcon MPR-S Expansion Automat

**Instruction manual, start-up protocol.**

**Appendix 1; Technical specifications, data, hydraulic equipment**

**Control module PN16, operating parameters.**

<table>
<thead>
<tr>
<th>Type</th>
<th>Operation type</th>
<th>Admissible operating over pressure [bar]</th>
<th>Rated set pressure [bar]</th>
<th>Rated heating power range [MW]</th>
<th>Allowable operating temperature, min. [°C]</th>
<th>Allowable operating temperature, max. [°C]</th>
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<tbody>
<tr>
<td>1.2</td>
<td>Single operation</td>
<td>16</td>
<td>10</td>
<td>2.0 - 4.1</td>
<td>3.2 - 0.9</td>
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<td>1.3</td>
<td>Single operation</td>
<td>16</td>
<td>10</td>
<td>3.2 - 5.9</td>
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<td>5</td>
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<tr>
<td>1.4</td>
<td>Single operation</td>
<td>16</td>
<td>10</td>
<td>4.9 - 9.6</td>
<td>3.2 - 0.9</td>
<td>5</td>
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<tr>
<td>1.5</td>
<td>Single operation</td>
<td>16</td>
<td>10</td>
<td>6.8 - 13.3</td>
<td>3.2 - 0.9</td>
<td>5</td>
</tr>
<tr>
<td>2.2</td>
<td>Single, change-over operation</td>
<td>16</td>
<td>10</td>
<td>2.0 - 4.1</td>
<td>3.2 - 0.9</td>
<td>5</td>
</tr>
<tr>
<td>2.3</td>
<td>Single, change-over operation</td>
<td>16</td>
<td>10</td>
<td>3.2 - 5.9</td>
<td>3.2 - 0.9</td>
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<tr>
<td>2.4</td>
<td>Single, change-over operation</td>
<td>16</td>
<td>10</td>
<td>4.9 - 9.6</td>
<td>3.2 - 0.9</td>
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<tr>
<td>2.5</td>
<td>Single, change-over operation</td>
<td>16</td>
<td>10</td>
<td>6.8 - 13.3</td>
<td>3.2 - 0.9</td>
<td>5</td>
</tr>
<tr>
<td>2.2</td>
<td>Parallel operation</td>
<td>16</td>
<td>10</td>
<td>2.0 - 4.1</td>
<td>6.1 - 1.8</td>
<td>5</td>
</tr>
<tr>
<td>2.3</td>
<td>Parallel operation</td>
<td>16</td>
<td>10</td>
<td>3.2 - 5.9</td>
<td>6.1 - 1.8</td>
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</tr>
<tr>
<td>2.4</td>
<td>Parallel operation</td>
<td>16</td>
<td>10</td>
<td>4.9 - 9.6</td>
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<tr>
<td>2.5</td>
<td>Parallel operation</td>
<td>16</td>
<td>10</td>
<td>6.8 - 13.3</td>
<td>6.1 - 1.8</td>
<td>5</td>
</tr>
</tbody>
</table>

**Control module PN16, power range single-, change-over operation.**

### Safety valve of heating unit, remarks:

- Pstat.min. = Psys. max. - Pvapour max. - P+ max.
- Pstat.min. = 13.3 bar - 0.013 bar (100°C) - 0.5 bar (min. 0.3) = 12.78 bar
- Psv min. system = (Psys. max. + Physteresis max. value) / 0.9
- Psv min. system = (13.3 + 0.5) / 0.9 = 15.3 bar
- Psv max. system = 16.0 bar (PN16)

(P+ max.: Desired pressure at the highest point of the HVAC installation.)
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**Flexcon MPR-S Expansion Automat**
Instruction manual, start-up protocol.
Appendix 1; Technical specifications, data, hydraulic equipment.

Control module PN16, Power range Parallel operation.

- **Limit**
  - $P_{sys\setmax} = 13.3 \text{ bar}$
  - $P_{hyd} = 0.5 \text{ bar}$
  - $P_{diff\underline{u}V} = 0.5 \text{ bar}$
  - $P_{ov\underline{v}}$ (Flexcon MPR-S 2.5*; PN 16)
    - Set value controller.
    - Set value increase: $P_{sys\setmax} + P_{hyd} + P_{diff\underline{u}V} = 14.3 \text{ bar}$
  - $P_{sys\setmax} = 5.9 \text{ bar}$
  - $P_{hyd} = 0.5 \text{ bar}$
  - $P_{diff\underline{u}V} = 0.5 \text{ bar}$
  - $P_{ov\underline{v}}$ (Flexcon MPR-S 1.2 - 1.5; 2.2 - 2.5; PN 16)

- **Manual Regulating valve HRV, initial settings.**

<table>
<thead>
<tr>
<th>Boiler heatingpower [MW]</th>
<th>1.2; 2.2</th>
<th>1.3; 2.3</th>
<th>1.4; 2.4</th>
<th>1.5; 2.5</th>
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<th>2.3</th>
<th>2.4</th>
<th>2.5</th>
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<tr>
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<td>1.3</td>
<td>1.4</td>
<td>1.5</td>
<td>1.2</td>
<td>1.3</td>
<td>1.4</td>
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<td>1.3</td>
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<td>1.2</td>
<td>1.3</td>
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<td>0.2</td>
<td>1.1</td>
<td>1.2</td>
<td>1.3</td>
</tr>
</tbody>
</table>

Example:
- Flexcon MPR-S 1.4, single operation
- Flexcon MPR-S 2.4, change-over operation
- Set system pressure 7 bar

Manual control valve HRV
Flexcon MPR-S Expansion Automat
Instruction manual, start-up protocol.
Appendix 1; Technical specifications, data, hydraulic equipment

Refill PN10, Volume flow.

Supply pressure (Flow pressure) [bar]
Volume flow [l/min.]

(Mag, Surge vessel diaphragm expansion tank PN16, Initial gas pressure Po.)

Set system pressure to 8.1; 7.7 bar

Set system pressure higher than 8.1; 7.7 bar to max. 13.3 bar

Calculation example:
Given: Psyst. 10.2 bar rel.; Physteresis pump: 0.5 bar
Solution: Pa1 = Po x 1.2307 = 6 + 1 bar abs. x 1.2307 = 8.61 + 1 bar rel.
dP = Psyst. - Physteresis prev. pump - Pa1 = 7.61 bar - 2.1 bar rel. = 5.5 bar rel.
Pa2 = Pa1 + dP = 8.61 bar + 5.5 bar = 14.1 bar rel.
The existing initial gas pressure of 6 bar
is to be raised by water filling to 7.6 bar (Pa1).
Then the initial gas pressure is to be raised by supplying nitrogen at the nitrogen valve by 2.1 bar (dP) to 9.7 bar (Pa2).
Ensure that the receiver volume is retained in the vessel at the higher initial pressure (Pa2).
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**Flexcon MPR-S Expansion Automat**

Instruction manual, start-up protocol.

Appendix 1; Technical specifications, data, hydraulic equipment

Control module PN25, operating parameters.

<table>
<thead>
<tr>
<th>Type of operation</th>
<th>Admissible operating over-pressure [bar]</th>
<th>Rated set pressure [bar]</th>
<th>Rated heating power-range [MW]</th>
<th>Allowable operating temperature, min. [°C]</th>
<th>Allowable operating temperature, max. [°C]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single operation</td>
<td>25</td>
<td>10</td>
<td>10.5 - 18.1</td>
<td>3.2 - 0.9</td>
<td>5</td>
</tr>
<tr>
<td>Single operation</td>
<td>25</td>
<td>10</td>
<td>13.2 - 22.0</td>
<td>3.2 - 1.2</td>
<td>5</td>
</tr>
<tr>
<td>Single-change-over</td>
<td>25</td>
<td>10</td>
<td>10.5 - 18.1</td>
<td>3.2 - 0.9</td>
<td>5</td>
</tr>
<tr>
<td>Single-change-over</td>
<td>25</td>
<td>10</td>
<td>13.2 - 22.0</td>
<td>3.2 - 1.2</td>
<td>5</td>
</tr>
<tr>
<td>Parallel operation</td>
<td>25</td>
<td>10</td>
<td>10.5 - 18.1</td>
<td>6.1 - 1.8</td>
<td>5</td>
</tr>
<tr>
<td>Parallel operation</td>
<td>25</td>
<td>10</td>
<td>13.2 - 22.0</td>
<td>6.1 - 2.2</td>
<td>5</td>
</tr>
</tbody>
</table>

Control module PN25, heating power range single-, change-over and parallel operation.

Safety valve of the HVAC installation, Remark:

\[ \text{Pstat.min.} = \text{Psys. set max.} - \text{Pvapour max.} - \text{P+ max.} \]

\[ \text{Pstat.min.} = 22.0 \text{ bar} - 0.013 \text{ bar (100 °C)} - 0.5 \text{ bar (min. 0.3)} = 21.48 \text{ bar} \]

\[ \text{Pstat.max.} = \text{Psys. set max.} - \text{Pvapour max.} - \text{P+ min.} \]

\[ \text{Pstat.max.} = 22.0 \text{ bar} - 0.013 \text{ bar (100 °C)} - 0.3 \text{ bar} = 21.68 \text{ bar} \]

\[ \text{PSv max. system} = \left( \text{Psys. set max.} + \text{Physteres max. valve} \right) / 0.9 \]

\[ \text{PSv max. system} = (22.0 + 0.5) / 0.9 = 25.0 \text{ bar (PN25)} \]

\[ \text{P+ max.: Desired pressure at the highest point of the HVAC installation} \]
Appendix 1; Technical specifications, data, hydraulic equipment

Manual regulating valve, initial settings.

Example:
- Flexcon MPR-S 1.7, Single operation
  or
- Flexcon MPR-S 2.7, change-over operation.
  Set system pressure 13.2 bar

Manual control valve HRV
Flexcon MPR-S Expansion Automat
Instruction manual, start-up protocol.

Appendix 1: Technical specifications, data, hydraulic equipment

Installation scheme, installation examples.

Illustration Flexcon MPR-S 1.6; 1.7 (overflow valve 23.0 bar) PN25, base vessel ¹), intermediate vessel

Illustration Flexcon MPR-S 2.2*-2.5 (overflow valve 14.3 bar) PN16, base and auxiliary vessel ¹).

Customer-provided: System connection, Connection vessel
Refill supply, outlet of safety valve and vessel drain, cap valves, component couplings, Electrical installation mains and error messages, electrical devices for error assessment, connection signal line level sensor.
¹) Supplement for auxiliary vessels with symmetrical connection B.

B Vessel connection (safety valve 2 bar).
E Electrical mains
F/A Level sensor, connection to signal line.
MAG Diaphragm expansion tank PN16
D/R/D Diaphragm rupture sensor, connection to signal line, Special version.
N Refill, connection PN10.
S System connection
VB*** Intermediate vessel

* Scope of supply ** Accessories *** Special version

Standard.

Flexcon MPR-S INSTALLATION AND OPERATING INSTRUCTIONS
Flamco

Flexcon MPR-S Expansion Automat
Instruction manual, start-up protocol.

Appendix 1: Technical specifications, data, hydraulic equipment

Installation scheme, installation examples.

Illustration Flexcon MPR-S 1.2; -1.5 (overflow valve 14.3 bar) PN16, base and auxiliary vessel ¹)

Customer-provided: Refill supply, outlet of safety valve and vessel drain, cap valves, component couplings, electrical installation mains and error message, electrical devices for error assessment, connection of signal line level sensor.

¹) Supplement for auxiliary vessels with symmetrical connection B.
Flexcon MPR-S Expansion Automat
Instruction manual, start-up protocol

Appendix 2: technical specifications, data, electrical equipment

Control, menu overview, operating mode

Display 1
Normal operating display in delivery condition of the controller. During standard initial programming, the current actual values: pressure, level, pump/valve settings and limit value level are presented.

The “ESC” key leads to display 1 for any selected message.

Display, error no. 6)*
The programmed limit value is reached or exceeded.

Display, error no. 7)*
The programmed limit value is reached or exceeded (diaphragm overload).

Display, error no. 8)*
The motor protection switch(es) are activated as a result of overflow or switched off manually (item 5.4; 5.5 page 5).

Display, error no. 9)*
This display can only appear in special model (e.g. Dual Control mode) if this message appears check diaphragm for ruptures.

Display, error no. 10)*
The programmed limit value is reached or exceeded.

Display, error no. 11)*
The programmed limit value is reached or exceeded.

Display, error no. 12)*
Phase missing or phase sequence is false at mains feed or downstream control units.

Display, error no. 13)*
Max. permitted top-up volume in 24 h has been reached. Acknowledging makes this volume over 24 h available again.

Display, error no. 14)*
The programmed limit value is reached or exceeded Pump(s) off.

Display 2
Indication of the nominal switch times, total, for pump drives 1 & 2.

Display 3
Indication of the programmed additional functions**: (On “*”; Off “-“) Leak probe is special version of MAG 80).

Display 4
System classification Indicates: Type, nominal pressure, capacity of basic vessel and software version.

Display 5
Indicates actual top-up values. If the reached value is smaller than the 24 h presets (display 25), the value indicated for the next 24 h is: 000.00.

Options:
Leak probe: “*” Parallel mode: “-” Back-up: “-”

Unit: MP
Nom. press: 25 bar Capacity: 0800 l
1141 V1.00 040911

Max top-up volume In 24 h: 000.00 m3 Total: 000.00 m3
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Flexcon MPR-S Expansion Automat
Instruction manual, start-up protocol

Appendix 2: technical specifications, data, electrical equipment

Control, menu overview, operating mode (typical displays)

Display 1
Normal operating display (p.17).
Unit is active for pressure maintenance and top-up!

Main switch
ON

Main switch
OFF

Open cabinet door
operating mode ON
with switch set to left
Close cabinet door.

Display 15
Status message after
switching to programming
mode. The unit is not active
to support pressure
maintenance or top-up (Fehler LED blinks!)

Display 16
Indication nominal system pressure
Psys.nom = Pstatic max + 
Pvapour. + Ppositive.;
see notes page 9; 12.

Display 17
Indication corresponds to limit
value min., which generates error
no. 6 and dry run protection (pump(s) 'OFF').

Display 18
Indication corresponds to limit
value max., which generates error no. 7
(diaphragm overload).

Display 19
Indication corresponds to limit
value min., which generates
error no. 10 (Page 20).

Display 20
Indication corresponds to limit
value max., which generates
error no. 11 (Page 20).

Display 21
Display is value at start of the filling
(note expansion capacity to be accepted).

Display 22
Display is value at end of the filling
(note expansion capacity to be accepted).

Display 23
Indication corresponds to limit, which
generates fault 14 if reached and
switches the pump(s) off.

System pressure "20.0"
Perm.: 00.6 – 23.2 bar
Confirm: [RET]

Min. water level
"05%"
Perm.: 4 % to 20%
Confirm: [RET]

Max. water level
"95%"
Perm.: 50 to 95%
Confirm: [RET]

Min. pressure: "19.5"
Perm.: 0.1 – 19.7 bar
Confirm: [RET]

Max. pressure: "20.5"
Perm.: 20.3 – 23.2 bar
Confirm: [RET]

Top-up level
Switch on at: "06 %
Perm: 08 – 22%
Confirm: [RET]

Top-up level
Switch off at: "12 %
Perm: 08 – 26%
Confirm: [RET]

Max. pump run time
"030 min"
Perm: 10-240 min
Confirm: [RET]

Display 16-23, 25
In programming mode, the presets available in
displays 16-23 and 25
can or should be
adjusted to the system
requirements.
Correct the entries prior
to start and use the
restphases of the
heating system for
further modifications.

Modifications in
displays 16-18 also
change permissible
values in displays 19-22,
consequently these
values must also be
entered.

Touching a button
allocated to a number
changes the value at
the cursor position in
the display. Once
input, the cursor moves
to the next position that
can then be amended.
Always remember the
permitted ranges in
each case, the limits
within which corrections
are possible.
If limits are exceeded,
the cursor will move to
its initial position after
the [RET] key on the left.
Now enter a value within
limits.
Press [ESC] to return
cursor to its initial
position from
intermediate positions.

Danger - electricity
Do not change any settings inside
the control cabinet unless
- The main switch is in the OFF
position; and
- If the main switch has been
secured against being switched
on again.
- Prevent tools being used to
switch on.
- Close and lock the control
Cabinet once settings are
complete.

Note: the mains feed up to the
main switch and auxiliary feeds
are LIV (terminals on I/O board
item 5.10 p.5)
Installation and components in
the control cabinet comply with
DIN and VDE rules; so electrical
connections cannot be accessed
by hand (without tools)
Flexcon MPR-S Expansion Automat
Instruction manual, start-up protocol
Appendix 2: technical specifications, data, electrical equipment
Control, menu overview, operating mode (typical displays)

Display 24
Do not use setting ‘1’ (back-up mode ‘OFF’ equals parallel operation ‘ON’; display 3).

Display 25
Indication corresponds to limit value max., which generates error no. 13, and cuts out filling if reached.

Display 26
Erasing with ‘9 RET’ resets the actual value in display 5 back to 000.00.

Display 27
Carry out at place of set up before first start (cap valve system connection and valve filling ‘OFF’).

Display 28
Information on ensuring that the basic vessel is aligned and free of additional loads or reliefs.

Display 29
Entry of the actual mass available at the level sensor of the basic vessel.

Display 30
Set when limits are exceeded as a result of unpermitted load or relief on the basic vessel. The required starting condition is to be created and the procedure repeated from display (16) 27.

Controls, service programming mode
This programming enables the trained service engineers to modify further control parameters. Important presets, which are programmed at the factory, are shown below.

Option Leak probe : (**2**) not available; special design)
(back-up operation with 3 (3 controls)* : (**2**) not available
(option Back-up operation (2 controls)* : (**2**) not available
2 to 1 back-up, as ordered or language, as ordered or : **4** (1: D; 2: GB; 3: NL, 4:RU)
Factory zero setting; vessel number : As ordered (PN16;PN25; vessel size)
Smoothing factor : **4**
Hysteresis Pump/valve : *0.3*
Turn-on delay Pump/valve : *03 sec*
Watergauge, litres per pulse : *010* )*
Display 16: System pressure, as ordered or : Flexcon MPR-S 1.2; 2.2; 1.3; 2.3: 3.5 bar; 1.4; 2.4; : 1.5; 2.5: 7.5 bar; 1.7; 2.7: 15.5 bar
Display 17: Min. water level : *05%*
Display 18: Max. water level : *95%*
Display 19: Min. pressure : System pressure minus 0.5
Display 20: Max. pressure : System pressure plus 0.5
Display 21: Filling level ON : *06%*
Display 22: Filling level OFF : *12%*
Display 23: Max. pump run time : *030min*
Display 24: (Parallel mode (dual controls)* : **2** not available *)
Display 25: Max. filling quantity in 24 h : MP-G 200-800 l; 0.6 m3; 1000-1600 l: 1.2 m3; : 2000-3500 l: 2.8 m3; 5000 l 4.0 m3

* Not available in Flexcon MPR-S versions, or required as setting, do not change!
*
** To be changed in: ‘*’ available if back-up operation required in Flexcon MPR-S 2. versions (see also: page 9; 12, characteristic curves).
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Instruction manual, start-up protocol.
Appendix 2; Technical specifications, data, electrical equipment

Controller, terminal diagram standard.

### Object Data

**Power supply**

400V 50Hz
L1; L2; L3; N; PE (CEE).
Fuse protection external: 16 A neutral (K).

**Fuses**

- Sensors; Pico fuse: M315 mA 250 V. (F1)
- Valve 1 - 4; Protection 1; 2; Pico fuse: M2A 250 V. (F2)
- Electronics; Thermal Fuse Transformer: not changeable.

**Protection type**

IP 54.
Level sensor IP 65.

**Nominal power**

<table>
<thead>
<tr>
<th>Flexcon MPR-S</th>
<th>kW</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.2</td>
<td>0.75</td>
</tr>
<tr>
<td>1.3</td>
<td>0.95</td>
</tr>
<tr>
<td>1.4</td>
<td>1.3</td>
</tr>
<tr>
<td>1.5</td>
<td>1.7</td>
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<tr>
<td>1.6</td>
<td>2.4</td>
</tr>
<tr>
<td>1.7</td>
<td>3.2</td>
</tr>
<tr>
<td>2.2</td>
<td>1.3</td>
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<td>1.7</td>
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<td>2.4</td>
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<tr>
<td>2.6</td>
<td>4.8</td>
</tr>
<tr>
<td>2.7</td>
<td>6.2</td>
</tr>
</tbody>
</table>
**Flexcon MPR-S Expansion Automat**

Instruction manual, start-up protocol.

**Appendix 3; Servicing recurrent testing, Return to service**

**Maintenance**

When carrying out maintenance, please observe the relevant instructions. Instructions needed for maintenance of extra equipment or accessories are available from the supplier. Further checks (e.g. of the inside of the vessel) should be carried out according to the prevailing local rules and regulations by the user.

Perform maintenance activities when the system is down and ensure that no part of the system is under pressure. Do not touch the cap valves on the pressure expansion vessel or expansion line while the power is on - do so only when components such as the pump and valve are down, i.e. when the power is off. Please observe all directions pertaining to operation, safety for the entire project. We additionally recommend you adhere to the maintenance periods stated in attachment.

<table>
<thead>
<tr>
<th>No.</th>
<th>Servicing protocol</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Company, owner. Executing Location of the system.</td>
</tr>
<tr>
<td>2</td>
<td>Heating power: MW Feedline temperature: °C Return temperature:</td>
</tr>
<tr>
<td></td>
<td>Safety valve: bar Serial no.: Flexcon MPR-S: Serial no. Controller:</td>
</tr>
<tr>
<td>3</td>
<td>Servicing date Servicing workflow Reference Execution marking</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Heating season but at least semi-annually.</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Check or arrange a free flow to a draining sump.</td>
<td>Start-up protocol, Project template</td>
</tr>
<tr>
<td>Clean filter insert, and filter housing.</td>
<td>Item 1.13; P.4; Pos.4.11; P.5</td>
</tr>
<tr>
<td>Cleaning, functional test of vent valve. Screw off the red cap and remove for cleaning the spring and ball inside. Assemble in reverse sequence, screw on the red cap and open it by one turn.</td>
<td>Image B2; P.2 Item 2.7; P.4</td>
</tr>
<tr>
<td>Check and confirm the correct setting of the manual control valve as shown in the diagram.</td>
<td>Start-up protocol Item 1.17; P.4; Item 4.16; P.5; P.10; 13 Setting:</td>
</tr>
<tr>
<td>Functioning test for pump 1; 2, valve 1; 2; 4 and water gauge. These actions are only to be carried out by trained personnel after parameter changes and changed filling level in the vessel. Other checks can be carried out only during the operation of the expansion automat (observation).</td>
<td>Item 1.8; 1.9; 1.16; 1.18; P.4 Item 4.6; 4.7; 4.14; 4.15; 4.17; P.5</td>
</tr>
<tr>
<td>Pump venting.</td>
<td>Start-up protocol P.3; 4</td>
</tr>
<tr>
<td>Checking and restoring the requisite set values on the controller (start-up protocol). Mark here the &quot;Refill quantity total&quot; and the &quot;Operating periods for pump 1; 2&quot;. (High refill quantities can be caused by installation leakages, test the system!)</td>
<td>Start-up protocol P.3; 4; P.18; 19 Refill quantity: m³ Operating periods Pump 1: h Pump 2: h</td>
</tr>
<tr>
<td>Checking and restoring of the requisite set value on the overflow valve.</td>
<td>Start-up protocol P.3; 4; P.9; 10; 12 Setting: bar</td>
</tr>
</tbody>
</table>
Flexcon MPR-S Expansion Automat Instruction manual, start-up protocol.

Appendix 3; Servicing recurrent testing, Return to service

Servicing protocol

If draining of the expansion water from the base vessel or even from the auxiliary vessels (MP G; MP B) is necessary, please remember the following action sequences, No. 5 - 10.

**Servicing date** | **Servicing content** | **Reference** | **Execution marking**
--- | --- | --- | ---
4 | Annually | Check and restore leaking of hydraulic connections. Check bolted joints for proper fit, evtl. external damages, deformations or corrosion and restore the operation-readiness. Caution: Deformation or rust on pressure-bearing parts can cause inadmissible stresses, and form potential danger for persons, assets or animals. | Total scope of supply, Flexcon MPR-S; MP-G; MP-B; MAG PN16 (Flexcon MPR-S PN16) P4; S; including supplementary customer-provided components, P.14 - 16; Project template

| **Workflow** | **Reference** | **Execution marking** |
--- | --- | ---
Functional check of safety valve through the valve lifting device (manually bolted part, on top) | Item 1.19; P4; Pos.4.18; P5 | ✔ |
Open condensate outlet, for diaphragm check. | Item 2.11; 2.4; P4 | ✔ |
Check and restore the requisite nitrogen initial pressure and the initial watercontent in the Surgevessel PN16 (Flexcon MPR-S PN16). Functional check for Manometer. Caution: The initial state ( ), at execution higher than 8.1; 7.7 bar, is to be restored after reduction from ( ) to ( ) . Check the diaphragm. | Start-up protocol P.3; 14.,16; Item3.7; P4 P 11 Item3.3; P4 | ✔ |

**Servicing date** | **Servicing content** | **Reference** | **Execution marking**
--- | --- | --- | ---
5 | Annually | Note the current filling level. Switch off the controller and close all cap valves and the ball valve off the refill. See that the level sensor is mounted on the base vessel and remember the filling level (%) is shown as value per vessel. | Display 1; P.17 Item 1.22; 1.21; 1.23; 2.12; P.4 Item 4.21; 4.20; 4.22; P.5 P.14.,16 |

6 | Annually | Drain the vessel that needs be drained through the draining valve (filling valve) of the respective vessel. Carry out the requisite work on the vessel and restore the initial conditions at the drained vessel (align vessel align, connect). Switch off the motor protection switch before switching on the controller. - Actions on drained base vessel: Check the value for filling level (%). | Item 2.8; P.4 P.14.,16 Item 5.4; 5.9; P.5 |

7 | Annually | Carry out operation zero-adjustment if value > 0 . If level = 0 , than fill the base vessel through the drain valve (filling valve). The level to be adjusted is to be observed in the process display and the filling process is to be interrupted on attaining the previously noted target value. - Actions for drained auxiliary vessel(s): Open all cap valves next to the vessels and remove the spring-ball assembly from the automatic ventvalve on top the vessel. Level equalization will take place between the vessels. Observe that this equalization takes place slowly and is terminated if the level display no longer changes. Filling an auxiliary vessel through the drain valve (filling valve) and interrupt filling possibly several times, to allow level equalization. The self-adjusting level is to be observed during the process and the filling process is to be interrupted on attaining the already noted set point value. Then replace assembly on the vent valves, open the cap by one turn. | Display 1; P.17 P.18; 19 P.14...16 Image B2; P.2 |

8 | Annually | Switch off the controller, remove the filling equipment(close the drain valve, filling valve). | (Pos.2.8; P.4) |

9 | Annually | Open cap valve vessel connection to pumpcontroller and vent the pump(s). | Item 1.21; P.4; Item 4.20; P.5 No. 26; P.3 |

10 | Annually | Open cap valve system connection, MAG PN16 (Flexcon MPR-S PN16) and ballvalve of refill. Switch on the motor protecting switch and the controller. (Quit the error "Motor protection" and possibly other errors, which can occur during the filling process, e.g.: "min. water level") Operating status restored | Item 1.22; 1.23; P.4 Item 4.21; 4.22; P.5 Item 5.4; 5.5; P.5 (Display...8..; P.17) |

**Note:** Please also note relevant or supplementary operating instructions in your actions, which can be attached to this documentation (delivery note content).
### Flexcon MPR-S Expansion Automat

**Instruction manual, start-up protocol.**

### Appendix 3: Servicing recurrent testing, Return to service

**Recurrent test.**

The design of the diaphragm expansion vessel (MAG PN16 for Flexcon MPR-S PN16) is executed in conformance with the Guideline 97/23/EG \(^1\) and on the basis of the German AD-data sheets \(^2\). The viewing and cleaning opening for the inspection has been provided on the basis of practical experience (taking into consideration German standards). Depending on proper use, the corrosion protection allowance (wall thickness increase) is selected at less than 1 mm. This allowance can be greater depending on the order. (Fig. 3; page 4)

This test must be carried out taking into consideration the requirements from the total system and must be certified (also refer to 4. Assembly, Start-up protocol, page 2). In Germany, the test conforms to the stipulations of the Operating Safety Ordinance \(^3\) and the Pressure Devices Guidelines \(^4\). In other countries, the national rules and stipulations are to be observed. For executing the testing operations conformity declaration and the acceptance drawing (scope of supply documentation) are available to the responsible person. The maximum periods for testing are given in No. 11 and 12.

<table>
<thead>
<tr>
<th>No.</th>
<th>Test date</th>
<th>Test content</th>
<th>Reference</th>
<th>Execution marking</th>
</tr>
</thead>
<tbody>
<tr>
<td>11</td>
<td>5 years</td>
<td>Internal check, Checking of interior surge chamber; corrosion, Deformations, Damages.</td>
<td>Image 3; P.4; P.14 ...16 Conformity declaration, Acceptance drawing</td>
<td>Certification No.:</td>
</tr>
</tbody>
</table>
| 12  | 10 years  | Compression resistance testing, Pressure testing with water of the surge chamber room with the allowable and required test overpressure. This test to performed without diaphragm, pressure gauge and other peripherals | Certification No.: | ✔


\(^2\) Safety related requirements for normal operating conditions, compiled by the associations collaborating in the Working Community for Pressure Vessels (AD). Publisher: Association of the Technical Monitoring Unions e.V. 45038 Essen.

\(^3\) Ordinance on safety and health protection during preparation of working aids and their utilization in work, on Safety in operation of systems requiring monitoring and on the Organization of the operational work protection. (Ordinance ICS 13.100 for Federal Law Bulletin I S. 3777 of the Federal Republic of Germany)
Flexcon MPR-S Expansion Automat

Instruction manual, start-up protocol.

Appendix 3: Servicing recurrent testing, Return into service

Tips for manometer disassembly MAG PN16 (Flexcon MPR-S PN16).
The scope of equipment allows, if necessary, (Test operations with testing manometer, Exchange) changing the manometers without loss in initial gas pressure. Make certain that when removing the manometer (keywidth14) the gas return lock (keywidth19) is not loosened.

Return into service.

- After long down times: Servicing is to be carried out (servicing protocol; No.3 10; possibly 11; 12; page 21; 22). Drain the connections between installation and expansion automat and ensure that the testing and restoring of requisite requirements for the assembly as well as the necessary operations for start-up take place. Use the start-up protocol (No.3 30; page 2; 3) and check especially the system changes, which can lead to other operating conditions of expansion automat (e.g. system pressure etc. Change over operation...). Check the free run capability of the pump shaft. To do so disassemble, the fan cover (motor, top), in voltage-free state of the controller, and turn the free fan by hand. If a rotation is not or not easily possible, change the pump. A non-rotating or very heavy pump shaft causes overloading or even triggering of the motor protection switch (no pressure increase). The air cover is to be reassembled after this test.

- After voltage failure on network supply: The set point values programmed on the controller and presets for pressurizing remain unchanged, such that the automatic operation resumes automatically when the operating voltage is available again. Caution: Special operating states on the system (e.g. cooling below the set control value) can exceed or fall below allowable operating hystereses for the expansion automat. Ensure that the minimum or maximum system pressures occurring at the time of cooling or heating of the system do not exceed or fall below the allowable operating pressures of the expansion automat. Limitswitches for under- or overpressure in operation of the HVAC installations are not part of the Flexcon MPR-S equipment. Check the operation of the automat for reliability (on site) after the mains supply is restored.