Fonterra Top 12

Planning

System description

Heating/cooling ceiling system for closed, suspended ceiling installations

Fonterra Top 12 is a jointless heating and cooling system for ceilings. It is ideal for use in office, administrative, and public buildings, but also for private residential buildings.

The prefabricated plaster boards available in various sizes are mounted to the ceiling on an on-site, acoustically decoupled metal sub-construction (CD profiles) with a minimum carrying capacity of 23 kg/m².

They are fastened with 30 mm drywall screws for plaster boards in dry construction. Since they are installed with the smooth side of the boards facing the room, they are ready for painting after the joints and fastenings have been smoothened. Non-active residual areas are closed up with non-milled 18 mm Fermacell boards.

The pipelines for the Top 12 boards are laid in the suspended hollow floor space. To this end, the connection pipes are likewise made of 12 x 1.3 mm PB pipes and guided to the manifold or zone valve.

The small pipe coverage of approx. 6 mm guarantees high performance and quick reaction of the Fonterra Top 12 heating and cooling ceiling.

Abb. 190: Ceiling construction
Features

- Dry construction system made of 18 mm plasterboard system panels with integrated oxygen-sealed 12x1.3 mm PB pipe
- Variable combination of all prefabricated ceiling panels
- Connection of the system panels connected in series up to 5 m² per heating/cooling circuit
- Installation of the connection pipes in the hollow floor space
- Use of tested Viega press connecting technology with SC-Contur
- Quick reactivity thanks to small pipe coverage
- Can be combined with all commercially available ventilation systems

System components

<table>
<thead>
<tr>
<th>System areas/pipe</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fonterra Cooling ceiling panel</td>
</tr>
<tr>
<td>620 x 2000 mm</td>
</tr>
<tr>
<td>310 x 2000 mm</td>
</tr>
<tr>
<td>620 x 1000 mm</td>
</tr>
<tr>
<td>Non-milled plaster board</td>
</tr>
<tr>
<td>620 x 2000 mm</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Accessories</th>
</tr>
</thead>
<tbody>
<tr>
<td>PB pipe 12x1.3 mm</td>
</tr>
<tr>
<td>PB pipe in protective pipe</td>
</tr>
<tr>
<td>Joint adhesive</td>
</tr>
<tr>
<td>Drywall screws</td>
</tr>
<tr>
<td>Pipe protection 12x18 for movement joints</td>
</tr>
<tr>
<td>Name</td>
</tr>
<tr>
<td>----------------------------------------------------------------------</td>
</tr>
<tr>
<td>PB pipe 12 x 1.3 mm, 120 mm</td>
</tr>
<tr>
<td>PB pipe 12 x 1.3 mm, 240 mm</td>
</tr>
<tr>
<td>PB pipe 12 x 1.3 mm, 650 mm</td>
</tr>
<tr>
<td>PB pipe 12 x 1.3 mm, 120 m in protective pipe</td>
</tr>
<tr>
<td>Fonterra cooling ceiling panel 620 x 2000 mm, pipe volume 16.5 m</td>
</tr>
<tr>
<td>Fonterra cooling ceiling panel 310 x 2000 mm, pipe volume 8.5 m</td>
</tr>
<tr>
<td>Fonterra cooling ceiling panel 620 x 1000 mm, pipe volume 8.0 m</td>
</tr>
<tr>
<td>Non-milled plaster board 620 x 2000 mm</td>
</tr>
<tr>
<td>Drywall screws 30 mm</td>
</tr>
<tr>
<td>Joint adhesive</td>
</tr>
<tr>
<td>Movement joint-protective pipe 12 x 18</td>
</tr>
<tr>
<td>Pipe guide 12</td>
</tr>
<tr>
<td>Connection screw fitting ¾ inch x 12</td>
</tr>
<tr>
<td>Connection screw fitting with SC-Contur ¾ inch x 12</td>
</tr>
<tr>
<td>Press connector 12 x 1.3</td>
</tr>
</tbody>
</table>

Tab. 91: System components
<table>
<thead>
<tr>
<th>Tools</th>
<th>Name</th>
<th>Article number</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Pipe shears for plastic pipes</td>
<td>652005</td>
</tr>
<tr>
<td></td>
<td>Hand press tool 12</td>
<td>401436</td>
</tr>
<tr>
<td></td>
<td>Viega press jaw 12</td>
<td>616915</td>
</tr>
<tr>
<td></td>
<td>Press machine, e.g. Pressgun Picco</td>
<td>735470</td>
</tr>
</tbody>
</table>

Tab. 92: Tools

### Technical data

<table>
<thead>
<tr>
<th>Technical data system panels</th>
<th>System panels</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dimensions W x H x D</td>
<td>e.g. 620 x 2000 x 18 mm</td>
</tr>
<tr>
<td>Material</td>
<td>Gypsum board</td>
</tr>
<tr>
<td>Fire rating class</td>
<td>A1 acc. to EN 13501-1/A2 acc. to DIN 4102-1</td>
</tr>
<tr>
<td>Weight</td>
<td>21.5 kg/m²</td>
</tr>
<tr>
<td>Pipe clearance</td>
<td>75 mm</td>
</tr>
<tr>
<td>Max. permissible supply temperature</td>
<td>50 °C</td>
</tr>
<tr>
<td>Max. heating circuit length</td>
<td>80 m / 5 m²</td>
</tr>
<tr>
<td>Movement joint</td>
<td>from 6.5 m active ceiling surface</td>
</tr>
<tr>
<td>Damp rooms</td>
<td>suitable for residential areas*</td>
</tr>
</tbody>
</table>

Tab. 93: Technical data system panels

* Note Brochure 5, Bundesverband der Gipsindustrie e. V. «Bäder und Feuchträume im Holz- und Trockenbau» (Bathrooms and damp rooms in timber and dry construction) and the data sheet of the Zentralverband des deutschen Baugewerbes ZDB (Association of the German Building Trade).

<table>
<thead>
<tr>
<th>Technical data system pipe</th>
<th>System pipe/ PB 12 x 1.3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dimensions</td>
<td>12 x 1.3</td>
</tr>
<tr>
<td>Minimum bending radius</td>
<td>5 x dₐ</td>
</tr>
<tr>
<td>Operating condition acc. to ISO 10508</td>
<td>4/1 5/0.8</td>
</tr>
<tr>
<td>Max. operating temperature</td>
<td>95</td>
</tr>
<tr>
<td>Mounting temperature</td>
<td>&gt; -5</td>
</tr>
<tr>
<td>Water volume</td>
<td>0.069</td>
</tr>
<tr>
<td>Heat conductivity λ</td>
<td>0.22</td>
</tr>
<tr>
<td>Linear coefficient of length expansion</td>
<td>1.3 x 10⁻⁴</td>
</tr>
<tr>
<td>Weight</td>
<td>50</td>
</tr>
</tbody>
</table>

Tab. 94: Technical data system pipe
### Installation data for Fonterra system

<table>
<thead>
<tr>
<th></th>
<th>Top 12</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pipe clearance</td>
<td>7.5 cm</td>
</tr>
<tr>
<td>Max. heating circuit area</td>
<td>5 m²</td>
</tr>
<tr>
<td>Max. heating circuit length</td>
<td>up to 80 m</td>
</tr>
<tr>
<td>Mounting time in group minutes</td>
<td>25 min/m²</td>
</tr>
</tbody>
</table>

### Tab. 95: Pipe requirement and mounting times

**System components** | **Available quantities/packing units** | **Pro-rata requirement** |
---                    | ------------------------------------ | -------------------------|
PB pipe 12 x 1.3 mm    | incl.                                | Supply lines supply/return flow |
Fonterra cooling ceiling element 620 x 2000 mm | 30 pieces | 0.80 pc./m² |
Fonterra cooling ceiling element 310 x 2000 mm | 30 pieces | 1.60 pc./m² |
Fonterra cooling ceiling element 620 x 1000 mm | 30 pieces | 1.60 pc./m² |
Drywall screws 30 mm    | 1000 pieces                          | 30 pc./m²                |
Joint adhesive 310 ml   | 20 ml                               | 20 ml/m                  |
Press connector with SC-Contur 12x1.3 mm | 5 pc. | 1.00 pc./m² |

### Material requirement

Connection lengths to the manifold must be considered.
Description of the heating and cooling function

As cold water temperature in cooling mode, Viega recommends a supply temperature of approx. 16 to 17 °C with an inclination of 3K; this means that temperatures of 16/19 °C or 17/20 °C should be expected. Accordingly, the mean surface temperature of the ceiling is 21 to 22 °C. Generally, it must be ensured that the temperature cannot fall below the dewpoint. Viega recommends an on-site supply regulation under consideration of the room air humidity which automatically adjusts the supply temperature to the requirements. An on-site humidity sensor can serve as a so-called “emergency stop” only. It eliminates the cold water circulation of the cooling ceiling, thus preventing condensate formation.

With this control, reduced performance of the ceiling must be expected before the condensate has dried since the cooling ceiling is separated from the water flow.

In heating mode, the Fonterra Top 12 ceiling is operated with a mean heating water temperature of approx. 33 °C. The mean ceiling surface temperature should not exceed 29 °C to ensure unobstructed heat dissipation at head height of persons in the room.
Performance data

Fig. 192: Performance diagram: Heating

Key
① Heat flow density [W/m²]  ② Overtemperature of fluid [K]

Determination of the overtemperature of the fluid:
\[
\frac{\text{Supply temperature} + \text{return temperature}}{2} - \text{Room temperature}
\]

Example: \((35 \, ^\circ \text{C} + 31 \, ^\circ \text{C} / 2) - 20 \, ^\circ \text{C} = 13 \, \text{K overtemperature of fluid}\)

Fig. 193: Performance diagram: Cooling

Key
① Heat flow density [W/m²]  ② Overtemperature of fluid [K]

Determination of the undertemperature of the fluid:
\[
\text{Room temperature} - \frac{\text{Supply temperature} + \text{return temperature}}{2}
\]

Example: \(26 \, ^\circ \text{C} - (16 \, ^\circ \text{C} + 19 \, ^\circ \text{C} / 2) = 8.5 \, \text{K undertemperature of fluid}\)
Performance parameters
The output parameters of the systems specified below apply under consideration of the comfort criteria defined in DIN EN ISO 7730 and the resulting radiation asymmetry.

<table>
<thead>
<tr>
<th>Heating and cooling ceiling</th>
<th>Fonterra Top 12</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Operating mode</strong></td>
<td>Heating</td>
</tr>
<tr>
<td>Operative room temperature [°C]</td>
<td>20</td>
</tr>
<tr>
<td>Heating fluid temperature [°C]</td>
<td>33</td>
</tr>
<tr>
<td>Mean ceiling temperature [°C]</td>
<td>approx. 28</td>
</tr>
<tr>
<td>Max. heating/cooling performance net [W/m²]</td>
<td>approx. 58</td>
</tr>
</tbody>
</table>

Tab. 97: Performance parameters

Abb. 194: Pressure loss diagram for PB pipes 12 x 1.3

Key
1. Pressure gradient R [Pa/m]
2. Mass flow m [kg/h] (fluid: water)

Notes on dimensioning
- Dimensioning the cooling ceiling surface according to the calculation of the on-site cooling load.
- The sub-construction (suspension height ≥ 12 cm) made of metal profiles is mounted diagonally to the longitudinal axis of the panels.
- The maximum panel surface of active ceiling panels without expansion joint must not exceed 6.2 m x 4.0 m (corresponding to 2 rows of panels each with 10 panels 62 x 200 cm).
- Planning of the heating/cooling ceiling areas corresponding to the situation onsite, with a max. panel surface of approx. 5.0 m² with a connection length of 2 x 10 m per heating/cooling circuit.
- A passive region of min. 120 mm in the area of the expansion and connection joints and of 200 mm in the area of the supply lines must be ta-
ken into consideration.

- Connection of the Fonterra Top 12 ceiling elements to Fonterra manifold DN25 or Fonterra zone valve model 1286.
- Dimensioning for heating and for cooling is based on the same volumes of water.
- Checking the pressure losses over the installed pipe length according to the pressure loss diagram. On-site calculation of the total pressure loss incl. supply lines.
- The use of oxygen-sealed Viega polybutene pipes makes system separation, e.g. by means of heat exchanger, redundant.
- The installation plans for the construction site are generated by the planning office in coordination with the Viega planning department.
- The cooling and heating ceiling does not meet the fire protection requirements. To fulfil these requirements, suitable on-site measures must be taken.

According to EnEV 2014 Appendix 5 table 1 and para. 2 and 4, connection lines to the manifold and manifold lines must be insulated. Where the EnEV does not specify the thickness of the insulation layer, the connection pipes must be laid in the protective pipe as a minimum requirement. Viega recommends on-site central dewpoint monitoring (e.g. at the manifold).

**Dimensioning**

![Dimensioning example](image)

Fig. 195: Installation example (see »Assembly steps« on page 238)
## Dimensioning of Fonterra heating surfaces

| Room number | Room designation | Available ceiling surface | Operative room temperature heating | Operative room temperature cooling | Standard heating load (or residual heating output) | Standard cooling load (or residual cooling load) | Overtemperature of the fluid | Undertemperature of the fluid | Design heat flow density heating | Design heat flow density cooling | Max. active surface required | Heating circuit no. | Cooling ceiling element Top 12 62 x 200 cm (1.24 m²) | Piece | Cooling ceiling element Top 12 31 x 200 cm (0.62 m²) | Piece | Cooling ceiling element Top 12 62 x 100 cm (0.62 m²) | Piece | Active surface per circuit | m² | Heating output per circuit | W | Cooling output per circuit | W | Total output heating | W | Total output cooling | W | Residual output heating | W | Residual output cooling | W | Dimension mass flow per circuit | kg/h | Installed pipe length incl. connection line per circuit | m | Pressure loss circuit | mbar | Pressure loss manifold | mbar | Total pressure loss | mbar | Target value at manifold | l/min |

### Tab. 98: Cooling and heating ceiling Fonterra Top 12 - Dimension sheet
### Dimensioning of Fonterra heating surfaces

<table>
<thead>
<tr>
<th>Project no.</th>
<th>∑Q_H</th>
<th>∆p_{max}</th>
<th>θ_{V/Ausl}</th>
<th>∑m_H</th>
<th>∑m_H</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Room number** | 1

**Room designation** | Sample

**Available ceiling surface** | m² | 30,9

**Operative room temperature heating** | °C | 20

**Operative room temperature cooling** | °C | 26

**Standard heating load (or residual heating output)** | W | 1100

**Standard cooling load (or residual cooling load)** | W | 800

**Overtemperature of the fluid** | K | 12,5

**Undertemperature of the fluid** | K | 8,5

**Design heat flow density heating** | W/m² | 58

**Design heat flow density cooling** | W/m² | 42

**Max. active surface required** | m² | 19

**Heating circuit no.** | 1 | 2 | 3 | 4

**Cooling ceiling element Top 12 62 x 200 cm (1.24 m²)** | Piece | 3 | 4 | 4 | 3

**Cooling ceiling element Top 12 31 x 200 cm (0.62 m²)** | Piece | 2 | 2

**Cooling ceiling element Top 12 62 x 100 cm (0.62 m²)** | Piece | 3 | 4 | 4 | 3

**Active surface per circuit** | m² | 4,96 | 4,96 | 4,96 | 4,96

**Heating output per circuit** | W | 287 | 287 | 287 | 287

**Cooling output per circuit** | W | 208 | 208 | 208 | 208

**Total output heating** | W | 1148

**Total output cooling** | W | 832

**Residual output heating** | W | 0

**Residual output cooling** | W | 0

**Dimension mass flow per circuit** | kg/h | 69 | 69 | 69 | 69

**Installed pipe length incl. connection line per circuit** | m | 81,5 | 73 | 81,3 | 72,7

**Pressure loss circuit** | mbar | 143 | 128 | 142 | 128

**Pressure loss manifold** | mbar | 3

**Total pressure loss** | mbar | 146

**Target value at manifold** | l/min. | 1,15 | 1,15 | 1,15 | 1,15

---

Tab. 99: Dimensioning example
Assembly steps

Fig. 196: Suspend base profile and mount edge profile

Fig. 197: Mount the carrier profile with the cross connectors

Fig. 198: Apply the adhesive and lay the first row of panels

Fig. 199: Lay the second row of panels offset by 310 mm

Fig. 200: Piping

Fig. 201: Mount the passive elements and the wall connection joint
Fig. 202: Expansion joint

Fig. 203: Finish the surface, remove any protruding adhesive and smooth the surface

Fig. 204: Dimensioning example (complete with panels)

Key
① Base profile
② Carrier profile
③ Passive elements
④ Active elements
⑤ Connection lines
⑥ Expansion joint
Joint implementation

In the Fonterra cooling and heating circuit, wall connections to vertical components, such as plastered brick wall, sight concrete, wood or dry construction walls, must generally be implemented as expansion joints.

Wall connection joint, passive

As shown above, the wall connection joints can be implemented with a visible connection elbow, or open with a UD profile mounted behind them. A rigid connection (screw) between cladding and connection elbow or UD profile is not possible.

The open joint (width 5 to 7 mm) can be sealed with an elastoplastic sealing material (no silicone) with an approved continuous motion absorption of minimum 15 to 20%. The panel edge must be primed before sealing.
Expansion joints

Generally, expansion joints are required wherever there are movement joints in the building, or where the heating/cooling ceiling area is larger than 6.2 x 4.0 m.

The expansion joint is formed as shown in the illustrations above. Make sure that the cladding (Fonterra ceiling panels Top 12) as well as the sub-structure of the two ceiling areas are separate from each other.
Mounting

Mounting instructions

- Mounting of the cooling ceiling panels according to the installation plan of the planning office.
- Arrange the on-site sub-construction made of metal CD profiles at a distance of 333 mm and a carrying capacity of min. 23 kg/m² diagonal to the installation direction of the panels. The minimum suspension height is 120 mm. By means of drywall screws, the panels are fastened to the sub-construction at the specified fixing points.
- Stress-relieved mounting of the ceiling elements from the centre of the elements to the edge, or from one panel edge continuously to the other edge. In this process, press the system panels tightly to the sub-construction.
- To form the wall connection joint, provide a circumferential passive strip of at least 120 mm.
- In the area of the pipeline arrangement (piping of the TOP 12 panels and the supply lines), provide a passive edge area of 200 mm.
- Generally, double planking is possible; however, make sure that the fixing screws are bolted all the way through to the sub-construction.
- A glue joint (width max. 1 mm) must be provided to connect the panels with each other. Before removing any protruding joint adhesive, allow the adhesive to cure fully (approx. 18 to 36 hours, depending on the room temperature). When installing the panels, avoid cross joints (offset at least 200 mm). Finish the joints and screws with Fermacell filler.

Fig. 209: Section drawing of the ceiling construction

Key

1. Ceiling fastening with direct or nonius suspension (optional suspension height)
2. Cross joint
3. Cooling ceiling panel Top 12
4. Base profile CD 60x27
5. Carrier profile CD 60x27
Before smoothing the surface, the room humidity must be smaller than 70% and the room temperature greater than 5 °C. Furthermore, the Top 12 ceiling panels and the collecting pipes must be leakage-tested.

- Since the Fonterra Top 12 ceiling elements are subject to changes in length (expansion and shrinking) when in heating or cooling mode or when exposed to a changing room climate, an expansion joint of 6 to 7 mm must be provided after approx. 6.5 mm active ceiling length. It should be designed open or with expansion joint profiles, so-called Göppinger profiles. The wall connection of the ceiling panels or the connection to other building materials must generally be implemented as an expansion joint. Sealing with acrylic joint filler (no silicone) is possible.
- The connection from active to passive panels must be made by means of an adhesive joint.
- For connection to gypsum plaster boards, an expansion joint must generally be provided.
- Connection lines should not be arranged behind the cooling ceiling elements because they must be accessible for leak tightness testing during the pressure test.
- Filling the system with water and flushing of the individual circuits.
- Leakage test of the Top 12 ceiling panels incl. connection lines according to the instruction below. Recording of the results by the executing company, and handover to the building owner or the authorised planning office.
- The drywall builder can mount non-active ceiling elements made of 18 mm plaster board along the edges or in the corners.

The ceiling elements must be free of frost at any time; this must be documented when the system is handed over.

In addition to these mounting instructions, the handling instructions of the company Xella Trockenbausystem GmbH (Fermacell) must be observed. Use only Fermacell adhesive or "greenline" joint adhesive.
To create the glue joint, the glue tip of the joint adhesive is moved to the centre of the panel edge of the mounted Fonterra Top 12 ceiling element. Make sure to apply a sufficient amount of adhesive. Then, the second Fonterra Top 12 ceiling element is pressed tightly against the panel edge of the first element. When pushing the two panel edges together, the edge must be completely filled with adhesive. The maximum joint width is 1 mm. Escaped adhesive can be removed after full curing of the adhesive (approx. 18 to 36 hours).

Do not install Fonterra Top 12 panels with a mean relative humidity of > 80%. The room temperature must be at least +5 °C. For application, the adhesive must have a temperature of > +10 °C.

Transport, storage, and handling conditions

- The ceiling elements should be stored laying flat on a clean, dry, and frost proof underground.
- Top 12 ceiling elements are supplied on pallets and must be protected from soiling and damage.
- Wait until immediately before mounting the panels before you remove the packaging foil to prevent the plasterboard material from absorbing moisture.
- Allow the panels to adjust to the surrounding room climate which should not change significantly in the 12 hours following installation.
- Lower temperatures and relative humidity prolong the curing time for the adhesive.
- Transport the panels in vertical position.
- For execution of the smoothing work, the humidity must be < 70% and the room temperature > 5 °C.
- Since building moisture prevents drying of the filler, plastering and screed work must have been completed and sufficiently cured.
- The ceiling elements must be free of frost at any time; this must be documented when the system is handed over.

Flushing of the pipelines
- Before executing the pressure test, all heating/cooling circuits of the Fonterra Top 12 system must be flushed until the leaking water contains no more air.
- Close the supply and return flow at the manifold as well as all supply valves
- Open the first supply valve
- Via the KFE tap at the manifold, flush the circuit with filtered water until the leaking water contains no more air.
- Close the valve again and repeat the process for all supply valves
- Open the supply and return flow locks at the manifold again and do a pressure test

Pressure test
Carry out the pressure test at a pressure of max. 0.6 MPa (0.6 bar) (also refer to the separate pressure log).
When the work lot is handed over to the drywall builders, the pressure must be increased to double the operating pressure.
This pressure must be maintained until the end of the drywall work.

- It is mandatory that system components not designed for this pressure, such as expansion vessels, safety valves etc., are shut off or removed.
- Please note that a 10K change of the pipe wall temperature occurring during the pressure test will change the test pressure by 0.5 to 1 bar.
Commissioning
- Setting of the calculated flowthrough volumes via the flow sensors at the manifold
- Mounting the actuators
- Setting the operating temperature
- Checking the heating and cooling function of the Fonterra Top 12 ceiling elements
- Fonterra Top 12 panels are factory-primed. After smoothing, their surface is ready for painting.

Surface finish
Before starting to work, check the surface to be treated including the joints: It must be dry, firm, and free of spots and dust. Furthermore, plaster or grout splatters must be removed, grooves and connecting end must be filled with Fermacell filler and sanded or smoothed. After smoothing, the surface of Fonterra Top 12 panels is ready for painting. Additional priming is only necessary if required by the manufacturer of finishing systems for use on plaster board. The moisture of the Top 12 panels on the construction site must be under 1.3%. This corresponds to a curing time of approx. 48 hours at 70% humidity and a min. room temperature of 15 °C (caution is required with previously applied wet screeds).

Application of coats of paint
To apply coats of paint on Fonterra Top 12 ceiling panels, proceed as with traditional plaster boards. You can use any type of commercially available paint, e.g. latex or water-based paint, or varnish. Before applying mineral paints such as whitewash and silicate paint or other special paints, check that they have been approved for this use by the manufacturer of the painting system. Apply the paint according to the manufacturer's information in at least two worksteps.

Plastering dry construction systems
If plastering of the Fonterra Top 12 ceiling panels (e.g. with acoustic or textured plastering) is necessary or desirable for structural reasons, the ceiling panels must be impregnated with blocking primers with a low water content belonging to the plaster system.

In the area of the corner and wall connections, textured plasters (max. thickness 4 mm) must be cut with the trowel. Textural plasters with mineral binding agents suitable for plasterboards or synthetic resin plasters can be used in compliance with the plaster manufacturer’s processing instructions.

During plastering, the surface temperature should be approx. 22 °C.
After filling the joints and screws, the surface of the Fonterra Top 12 ceiling elements is ready for painting. According to Data sheet 2.1 of the Bundesverband der Gips- und Gipsbauindustrie e.V. (Association of the German gypsum industry), this corresponds to quality level 1. Terms like "Ready for painting" or similar used in tender documents do not sufficiently define the surface quality to be provided.

Unless specified otherwise in the contract, the levelness tolerances of DIN 18202 Table 3 line 6 apply.

Worksteps required to reach Q2:
- Gluing of the joints
- Removal of any protruding adhesive after curing
- Filling of the visible connection elements by means of Fermacell or gypsum filler
- Smoothing of the joints and connection elements until free of burrs or unevenness

Quality level 2 does not exclude visibility of the joints, above all in raking light.

For quality level 3, the increased requirements should be agreed upon according to Table 3, line 7.

Worksteps required to reach Q3:
- Gluing of the joints
- Removal of any projecting joint adhesive after curing
- Smoothing of the visible connection elements with joint filler
- Extended filling of the joints
- Use filler to amply coat the entire surface, and smooth it sharply.

A surface quality of quality level 3 goes beyond the standard requirements and must therefore be specifically agreed in the contract. It is not fully excluded that unevenness may be visible in raking light (e.g. visible joints). However, the unevenness is smaller than with Q2. The surface texture must not have any visible differences.

If the surface is to be assessed at raking light or artificial lighting, the customer must ensure that these lighting conditions are available during execution of the works.

The highest quality level 4 requires a filler coat over the entire area; it must be contracted out or agreed separately.

The relevant processing guidelines of the individual system providers must be observed.
Single room regulation
The cooling and heating ceiling Fonterra Top 12 uses a heating/cooling room thermostat for single room regulation. This room thermostat is used for heating and cooling; in connection with the basic unit heating/cooling, it acts on the actuators of the manifold station. To switch to cooling mode, a "change-over" contact is used, e.g. from the central instrumentation and control engineering system.

If the room temperature exceeds the value preset at the room thermostat due to external or internal loads, the so-called self-regulation effect of thermally active surfaces comes into play: Energy is transmitted only due to the prevailing temperature differences.

The self-regulating effect of surface heating/cooling systems occurs independent of control systems and simultaneously with a change in room temperature.

Example:
- Room situation: 24°C RT
- Surface temperature of the cooling ceiling 22°C
- Output-defining temperature difference 2K

If the room temperature increases (as in the example above) from 24 °C to 26 °C, the output-defining temperature difference increases from 2K to 4K. While the surface temperature remains at 22 °C, the output of the cooling ceiling doubles.

To ensure this functionality, Viega recommends 24-hour operation of the Fonterra Top 12 system.

Supply of fresh air
Fonterra Top 12 heating/cooling circuits are used for room heating and cooling exclusively. This means that they cover the function of energy transport but not of air exchange. Hygienic air exchange need to be ensured. To this end, the Fonterra Top 12 systems can be combined with all commercially available ventilation systems. Since the cooling ceiling takes over the major part of the energy load, a smaller-dimensioned ventilation system can be used, which significantly reduces the operating costs.
# Pressure test

After completion of the pressure test, this document must be handed over to the planner. We recommend to retain the document.

<table>
<thead>
<tr>
<th>Building project</th>
<th>Date</th>
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<table>
<thead>
<tr>
<th>Building owner's address</th>
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<table>
<thead>
<tr>
<th>Address of the qualified installation company</th>
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Before mounting the passive ceiling elements, the leak tightness of the heating circuits is tested with water. The leakage test is carried out at the finished but not yet covered pipelines.

**Notes on the test procedure**

- Fill the system with filtered water and vent it completely.
- In case of major differences (~10K) between the ambient temperature and the filling water temperature, wait for 30 minutes after filling the system for the temperatures to adjust.
- The leakage test is done with a test pressure of min. 0.4 MPa (4 bar) and max. 0.6 MPa (6 bar).
  - When the work lot is handed over to the drywall builders, the pressure must be increased to double the operating pressure.
- Visual inspection of the piping system/check per manometer*.
- This pressure must be maintained until the end of the drywall work.
- Take suitable measures to exclude freezing, for example room heating or addition of anti-freeze to the heating water.
- If the anti-freeze is not required for normal operation, the system must be cleaned by emptying and flushing with at least three water exchanges.
- The water temperature must be kept constant during the test.

* Use pressure gauges which clearly indicate pressure changes of 0.01 MPa (0.1 bar).

**Materials used**

- Pipes
  - 12x1.3mm
- Pipe connectors
  - Pressing
  - Clamping

**Log of the pressure test**

<table>
<thead>
<tr>
<th>Start of the pressure test:</th>
<th>Start pressure:</th>
<th>Water temperature [°C]:</th>
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<tr>
<th>End of the pressure test:</th>
<th>Final pressure:</th>
<th>Water temperature [°C]:</th>
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</table>

- Visual inspection of pipe connectors carried out?
  - Yes
  - No
- Leak tightness was established, no permanent form changes identified in any component?
  - Yes
  - No
- Has the operating pressure been set on system handover?
  - Yes
  - No

**Comments**

**Building owner**

Date/signature/stamp

**Site management**

Date/signature/stamp

**Qualified installation company**

Date/signature/stamp