RÖCHLING

Processing instructions

Polystone® P CubX®

Röchling Industrial

Polystone® P CubX®

Contents

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Polystone® P CubX®

Areas of application

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

Alternative areas of application

There is a wide range of further uses of Polystone® P CubX® 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® (Homopolymer)
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)

	Test method	Unit	Value
Properties of the full cross-ribbed twin-wall sheet			
Density	DIN EN ISO 1183	g/cm³	0.3
Weight per unit area		kg/m²	17.1
Weld strength lattice/covering sheet		MPa	≥20
Flatness	DIN EN ISO 15860	mm/m	≤3
Properties of the covering sheets			
Density, RT	DIN EN ISO 1183	g/cm³	0.92
Notched impact strength, RT	DIN EN ISO 179 EA1	kJ/m²	7.9
Melt flow rate (MFR) 2.16 kg, 230°C	DIN EN ISO 1133	g/10 min.	0.45
Yield strain, RT	DIN EN ISO 527	%	7.19
Yield stress, RT	DIN EN ISO 527	N/mm²	34.56
Thermal properties, longitudinal, 150°C	DIN EN ISO 15013	%	0.33
Thermal properties, transverse, 150°C	DIN EN ISO 15013	%	0.17
Tensile modulus of elasticity, RT	DIN EN ISO 527	MPa	1700

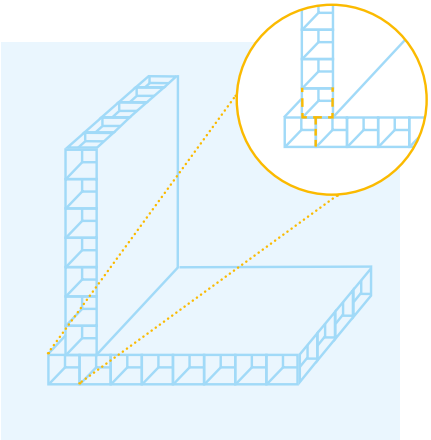
The data stated above are average values verified on the basis of regular static tests. They are in accordance with DIN EN 15860. These data are provided for information purposes only and shall not be regarded as binding unless expressly agreed in a contract of sales.

Connection options

Recommended constructive connection types

Wall/floor connection:
(also applies for cover and partition wall connections as well as edge reinforcements)

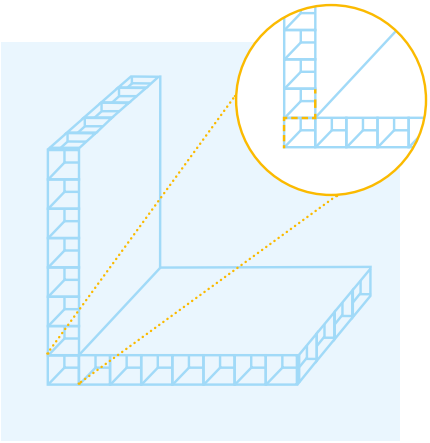
a) Base plate as a solid plate



b) Base plate made of Polystone® P CubX®

In both alternatives, the connection must be made as a T-joint with a fillet weld on both sides!

Corner joints (vertical tank edges)



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.

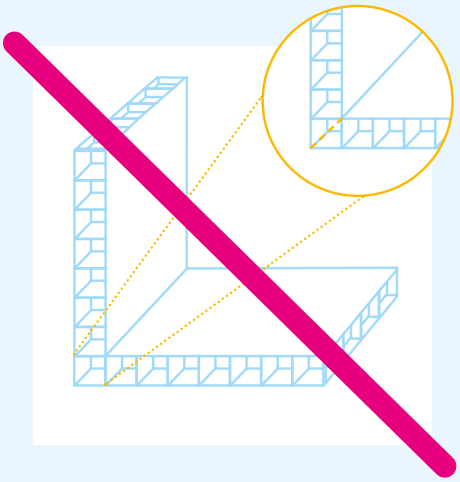
Alternative

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.

If T-joints are preferred for the corner joints, U-profiles can be used for the edge closure.

Note

The use of corner joints with mitres is not recommended unless full-surface mitre welding is possible



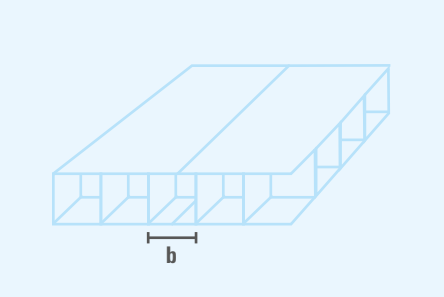
Processing parameters

Heating element butt welding

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

Processing Instructions (summary)

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 on 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. Preheating at reduced pressure ≤ 0.01 N/mm^{22}, 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. Immediately afterwards 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 has elapsed. For workshop tasks see Joining in section 4.1.3.
23. Complete the welding protocol.



Heating element butt weld

The maximum field sizes (b) of the inner lattice structure, resulting in vicinity of the butt weld must not exceed 50 mm.

Röchling recommends the process times for aligning, preheating and changing according to the standard values in table 4.1.3.1. for the nominal wall thickness of a 6 mm solid wall panel. The process times for joining can be found in the standard values for a 12 mm solid wall panel. To determine the process forces, an equivalent thickness of 12 mm must always be assumed and multiplied by the specific pressures according to table 4.1.3.1.

Reference values for the heated plate welding of panels made of polypropylene

Table 2. 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** Bead height on heating element at the end of the equalising time (minimum values) (equalising p = 0.10 ± 0.01 N/mm²)	**Preheating** Preheating time (preheating p ≤ 0.01 N/mm²)	**Changeover time** (maximum time) Changeover	**Joining** Joining pressure build-up time (maximum time, may be up to 50% shorter)	**Joining** Cooling time (minimum values) under joining pressure p = 0.10 ± 0.01 N/mm²
[mm]	[mm]	[s]	[s]	[s]	[Min]*)
to 4.5	0,5	to 53	5	6	6,5
4,5...7	0.5	53...81	5...6	6...7	6,5...9,5
7...12	1,0	81...135	6...7	7...11	9,5...15,5
12...19	1,0	135...206	7...9	11...17	15,5...24
19...26	1,5	206...271	9...11	17...22	24...32
26...37	2,0	271...362	11..14	22...32	32...45
37...50	2,5	362...450	14...17	32...43	45...61
50...70	3,0	450...546	17...22	43	61...85

*) A reduction in the cooling time of up to 50 %, i.e. reduction in joining pressure and removal of the welded part from the welding machine, is permitted in the following circumstances:
- 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 negligible loading of the joint connection.

Hot gas extrusion welding

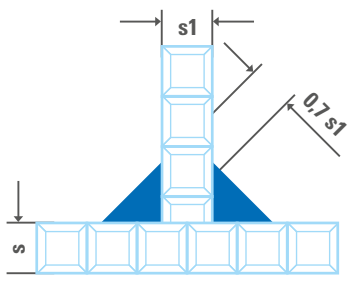
Standard values recommended by Röchling in accordance with DVS 2207-4 for connecting Polystone® P CubX® sheets by means of extrusion welding

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

Material	Abbreviation	Material temperature[1] [°C]	Hot gas temperature[2] [°C]	Hot gas volume[3] [l/min]
High-density polyethylene	PE-HD[4]	210...230	250...300	300
Polypropylene Types 1, 2 and 3	PP-H, PP-B, PP-R	210...240	250...300	300
Unplasticised polyvinyl chloride	PVC-U	170...180	300...360	300
Impact-resistant polyvinyl chloride	PVC-HI	170-180	280...340	300
Chlorinated polyvinyl chloride	PVC-C	195-205	300...360	300
Polyvinylidene fluoride	PVDF	240...260	280...350	300

[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 the ambient pressure
[4] PE 63, PE 80 and PE 100



c) Double fillet weld

Röchling recommends using a double fillet weld (see diagram) as the connecting seam when welding together Polystone® P CubX® sheets and when connecting them to a solid wall panel.

When using Polystone® P CubX® as a container wall, we recommend applying an equivalent thickness of **20 mm** for **"s1"** (material thickness wall) to calculate the design throat thickness **(0.7 x s1)**.

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

Röchling recommends using **Polystone® P copolymer** welding rod as the filler.

Processing parameters

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® P CubX® sheets by means of hot gas welding with a torch separate from the filler rod

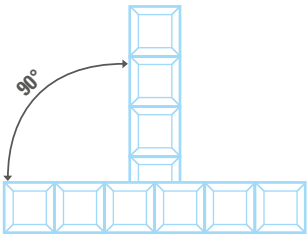
The following information on directive DVS 2207-3 includes welding parameter standard values for hot gas welding and hot-gas welding with a torch separate from the filler rod. They apply for manual welding using the equipment specified in directive 2207-3, supplement 2 and the materials listed in table 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.

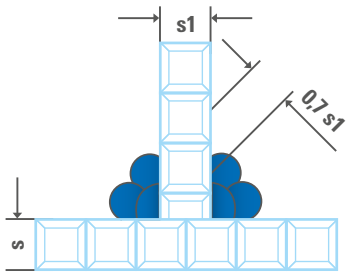
Welding parameters

Welding process	Material	Abbreviation	Hot gas temperature[1] [°C]	Hot gas volume flow[2] [Nl/min]	Welding speed [3] [mm/min]	Welding force (N) with stick diameter	
						3 mm	4 mm
Hot gas fan welding (WF)	High-density polyethylene	PE-HD[4]	300...320	40-50	70...90	8...10	20...25
	Polypropylene, Types 1, 2 and 3	PP-H, PP-B, PP-R	305...315	40-50	60...85	8...10	20...25
	Unplasticised polyvinyl chloride	PVC-U	330...350	40-50	110...170	8...10	20...25
	Chlorinated polyvinyl chloride	PVC-C	340...360	40-50	55...85	15...20	20...25
	Polyvinylidene fluoride	PVDF	350...370	40-50	45...50	15...20	25...30
Hot gas string-bead welding (WZ)	High-density polyethylene	PE-HD	300...340	45-55	250...350	15...20	25...35
	Polypropylene, Types 1, 2 and 3	PP-H, PP-B, PP-R	300...340	45-55	250...350	15...20	25...35
	Unplasticised polyvinyl chloride	PVC-U	350...370	45-55	250...350	15...20	25...35
	Chlorinated polyvinyl chloride	PVC-C	370...390	45-55	180...220	20...25	30...35
	Polyvinylidene fluoride	PVDF	365...385	45-55	200...250	20...25	30...35
	Ethylene / chlorotrifluoroethylene	E/CTFE	350...380	50...60 Hot gas Nitrogen	220...250	10...15	No data
	Tetrafluoroethylene perfluorovinyl ether copolymer	FEP	380..390	50...60	60...80	10...15	No data
	Tetrafluoroethylene perfluoromethyl vinyl ether	MFA	395...405	50...60	60...80	10...15	No data
	Perfluoroalcoxy copolymer	PFA	400..410	50...60	70	10...15	No data

[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] Depending on the welding filler material diameter and the welding groove geometry [4] PE 63, PE 80 and PE 100

Röchling recommends using **Polystone® P copolymer** welding rod as the filler.



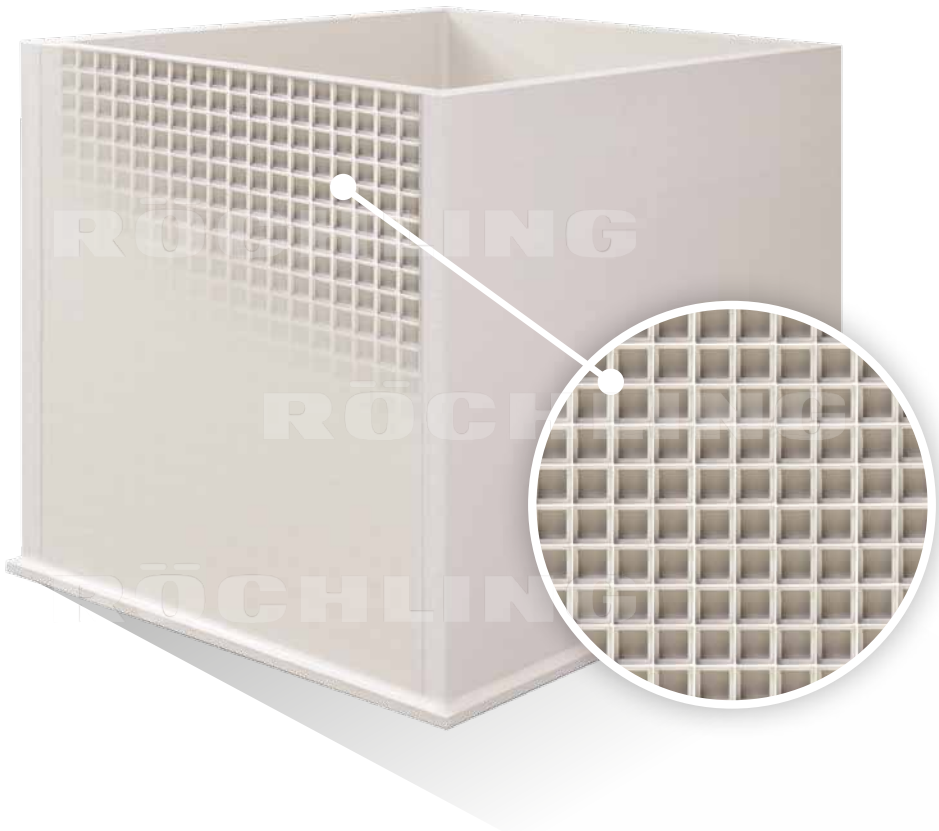


a) Double fillet weld

Röchling recommends using a double fillet weld (see DVS extract) as the connecting seam when welding together Polystone® P CubX® sheets and when connecting them to a solid wall panel with a wall thickness of > 15 mm.

We recommend applying an equivalent wall thickness of **20 mm** for **"s1"** to calculate the design throat thickness **(0.7 x s1)**.

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



Polystone® P CubX®

True strength comes from within.
Developed for chemical tank and plant construction.

Material

Polystone® P (PP), tried-and-tested for decades worldwide in the construction of rectangular and round tanks

Product range

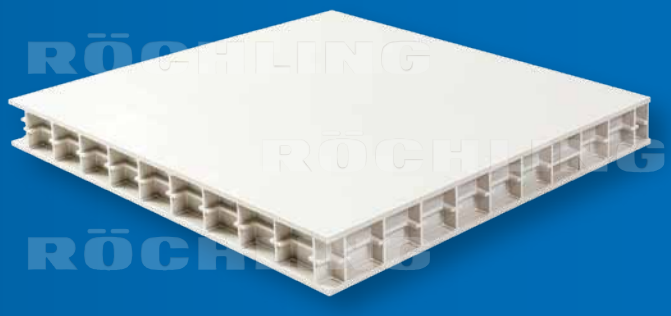
- Format: 2,000 x 1,500 mm
- Thickness: 57 mm
- Colour: grey (RAL 7032) standard from stock, other colours are available on request

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

Application areas

- Rectangular tank, for example, for galvanising plant, steel pickling plant, sewage technology, cleaning systems, purification systems, 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.



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