Diaphragm expansion vessels for heating, solar and cooling water applications
The professional way to keep up the pressure

Proven in the past and looking to the future: ‘reflex,’ the versatile diaphragm expansion vessel for closed-loop heating, solar, and cooling water circuits, works on the principle of static pressure maintenance using a nitrogen cushion. The gas space and water space are separated by a diaphragm.

‘reflex’ offers a sound design, and reliable operation without the need for auxiliary energy. The reflex ‘control’ and reflex ‘servitec’ make-up and degassing systems are useful ways to increase system automation.

All ‘reflex’ models feature a high-quality coating in either standard red or white depending on the model and size.

‘reflex F’: perfect for any boiler

The ‘reflex F’ is white and flat, making it extremely adaptable for use with wall-mounted boilers. Special models with an individual vessel geometry are also available.

8 – 24 l 3 bar/120 °C*

‘reflex N, NG and G’: vessels for heating and cooling circuits

These expansion vessels are renowned for their versatility; they are suitable for use in individual homes as well as complexes for living space and industrial applications. Vessels with a nominal volume of up to 1,000 liters are supplied with either an exchangeable (type G) or fixed (type N, NG) diaphragm; nominal volumes above this are only available with an exchangeable diaphragm.

8 – 10,000 l 3/6/10/16 bar/120 °C*

‘reflex S’: vessels for solar, heating, and cooling circuits

‘reflex S’ has been specially designed for use in solar heating systems with a high proportion of antifreeze. Available in red and white, it is of course also ideal for use in both heating and cooling systems.

2 – 600 l 10 bar/120 °C* (* vessel 120 °C, diaphragm 70 °C)


The right expansion vessel for every application

‘reflex’

'reflex F'

- For direct installation in the boiler
- As an extension vessel outside the boiler

'reflex N, NG’ and ‘reflex S’

- Two products from a range offering outstanding expansion

Reflex water make-up and degassing systems – the logical ‘reflex’ add-on

- Controlled water make-up
- Pressure indicator
- Central system degassing

‘Why did I choose ‘reflex’? It has it all: variety, quality, and a presence within this specialist trade!”
'reflex'  
**Technical data**

### ‘reflex N + NG’
- For heating and cooling water applications
- Threaded connections
- Diaphragm in accordance with DIN 4807 part 3, max. operating temperature 70 °C
- Approval in accordance with pressure equipment directive 97/23/EC
- Colour: red or white; durable powder coating
- Pre-set pressure 1.5 bar

<table>
<thead>
<tr>
<th>Type</th>
<th>Article-No.</th>
<th>Weight</th>
<th>ø D</th>
<th>H</th>
<th>h</th>
<th>C</th>
</tr>
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<td>NG 8</td>
<td>7230100</td>
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<td>206 mm</td>
<td>285 mm</td>
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<td>R ¾</td>
</tr>
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<tr>
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<td>175</td>
<td>R 1</td>
</tr>
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</table>

### ‘reflex F’
- Flat vessel for heating and cooling water applications, especially suited for installation within the boiler
- Diaphragm in accordance with DIN 4807 part 3, max. operating temperature 70 °C
- Vessels ≥ 18 liters supplied with wall-hung clip
- Approval in accordance with pressure equipment directive 97/23/EC
- Colour: white; durable powder coating

<table>
<thead>
<tr>
<th>Type</th>
<th>Article-No.</th>
<th>Weight</th>
<th>H</th>
<th>W</th>
<th>D</th>
<th>C</th>
<th>Pre-set pressure</th>
</tr>
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<tbody>
<tr>
<td>F 8</td>
<td>9600011</td>
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<td>F 12</td>
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<td>1.0 bar</td>
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<td>F 15</td>
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<td>F 18</td>
<td>9600000</td>
<td>9.5 kg</td>
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</table>

Vₙ Nominal volume/litres
### technical data

#### ‘reflex G’

- For heating and cooling water applications
- Threaded connections up to 1,000 l Ø 740
- Flange connections
  - PN 6 at 6 bar, PN 16 at 10 bar
- Bladder in accordance with DIN 4807 part 3, max. operating temperature 70 °C
- Approval in accordance with pressure equipment directive 97/23/EC
- Inspection port
- Pressure gauge in nitrogen space
- Colour: red; durable powder coating
- Pre-set pressure 3.5 bar

### Table

<table>
<thead>
<tr>
<th>Type</th>
<th>Article-No.</th>
<th>Weight kg</th>
<th>Ø D mm</th>
<th>H mm</th>
<th>h mm</th>
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</table>

### Additional Information

- 6 bar/120 °C
- 10 bar/120 °C
- ‘reflex G’ – special versions available on request
  - Special vessel > 5,000 liters
  - Special vessel > 10 bar
  - Individual approval from a notified body in accordance with pressure equipment directive 97/23/EC

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\[ V_n = \text{Nominal volume/liters} \]
### ‘reflex S’

- For solar, heating, and cooling water applications
- For antifreeze additive of up to 50%
- Threaded connections
- Diaphragm in accordance with DIN 4807 part 3, max. operating temperature 70 °C
- 33 liters with wall-hung clip
- Approval in accordance with pressure equipment directive 97/23/EC
- Colour: red or white; durable powder coating

<table>
<thead>
<tr>
<th>Type</th>
<th>Article-No.</th>
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<th>h</th>
<th>C</th>
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<td>white</td>
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<td>mm</td>
<td>mm</td>
<td>mm</td>
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<td>S</td>
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<td>103.0</td>
<td>740</td>
<td>1,530</td>
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</tr>
</tbody>
</table>

V<sub>n</sub>: Nominal volume/liters

### Technical data

- 10 bar/120 °C

### Valves, mounts

→ p. 7

### Water make-up, degassing

→ p. 8, 9
reflex 'Wall hung holder' for 'reflex' 8 – 25 liters

'reflex' models up to 25 liters do not have their own feet. We recommend using a mount with these models. There are two versions available:

► Bracket with multiple connections, for ‘reflex’ 8 – 25 liters with a top vessel connection
Article-No.: 7612000

► Bracket with tightening strap for ‘reflex’ 8 – 25 liters, vertical assembly, top or bottom vessel connection
Article-No.: 7611000

Protected shut-off

DIN EN 12828: It must be possible to drain the water space in expansion vessels. All expansion vessels must be arranged such that they can be shut off from the heating system.

The dimensions of the lockshield valves can generally be selected in accordance with the nominal width of the vessel connection. You can find guideline values for acceptable heat output on page 11.

► reflex 'SU R ¾' lockshield valve
- Protected shut-off used when disassembling expansion vessels
- Draining function
- In accordance with DIN EN 12828
- PN 10/120 °C

► reflex 'SU R 1' and 'AG' connection assembly
- For super-fast assembly and maintenance of diaphragm expansion vessels
- Incl. protected shut-off and elbow connector with screw connection
- With G ½ draining tap and hose nozzle in accordance with DIN EN 12828
- PN 16/120 °C
- Ideal for use with 'reflex G’ 100 – 1000 Ø 740

reflex 'Digital pressure gauge'

DIN EN 12828: Expansion vessels must be serviced once a year. This must include checking the gas preset pressure $p_0$ with a valve when drained and making any necessary corrections.
reflex ‘control’ Water make-up systems
The logical way to enhance your ‘reflex’

‘reflex’ is synonymous with simple construction and reliable, robust functionality. However, operating faults may still occur if, for example, the heating system is not made up with enough water at the right time. This means that the water seal required for operation is not present.

This is where reflex ‘control’ make-up stations have shown themselves to be a logical addition to the ‘reflex.’ By monitoring and displaying the pressure and offering controlled water make-up, they ensure that the ‘reflex’ always has the required water seal.

With reflex ‘magcontrol’ or ‘control P’: everything runs at its best

- ‘magcontrol’ or, if the water make-up pressure is insufficient, ‘control P’ monitors the diaphragm expansion vessel (DEV) pressure and makes up the water as required
- The expansion vessel constantly has the amount of water it needs

The result:

- Optimum system pressure
- The diaphragm can move freely to allow water to be both drawn in and fed out
- No risk of air problems
- Controlled make-up volumes
- ‘control P’ and ‘magcontrol’ with reflex ‘fillset’ meet the requirements of the new DIN EN 1717

Minimum flow pressure $p \geq p_0 + 1.3$ bar

With reflex ‘magcontrol’
Make-up station with no pump

With reflex ‘control P’
Make-up station with pump

reflex ‘control’ water make-up systems
The logical way to enhance your ‘reflex’
reflex ‘servitec’ degassing systems... and more
online, on DVD, and in an extra brochure

www.reflex.de

reflex ‘servitec’ degassing systems... and more
online, on DVD, and in an extra brochure

The issue of air problems in heating and cooling circuits is
something known to every expert in the field through expe-
rience. It is something that affects over 50% of all systems,
according to a study by Dresden University of Technology.
reflex ‘servitec’ automatically ensures central degassing
right through to the highest, most remote corner, monitors
the ‘reflex’ expansion vessel, and makes up the water as
required.

’reflex’ + ‘servitec’
the alternative pressure-maintaining station
with outstanding service

For systems featuring diaphragm expansion
to the highest, most remote corner, monitors
vessels (e.g. ‘reflex N), a combination
the ‘reflex’ expansion vessel, and makes up the water as
required.

‘reflex’ + ‘servitec’ ensures:

» Constantly elastic pressure despite degassed
circuit water

+ The benefits of the outstanding ‘servitec’
   service

» Central deaeration and degas-
sing of the circuit water
» Controlled water make-up with
   simultaneous degassing
» Pressure display and control
» Data transfer via floating con-
tact and RS-485 interface

reflex ‘servitec’ is also ideal for retrofitting in
problematic systems.

reflex ‘servitec 25’ 6830700
reflex ‘servitec 35’ 6820100
reflex ‘servitec 60’ 6820200
reflex ‘servitec 60/gl’ 6820300

reflex ‘servitec’ – your true ‘savings’ system: No expensive
installation and maintenance of multiple decentralized me-
chanical air separators, no costly post-ventilation; instead,
operations management is automatic and optimized.
### Example

<table>
<thead>
<tr>
<th>Calculation</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>p_{SV} = 5 bar</td>
<td></td>
</tr>
<tr>
<td>H = 23 m</td>
<td></td>
</tr>
<tr>
<td>Q = 600 kW, radiators, 90/70°C</td>
<td></td>
</tr>
</tbody>
</table>

**Calculation:**

\[
p_{SV} = \frac{600 \, \text{kW} \times 13.5 \, \text{l/kW}}{10} = 8,100 \, \text{l}
\]

\[
p_0 = \left( \frac{23}{10} + 0.2 \right) = 2.5 \, \text{bar}
\]

**From the table:**

Where \( p_{SV} = 5 \, \text{bar}, p_0 = 2.5 \, \text{bar}, V_a = 8,100 \, \text{l} \)

\[
V_a = 1,000 \, \text{l} \quad \text{(for } V_a \text{ max. 8,910 l)}
\]
11

Version 2 – Battery circuit with 2x 'reflex N' – the cost-effective alternative

2x 'reflex N 500,' 6 bar → p. 4
- Fixed diaphragm
- Threaded connections
- Battery circuit set up on site
2x SU R1’ cap ball valves → p. 7

It is possible to connect numerous 'reflex N' units to batteries. This is generally a cost-effective alternative to using larger vessels.
In accordance with DIN EN 12828:

- every heat generator must be connected to one or more expansion vessels by at least one expansion line.

You should select the appropriate circuit as follows:
- **Diaphragm expansion vessel in boiler return – circulating pump in boiler flow line**
  - Direct connection between DEV and heat generator
  - Low temperature load on diaphragm
  - DEV on the suction side of the circulation pump to minimize the risk of a vacuum forming

Please consult your specialist adviser in the event of any deviations!

**Notes for the installer – hydraulic integration**

The boiler and system each have an expansion vessel. This ensures that no vacuum can form in the system circuit, even with fully sealing mixers.

*reflex* 'fillset' is a pre-packaged valve assembly providing a direct connection to potable water systems for making up and filling the system.

→ Page 8

**Notes for the installer**

The circuits must be adjusted to suit local conditions.
The circuits must be adjusted to suit local conditions.

Notes for the installer – multi-boiler systems

- In accordance with DIN EN 12828:
  every heat generator must be connected to one or more expansion vessels by at least one expansion line.

- Which circuit should you choose?
  You can have individual protection for each boiler through an expansion vessel, or opt for a common boiler and system protection option. When using shut-offs via boiler sequential circuits, you must ensure that the boiler in question is connected to at least one expansion vessel. It is always best to consult the boiler manufacturer.

Notes for the installer

- Connecting numerous ‘reflex N’ 6 or 10 bar vessels to a battery circuit is usually a more cost-effective alternative to using larger ‘reflex G’ vessels.
- The burner is used to shut off the corresponding boiler circulating pump and close the motorized valve \( M \) via the temperature control \( TIC \). This enables the boiler to remain connected to the ‘reflex.’ It is the most frequently used circuit for boilers with a minimum return flow temperature, preventing boiler circulation when the burner is switched off.

Notes for the installer

- When the burner is switched off, the corresponding actuator \( M \) is closed via the temperature control \( TIC \) while preventing unwanted circulation in the shut-off boiler. In addition, the boiler expansion line above the center of the boiler prevents gravity circulation. This option is ideally suited to systems without a minimum boiler return flow temperature (e.g. condensing systems).
- Our reflex ‘servitec’ vacuum spray-tube degassing unit guarantees effective system service:
  - Displays and monitors pressure
  - Provides automatic making up and filling
  - Centrally degasses and bleeds the contained, filling, and make-up water

→ P. 9
→ reflex ‘servitec’ brochure

Notes for the installer

- ‘reflex N’ – battery circuit in a multi-boiler system with individual protection

- ‘reflex’ in a multi-boiler system with common boiler and system protection

The circuits must be adjusted to suit local conditions.
Because of the low temperature load, the circulating pump and 'reflex S' are located in the collector return. This means that the expansion vessel must be installed on the pressure side of the circulating pump. The circulating pump pressure must therefore be considered when calculating the pre-set pressure $p_0$.

There is no need to install the reflex 'V in-line vessel' where the maximum possible temperature load for the expansion vessel is 70 °C.

Notes for the installer
- If the floor heating circuit does not use oxygen-tight plastic tubing, there is a risk of corrosion.
- Even so, the safest option is to implement system separation between the boiler and floor circuit, e.g. with a reflex 'longtherm' plate heat exchanger. We recommend using the 'refix DE' with special corrosion protection to prevent corrosion of the expansion vessel. → 'refix' brochure

The circuits must be adjusted to suit local conditions.
Notes for the installer

- TRD 402, 18.6: The actual operating temperature can be used as the calculation temperature for expansion vessels and collection vessels.
- TRD 604 sheet, 2, 1.3.: There is no need to install a water level limiter with a DEV if a minimum pressure limiter is activated for the DEV when the water level drops below minimum.

We recommend:
- reflex 'V In-line vessel' > 120 °C

Special requests

Special requests 📞 +49 23 82 / 70 69 - 568

The circuits must be adjusted to suit local conditions.
Excerpts from the assembly, operating, and maintenance instructions

Expansion vessels must be configured at start-up and be subjected to annual maintenance. This must include checking the gas pre-set pressure and system filling pressure and making adjustments to suit local conditions/planning specifications.

In order to perform maintenance on expansion vessels, DIN EN 12828 stipulates that: **there must be no lockshield valve between the expansion vessel and heat generator. The only possible option in this case is a lockshield valve protected against inadvertent closure for inspection purposes.**

We recommend the following to provide protected shut-off for 'reflex' for configuring the pre-set pressure:

- reflex 'SU' and 'AG' lockshield valves → page 7
- reflex 'Digital pressure gauge' → page 7

The factory setting for the gas pre-set pressure is listed under the technical data for the individual 'reflex' models. For more detailed information, please refer to the assembly and operating instructions accompanying each vessel.

**The gas pre-set pressure** $p_0$ must be adjusted to suit local conditions and entered on the name plate.

**The water seal** $V_W$ is introduced cold when filling the system and is controlled via filling pressure $p_F$ at the system pressure gauge on the water side after the system has been bled and degassed from cold.

**The system is thermally degassed once the max. flow temperature is reached. The circulating pumps must be switched off and the system bled. Water is then made up to final pressure $p_e$.**

**Pre-set pressure**
- $p_0 \geq$ static pressure + 0.2 bar
- $+ \text{evaporation pressure, where } t > 100 \text{ °C}$
- $p_0 \geq 1 \text{ bar (recommended)}$

**Filling pressure**
- $p_F \geq p_0 + 0.3 \text{ bar}$

**Final pressure**
- $p_e \leq p_{SV} - 0.5 \text{ bar, for } p_{SV} \leq 5 \text{ bar}$
- $p_e \leq 0.9 \times p_{SV} \text{, for } p_{SV} > 5 \text{ bar}$
Definitions in accordance with DIN EN 12828 and following DIN 4807 T1/T2 using a heating system as an example

Pressures and volumes using a DEV as an example

Pressures are given as overpressures and relate to the DEV connection or the pressure gauge on pressure-maintaining stations. The circuit is as per the sketch above.

- \( p_{PV} \): Safety valve actuation pressure
- \( p_e \): Final pressure
- \( p_F \): Filling pressure
- \( p_a \): Initial pressure
- \( p_0 \): Minimum operating pressure
- \( p_{st} \): Static pressure
- \( p_{SV} \): Safety valve actuation pressure
- \( p_{D} \): Pumping pressure
- \( V_e \): Expansion volume
- \( V_W \): Water seal

**Terms**

- **Pressures**
  - \( p_{PV} \): The permissible operating pressure may not be exceeded at any point within the system.
  - \( p_e \): Pressure in the system at maximum temperature
  - \( p_F \): Pressure in the system at filling temperature
  - \( p_a \): Pressure in the system at minimum temperature

- **Volumes**
  - \( V_e \): Water seal to cover system-related water losses

**Normal pressure range**

- \( p_{min} \) to \( p_{max} \)

**Minimum operating pressure**

- \( p_0 \): Minimum pressure to avoid
  - vacuum formation
  - evaporation
  - cavitation

**Static pressure**

- \( p_{st} \): Pressure of liquid column in accordance with static height (H)

**Water seal**

- \( V_W \): Water seal to cover system-related water losses

**Normal pressure range**

- \( p_{min} \) to \( p_{max} \)

**Minimum operating pressure**

- \( p_0 \): Minimum pressure to avoid
  - vacuum formation
  - evaporation
  - cavitation

**Static pressure**

- \( p_{st} \): Pressure of liquid column in accordance with static height (H)
Ensure the pre-set and filling pressures are correct.

reflex 'T expansion trap'
Selection in accordance with DIN EN 12828 → reflex accessories brochure

reflex 'EB dirt collector'
Ideal for older systems → reflex accessories brochure

reflex 'fillset'
Connection assembly providing access to potable water systems with water meter and system separator → reflex 'control' brochure

reflex 'magcontrol'
Filling pressure monitoring with automatic water make-up → reflex 'control' brochure

reflex 'control P'
Make-up station with pump → reflex 'control' brochure

reflex 'servitec'
Degassing of circuit and make-up water → reflex 'servitec' brochure

reflex 'V in-line vessel'
Expansion vessel protection, only required where return flow temperatures tR exceed 70 °C → reflex accessories brochure

Protected shut-offs
For reflex → Pages 7 and 11

reflex 'wall mount'
for reflex 8 – 25 liters → page 7

This item is featured in this brochure.
This item is featured in the specified brochures.
## Order information

### Diaphragm expansion vessels

<table>
<thead>
<tr>
<th>Article-No.</th>
<th>Quantity</th>
<th>Order instructions</th>
</tr>
</thead>
<tbody>
<tr>
<td>'reflex N'</td>
<td>..... liters</td>
<td>..... Choice of red or white up to 80 liters</td>
</tr>
<tr>
<td>'reflex G'</td>
<td>..... liters</td>
<td>..... Choice of red or white up to 33 liters</td>
</tr>
<tr>
<td>'reflex S'</td>
<td>..... Liters</td>
<td>.....</td>
</tr>
<tr>
<td>'reflex F'</td>
<td>..... Liters</td>
<td>.....</td>
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</tbody>
</table>

### Accessories

<table>
<thead>
<tr>
<th>Reflex 'wall mount' 8 – 25 liters</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bracket with multiple connections 7612000</td>
</tr>
<tr>
<td>Bracket with tightening strap 7611000</td>
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<table>
<thead>
<tr>
<th>Reflex 'SU quick coupling'</th>
</tr>
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<tbody>
<tr>
<td>SU R ¾ 7613000</td>
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<tr>
<td>SU R 1 7613100</td>
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<table>
<thead>
<tr>
<th>Reflex 'AG connection assembly'</th>
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<tbody>
<tr>
<td>AG 1 9119204</td>
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<tr>
<td>AG 1¼ 9119205</td>
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<tr>
<td>AG 1½ 9119206</td>
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<table>
<thead>
<tr>
<th>Reflex 'digital pressure gauge' 9119198</th>
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<table>
<thead>
<tr>
<th>Reflex 'T expansion trap'</th>
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<tbody>
<tr>
<td>..... Liters</td>
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<table>
<thead>
<tr>
<th>Reflex 'EB dirt collector'</th>
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<tbody>
<tr>
<td>..... liters</td>
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<table>
<thead>
<tr>
<th>Reflex 'V in-line vessel'</th>
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<tbody>
<tr>
<td>..... Liters</td>
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### Water make-up and degassing

<table>
<thead>
<tr>
<th>Reflex 'fillset'</th>
</tr>
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<tbody>
<tr>
<td>With standard water meter 6811105</td>
</tr>
<tr>
<td>With contact water meter 6811205</td>
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<table>
<thead>
<tr>
<th>Reflex 'fillcontrol' 6811500</th>
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<table>
<thead>
<tr>
<th>Reflex 'magcontrol' 6812100</th>
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<table>
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<tr>
<th>Reflex 'control P' 7688500</th>
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<table>
<thead>
<tr>
<th>Reflex 'servitec 25' 6830700</th>
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</thead>
<tbody>
<tr>
<td>System water content ..... m³</td>
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<table>
<thead>
<tr>
<th>Reflex 'servitec 35' 6829000</th>
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</thead>
<tbody>
<tr>
<td>Proportion of glycol in water mixture ..... %</td>
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<table>
<thead>
<tr>
<th>Reflex 'servitec 60' 6829010</th>
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<tbody>
<tr>
<td>Pressure maintenance final pressure ..... bar</td>
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<table>
<thead>
<tr>
<th>Reflex 'servitec 60/gl' 6829700</th>
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<tbody>
<tr>
<td>Heat generator SV response pressure ..... bar</td>
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<table>
<thead>
<tr>
<th>'servitec' start-up 7945600</th>
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Tender specifications... and more online and on DVD!
Real progress is only achieved when man takes care of natural resources. Therefore, we favour materials and production technology which offer maximum environmental compatibility. Taking care of and assuming responsibility for the environment has been and will always be one of the principles of Reflex.

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