Processing instructions

Polystone® CubX®
Content

Areas of application 3
Alternative areas of application 3
Delivery format 3
Product characteristics 3
Connection options
  Connection to wall/floor 4 – 5
  Corner joints (vertical tank angles) 6
  Nozzle connection 7
  Basically tank construction 8 – 9
Processing parameters
  Heating element butt welding 10 – 11
  Hot gas extrusion welding 12
  Hot gas welding 13
  Hot gas welding with torch separate from filler rod 13
Product information 14
Areas of application

The main areas of application of Polystone® P CubX®, Polystone® PPs CubX® and Polystone® P CubX® white UV are surface treatment plants, electroplating plants, pre-treatment plants and the use as supplementary equipment for chemical plants (e.g. covers, floors, and partitions).

Alternative areas of application

There is a wide range of further uses of Polystone® P CubX®, Polystone® PPs CubX® and Polystone® P CubX® white UV in other industrial areas. For example, as equipment for flood protection, in the area of fishery breeding tanks, safety basins and chemical filling stations and not least in industrial housings/cladding (with thermal and acoustic insulation properties) as well as in many swimming pool construction applications (e.g. splash water tanks).

Delivery format

- Full name: Polystone® P CubX®, Polystone® PPs CubX® and Polystone® P CubX® white UV
- Format: 2,000 x 1,500 x 57 mm
- Delivery format: 2,020 x 1,520 x 57 mm
- Design: cross-ribbed twin-wall sheet
- Covering sheets: 6 mm
- Inner lattice structure: compartment size: 50 x 50 mm

Product characteristics

(extract from the technical data sheet)

<table>
<thead>
<tr>
<th>Test method</th>
<th>Unit</th>
<th>Polystone® P CubX®</th>
<th>Polystone® PPs CubX®</th>
<th>Polystone® P CubX® white UV</th>
</tr>
</thead>
<tbody>
<tr>
<td>Density</td>
<td>g/cm³</td>
<td>0.3</td>
<td>0.3</td>
<td>0.3</td>
</tr>
<tr>
<td>Weight per unit area</td>
<td>kg/m²</td>
<td>17.1</td>
<td>17.67</td>
<td>17.1</td>
</tr>
<tr>
<td>Weld strength lattice/covering sheet</td>
<td>MPa</td>
<td>≥ 20</td>
<td>≥ 20</td>
<td>≥ 20</td>
</tr>
<tr>
<td>Flatness</td>
<td>mm/m</td>
<td>≤ 3</td>
<td>≤ 3</td>
<td>≤ 3</td>
</tr>
</tbody>
</table>

| Density, RT | g/cm³ | 0.92               | 0.94                  | 0.92                         |
| Notched impact strength, RT | kJ/m² | 7.90               | 4.00                  | > 30.00                     |
| Yield stress, RT | N/mm² | 34.56              | 32.00                 | 24.00                       |
| Tensile modulus of elasticity, RT | MPa | 1,700              | 1,300                 | 1,200                        |

The data stated above are average values verified on the basis of regular static tests. They are in accordance with DIN EN 15860. These data are provided for information purposes only and shall not be regarded as binding unless expressly agreed in a contract of sales.
Connection options
Recommended constructive connection types

1. Wall/bottom connection
(also applies for cover and partition wall connections as well as edge reinforcements)

**Variant A**
Wall construction Polystone® CubX® with bottom of solid sheet

**Variant B**
Wall and floor made of Polystone® CubX®

1.1 Weld design (wall/bottom)

Röchling recommends a double fillet weld (see diagram) as connecting seam for the welded connection of Polystone® CubX® sheets with each other as well as for the connection to a solid sheet.

With the a-measure to be calculated with \(0.7 \times s\), we recommend using an equivalent thickness of 20 mm when using Polystone® CubX® as a bottom sheet.

Preparations of welds and joining surfaces as well as the actual welding process are to be carried out in accordance with the DVS guideline.

As welding filler, Röchling recommends the use of Polystone® P copolymer welding rods.
1.2 Weld design

A) Butt welding

The maximum field sizes (b) of the inner lattice structure resulting in the butt weld area should not exceed 50 mm.
For standard values see “Processing parameters” (p. 10).

B) Extrusion welding

For standard values see “Processing parameters” (p. 10).
2. Corner joints (vertical tank edges)

Standard corner

Recommended alternative with a milled or cut-out recess for the production of corner joints with closed edges. The inner weld is a fillet weld, the outer weld is a V-weld.

2.1 Weld design

Alternative corner joints

25 degree weld

Attention!
Only with complete welding over the entire 45 degree area.
3. Connection of nozzles

For the determination of the α-measure, we recommend the assumption of an equivalent wall thickness of 20 mm for the Polystone® CubX® sheet.

i.e.: $sw = se$

$S > Se; \alpha = 0.7 \times Se$

$S < Se; \alpha = 0.7 \times S$

**Example:**
Pipe socket (approx. 160 mm) in a Polystone® CubX® tank wall (size in mm)
4. Basically tank construction

- Upper edge plate
- Upper edge reinforcement made of rectangular steel tube, covered with PP if statically necessary.
- If statically necessary, eventually all around reinforcement made of Polystone® CubX®, or rectangular steel tube.
- Polystone® CubX®
- Bottom sheet
4.1 Exemplary machined construction designs

- Milling cutouts
- Milling cutout for nozzels
- Cutout for inserted Polystone® P CubX® base sheet
- Preparation of a milled flap opening for a fish transport tank
Processing parameters

Heating element butt welding

Standard values recommended by Röchling in accordance with DVS 2207-11 for connecting Polystone® CubX® sheets by means of heating element butt welding

Processing instructions

1. Establish permissible working conditions, e.g. a welding tent.
2. Connect the welding equipment to the mains or the AC generator and check proper function.
3. Align and clamp the parts to be welded, e.g. using roller blocks.
4. Seal the pipe ends against draughts.
5. Clean the joint surface in the weld area and beyond using a cleaning agent according to sections 3.2.1 and 3.2.3 with unused, absorbent, lint-free and non-staining paper. Machine the pipe surfaces to be joined, e.g. with a planer.
6. Remove the planer from the pipe welding machine.
7. Remove any swarf in the weld area without touching the joint surfaces.
8. Check the parallelism of the planes by placing the joint surfaces against each other (maximum gap as per Table 1).
9. Check misalignment (maximum 0.1 x wall thickness).
10. Check heating element temperature (210 ± 10°C).
11. Clean the heating element using a cleaning agent according to sections 3.2.1 and 3.2.2 with unused, absorbent, lint-free and non-staining paper. Ventilate after cleaning.
12. Determine the movement pressure/movement force before every weld and document it in the welding protocol.
13. Determine the settings for the equalising pressure, preheating pressure and joining pressure.
14. Define reference values as per Tables 2 or 3.
15. Bring the heating element into the welding position.
16. Equalise the surfaces to the heating element until a bead (in accordance with Table 2 or 3, Column 2) appears.
17. Preheat at reduced pressure ≤ 0.01 N/mm², preheating time as per Table 2 or 3, Column 3.
18. After the end of the preheating phase, detach the joining surfaces to be welded from the heating element and remove the heating element from the welding position.
19. Quickly move the surfaces to be welded together until they are almost touching within the changeover time (Table 2 or 3, Column 4). When they touch, they should be moving at a speed very close to zero. Then immediately start building up the joining pressure in a linear manner during the build-up time (Table 2 or 3, Column 5).
20. After joining at a pressure of 0.10 N/mm², a bead must be present. As per figure 4, K must be > 0 at every location.
21. Cool down under joining pressure as per Table 2 or 3, Column 5.
22. Release the welded parts after the cooling time haselapsed. For workshop tasks see “Joining” in section 4.1.3.
23. Complete the welding protocol.
Reference values for the heated plate welding of panels made of polypropylene

Reference values for the heated plate welding of panels made of polypropylene at ambient temperatures up to 40°C and moderate air movement (intermediate values can be interpolated).

| Nominal wall thickness \(s\) | Equalising | Preheating | Changeover | Joining | Cooling time [minimum values under joining pressure \(p = 0.10 \pm 0.01\) N/mm²]
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>[mm]</td>
<td>[mm]</td>
<td>[s]</td>
<td>[s]</td>
<td></td>
<td>[Min(*)]</td>
</tr>
<tr>
<td>up to 4.5</td>
<td>0.5</td>
<td>up to 53</td>
<td>5</td>
<td>6</td>
<td>6.5</td>
</tr>
<tr>
<td>4.5...7</td>
<td>0.5</td>
<td>53...81</td>
<td>5...6</td>
<td>6...7</td>
<td>6.5...9.5</td>
</tr>
<tr>
<td>7...12</td>
<td>1.0</td>
<td>81...135</td>
<td>6...7</td>
<td>7...11</td>
<td>9.5...15.5</td>
</tr>
<tr>
<td>12...19</td>
<td>1.0</td>
<td>135...206</td>
<td>7...9</td>
<td>7...11</td>
<td>11...17</td>
</tr>
<tr>
<td>19...26</td>
<td>1.5</td>
<td>206...271</td>
<td>9...11</td>
<td>11...17</td>
<td>15.5...24</td>
</tr>
<tr>
<td>26...37</td>
<td>2.0</td>
<td>271...362</td>
<td>11...14</td>
<td>17...22</td>
<td>24...32</td>
</tr>
<tr>
<td>37...50</td>
<td>2.5</td>
<td>362...450</td>
<td>14...17</td>
<td>32...32</td>
<td>32...45</td>
</tr>
<tr>
<td>50...70</td>
<td>3.0</td>
<td>450...546</td>
<td>17...22</td>
<td>43</td>
<td>45...61</td>
</tr>
<tr>
<td>70...85</td>
<td>3.5</td>
<td></td>
<td></td>
<td>43</td>
<td>61...85</td>
</tr>
</tbody>
</table>

\(*) A reduction of the cooling time by up to 50%, i.e. a reduction in joining pressure and the removal of the welded part from the welding machine, is permitted under the following conditions: the joint connection was created under workshop conditions and the removal of the part from the welding machine and its temporary storage (until it has completely cooled down in accordance with column 5) causes only a slight load on the joint connection.
Hot gas extrusion welding

Standard values recommended by Röchling in accordance with DVS 2207-4 for connecting Polystone® CubX® sheets by means of extrusion welding

The following information on directive DVS 2207-4 includes parameter standard values for hot gas extrusion welding. They apply for manual welding using the machinery and equipment specified in directive 2207-4, supplement 1 and the materials listed in Table 1. When welding with automatic welding machines, other parameters may also be used (see section 10.3).

The welding speed depends directly on the melt output, the weld cross-section and the preheating temperature. Based on experience, it should be 200 to 350 mm/min. It must be ensured that the adherends are plasticised 0.5 mm to 1 mm deep at the joint and beyond the seam width (see Section 10.3).

Welding parameters

<table>
<thead>
<tr>
<th>Material</th>
<th>Abbreviation</th>
<th>Material temperature¹ [°C]</th>
<th>Hot gas temperature² [°C]</th>
<th>Hot gas volume³ [l/min]</th>
</tr>
</thead>
<tbody>
<tr>
<td>High-density polyethylene</td>
<td>PE⁴</td>
<td>210...230</td>
<td>250...300</td>
<td>150...400</td>
</tr>
<tr>
<td>Polypropylene Types 1, 2 and 3</td>
<td>PP-H, PP-B, PP-R</td>
<td>210...240</td>
<td>250...300</td>
<td>150...400</td>
</tr>
<tr>
<td>Unplasticised polyvinyl chloride</td>
<td>PVC-U</td>
<td>190...200</td>
<td>330...360</td>
<td>150...400</td>
</tr>
<tr>
<td>Impact-resistant polyvinyl chloride</td>
<td>PVC-HI</td>
<td>170...180</td>
<td>280...340</td>
<td>150...400</td>
</tr>
<tr>
<td>Chlorinated polyvinyl chloride</td>
<td>PVC-C</td>
<td>195...205</td>
<td>300...360</td>
<td>150...400</td>
</tr>
<tr>
<td>Polyvinylidene fluoride</td>
<td>PVDF</td>
<td>240...260</td>
<td>280...350</td>
<td>150...400</td>
</tr>
</tbody>
</table>

¹ measured with an insert thermometer at the extrudate outlet of the welding machine
² measured 5 mm in the nozzle in the centre of the nozzle opening
³ drawn-in cold air volume at ambient pressure
⁴ PE 63, PE 80 and PE 100
Hot gas welding and hot gas welding with torch separate from filler rod

Standard values recommended by Röchling in accordance with DVS 2207-3 for connecting Polystone® CubX® sheets by means of hot gas welding with a torch separate from the filler rod

The following information on directive DVS 2207-3 includes welding parameter standard values for hot gas welding and hot gas welding with a torch separate from the filler rod. They apply for manual welding using the equipment specified in directive 2207-3, supplement 2 and the materials listed in Table 1. Before applying the parameters, the information provided by the semi-finished product manufacturers must also be taken into account. By matching the parameters of hot gas temperature, gas quantity and welding speed, it must be ensured that the adherends are plasticised at least 0.3 mm deep at the joint.

Welding parameters

<table>
<thead>
<tr>
<th>Welding process</th>
<th>Material</th>
<th>Abbreviation</th>
<th>Hot gas temperature¹ [°C]</th>
<th>Hot gas volume flow² [NI/min]</th>
<th>Welding speed³ [mm/min]</th>
<th>Welding force [N] with stick diameter Ø 3 mm</th>
<th>Welding force [N] with stick diameter Ø 4 mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hot gas fan welding (WF)</td>
<td>High-density polyethylene</td>
<td>PE⁴</td>
<td>300...320</td>
<td>40 - 60</td>
<td>70...100</td>
<td>8...10</td>
<td>20...25</td>
</tr>
<tr>
<td>Polypropylene Types 1, 2 and 3</td>
<td>PP-H, PP-B, PP-R</td>
<td>305...315</td>
<td>40 - 60</td>
<td>60...100</td>
<td>8...10</td>
<td>20...25</td>
<td></td>
</tr>
<tr>
<td>Unplasticised polyvinyl chloride</td>
<td>PVC-U</td>
<td>330...350</td>
<td>40 - 60</td>
<td>110...170</td>
<td>8...10</td>
<td>20...25</td>
<td></td>
</tr>
<tr>
<td>Chlorinated polyvinyl chloride</td>
<td>PVC-C</td>
<td>340...360</td>
<td>40 - 60</td>
<td>60...100</td>
<td>15...20</td>
<td>20...25</td>
<td></td>
</tr>
<tr>
<td>Polyvinylidene fluoride</td>
<td>PVDF</td>
<td>350...370</td>
<td>40 - 60</td>
<td>40...60</td>
<td>15...20</td>
<td>25...30</td>
<td></td>
</tr>
<tr>
<td>Hot gas string-bead welding (WZ)</td>
<td>High-density polyethylene</td>
<td>PE⁴</td>
<td>300...340</td>
<td>45 - 60</td>
<td>250...350</td>
<td>15...20</td>
<td>25...35</td>
</tr>
<tr>
<td>Polypropylene Types 1, 2 and 3</td>
<td>PP-H, PP-B, PP-R</td>
<td>300...340</td>
<td>45 - 60</td>
<td>250...350</td>
<td>15...20</td>
<td>25...35</td>
<td></td>
</tr>
<tr>
<td>Unplasticised polyvinyl chloride</td>
<td>PVC-U</td>
<td>350...370</td>
<td>45 - 60</td>
<td>250...350</td>
<td>15...20</td>
<td>25...35</td>
<td></td>
</tr>
<tr>
<td>Chlorinated polyvinyl chloride</td>
<td>PVC-C</td>
<td>370...390</td>
<td>45 - 60</td>
<td>180...220</td>
<td>20...25</td>
<td>30...35</td>
<td></td>
</tr>
<tr>
<td>Polyvinylidene fluoride</td>
<td>PVDF</td>
<td>365...385</td>
<td>45 - 60</td>
<td>200...250</td>
<td>20...25</td>
<td>30...35</td>
<td></td>
</tr>
</tbody>
</table>

¹ measured 5 mm in the nozzle in the centre of the main nozzle opening
² drawn-in cold air volume at the ambient pressure
³ drawn-in cold air volume as a function of the discharge quantity
⁴ depending on the welding filler material diameter, the welding temperature and the welding groove geometry
⁵ PE 63, PE 80, PE 100

As a filler, Röchling recommends the use of Polystone® P copolymer welding rod.
True strength comes from within.
Developed for chemical tank and plant construction.

**Material**

- **Polystone® P CubX®**: Polystone® P (PP), tried-and-tested for decades worldwide in the construction of rectangular and round tanks
- **Polystone® PPs CubX®**: Polystone® PPs, flame retardant (B1) for sensitive areas of application
- **Polystone® P CubX® white UV**: UV-resistant for outdoor use

**Product range**

- Dimensions: 2,000 x 1,500 mm
- Thickness: 57 mm
- **Polystone® P CubX®**: Colour grey (RAL 7032) standard from stock, other colours are available on request
- **Polystone® PPs CubX®**: Colour grey (RAL 7037)
- **Polystone® P CubX® white UV**: Colour white (RAL 9010)

**Characteristics**

- High longitudinal and transversal stiffness
- High chemical resistance
- Light weight, easy handling
- Good thermal insulation
- Easy to weld by means of heating element butt welding, hot gas welding, extrusion welding

**Areas of application**

- Rectangular tanks, e.g. for galvanising plants, steel pickling plants, sewage technology, cleaning systems, purification systems, and tank fittings
- Lids and partitions for round tanks
- Enclosures for ventilation systems
- Retrofitting and repair of rectangular tanks
- Additional significant potential in other applications outside the chemical industry, including flood retention, fishery breeding tanks, swimming pool technology, etc.