

SSAB water mains

A reliable and economically advantageous
solution for water supply

SSAB's system of water mains

distributes
clean water
safely

A system made up of steel water mains is a reliable and economically advantageous solution for drinking water supply for decades. The water mains and fittings are delivered flexibly according to the customers' wishes.

Steel is a versatile piping material suited for several joining methods. Joints are realised either as welded, flanged or couplings.

The long life of steel water mains is ensured by external polyethylene coating and an internal concrete or epoxy layer suitable for use with drinking water. There are also suitable inside coatings for sewage and rainwater.

SSAB has long experience from large and demanding pipeline deliveries. Our solutions are economically competitive and technically first rate. Partnering with customers means to us commitment to high delivery capacity and punctuality as well as expert technical customer service.



Installation of large diameter pipes and fittings on site.



1. Key advantages of SSAB water mains

- Steel pipes' diameter tolerances are precise
- Curved fittings allow large-radius bends in pipelines
- The number of joints in a pipeline can be optimised by the choice of pipe lengths (6–16 m)
- The system of water mains is modifiable which allows implementing special solutions also by welding
- Steel withstands extremely well external stresses and internal hydraulic shocks
- Coated steel pipe withstands environmental stresses (e.g. de-icing salt, corrosion, aggressive clay soil and contaminated soil layers) extremely well and guarantees long service life even without cathodic protection
- High delivery capacity and punctual deliveries directly to the site
- Expert technical customer service

2. Steel pipes

Welded steel pipes are used in water mains systems where the maximum service pressure is normally 16 bar. Pipes are protected internally by concrete or epoxy and externally by polyethylene or polyurethane. They are generally made of steel grade P235GH TC1 in accordance with Standard EN 10217-5. Table 1 shows the mechanical properties of the steel grades.

Steel water mains are spiral welded by the submerged arc method. The maximum height of the weld seam is 2.5 mm when wall thickness is ≤ 8 mm. With greater wall thicknesses, the maximum height of the seam is 3.0 mm. Pipe ends are lathed to prepare them for joining by welding or a couplings.

2.1 Dimensions and weights

Outside diameters of pipes and wall thicknesses are selected from the dimensions specified in Standard EN 10220. Table 2 shows SSAB's most common dimensions in yellow, and gives the weights per unit length of uncoated steel pipes and coatings. Total weights per unit length of coated steel pipes will be counted by uncoated steel pipe, external and internal coatings.

2.2 Tolerances

Straightness

Maximum deviation 1.0 mm per metre of pipe.

Lengths

The lengths of water mains are agreed individually for each order. The nominal pipe lengths on stock are generally 6 m and/or 12 m, the maximum length is 16 m from production for big projects. If necessary, pipes can be manufactured to specific lengths, e.g. 8 metres with length tolerance of ± 20 mm. When OV and DIN/G welded joints are used, exact construction length will be an original pipe length minus a length of joint part.

Diameter

The diameter measured with a measuring ring at the pipe end must not deviate more than ± 2 mm from the pipe's nominal diameter over a distance of 100 mm from the pipe end. Over the rest of the pipe body, diameter tolerance is $\pm 0.75\%$ of the nominal diameter, however, not more than ± 6 mm.

Out-of-roundness

The difference between the largest and smallest diameter at the pipe end must not exceed 2 % of the nominal diameter.

Wall thickness

Wall thickness tolerance is $\pm 8\%$ of nominal thickness of the pipe.

3. Pipe markings

One end of a pipe is marked with:

- the manufacturer's code
- the steel grade
- the pipe number

Other methods of marking are agreed when placing the order.

4. Permissible pressures

During pipe production leak-tightness of each pipe will be tested by hydrostatic water pressure test. Test pressure is calculated using equation in standard EN 10217-1 section 10.3.2 or standard EN 10217-5 section 11.6. Table 3 gives examples of rough permissible pressures for certain pipe sizes at the room temperature according to outside diameter and wall thickness for steel grade P235. The calculations assumed coated pipes which allows ignoring the corrosion allowance.

5. Ring stiffness

The ring stiffness of a pipe indicates the ability of the pipe to resist external soil, traffic loads together with negative internal pressure. Table 3 gives rough ring stiffnesses for certain pipe sizes according to outside diameter and wall thickness.

6. Non-destructive testing

The tightness of pipes is examined by a hydraulic pressure test using a test pressure derived from the applicable technical delivery condition standard. The test lasts a minimum of 15 seconds. Welded joints are tested with ultra sound and splices and any possible repair welded areas are X-rayed in accordance with the requirements of technical delivery condition standards.

7. Material certificate

A material certificate complying with Standard EN10204-3.1 is issued for water mains manufactured by SSAB.

8. Protection of pipe ends

Each pipe end is sealed by plastic film for transportation and storage.





Table 1. Mechanical properties

Steel grade	Standard	Yield strength R_{eH} N/mm ² Minimum	Tensile strength R_m N/mm ²	Elongation A_5 % Minimum
P235TR1	EN 10217-1	235	360 – 500	25
P235GH ¹⁾	EN 10217-5	235	360 – 500	25
P355TR1 ²⁾	EN 10217-1	355	500 – 650	21

¹⁾ P235GH is SSAB's most common steel grade on stock

²⁾ P355TR1 is produced acc. to suitable parts of EN 10217-1, not on stock

Table 2. Dimensions and weights per unit length of steel pipes

Outside diameter, mm	Weight (kg/m) according to wall thickness t (mm)									Coating (kg/m)	
	6,3	7,1	8,0	8,8	10,0	11,0	12,5	14,2	16,0	PE-v	Concrete
406,4	62,2	69,9	78,6	86,3	97,8	107	121			4,0	22,5
508	77,9	87,7	98,6	108	123	135	153			5,5	28,1
610	93,8	106	119	130	148	162	184	209		6,6	33,7
711		123	139	152	173	190	215	244		7,6	49,1
813			159	175	198	218	247	280	314	9,9	56,2
914			179	196	223	245	278	315	354	11,2	63,2
1016			199	219	248	273	309	351	395	12,4	84,2
1220			239	263	298	328	372	422	475	14,9	101

SSAB's most common dimensions on stock with steel material P235GH are in yellow.

Total weight per unit length of coated steel pipe will be counted by uncoated steel pipe, external PE-coating and internal concrete lining. The pipe length is 12 m on stock.

PE density 920 kg/m³ and concrete density 2,300 kg/m³ were used to calculate weights per unit length.

Table 3. Permissible pressure

Outside diameter, mm	Wall thickness mm									
	6,3	7,1	8,0	8,8	10,0	11,0	12,5	14,2	16,0	
Permissible pressure (bar) according to outside diameter and wall thickness										
406,4	35	40	47	52	61	67	78			
508	28	32	37	42	49	53	62			
610	23	27	31	35	40	44	51	60		
711		23	26	30	35	38	44	51		
813			23	26	30	33	39	45		
914			21	23	27	29	34	40		
1016			18	21	24	26	31	36	41	
1220			15	17	20	22	26	30	34	

Table shows rough permissible service pressures at room temperature according to standard SFS 3274 according to outside diameter and wall thickness for steel grade P235 (design strength and safety factor 1,5). The calculations assumed coated pipes which allows ignoring the corrosion allowance. Accurate calculation of permissible service pressure shall be made according to application e.g. according to standard EN 13480-3.

During pipe production leak-tightness of each pipe will be tested by hydrostatic water pressure test. Test pressure is calculated using equation in standard EN 10217-1 section 10.3.2 or standard EN 10217-5 section 11.6.

Table 4. Ring stiffness

Outside diameter, mm	Wall thickness mm									
	6,3	7,1	8,0	8,8	10,0	11,0	12,5	14,2	16,0	
Ring stiffness (kN/m ²) according to outside diameter and wall thickness										
406,4	59	74	117	146	219	296	442			
508	26	38	55	75	112	152	226			
610	15	22	32	43	65	88	115	195		
711		14	20	27	41	55	83	123		
813			13	18	27	37	55	82		
914			9	13	19	26	39	58		
1016			7	9	14	19	26	42	52	
1220			4	5	8	11	16	24	35	

Table shows rough calculated ring stiffness according to outside diameter and wall thickness of steel grade P235(E=206000 MPa).

Ring stiffness equates 3% compression of outside diameter. The calculations assumed coated pipes which allows ignoring the corrosion allowance. Accurate determination of ring stiffness shall be made by experiment.



9. Joining methods

Pipe joints (Fig. 1) connect pipes and fittings into an integrated pipeline. More information is given in SSAB's installation instruction "Water mains. Installation".

Joints can be divided into two main types: tension resistant and non-tension resistant ones. Joints may also be divided by application as follows:

Butt joint

Used in water pipelines especially when diameter \geq DN 800 and the joint can be repaired from the inside after welding.

OV welded joint

Used in water lines to facilitate installation and to allow 1.5 – 3.0 degree bends at joints. Since the joint is welded from the inside to make it tension-resistant, it is suitable for diameters \geq DN 800 and pressures up to 16 bar.

DIN/G-welded joint

Used in pipelines requiring easy installation of the tension resistant joint and the possibility of making less than 1.0 degree bends.

Welded from the outside. Suits pipe diameters DN 400 – 900 pressure class up to PN16 and DN 1000 – 1200 pressure class up to PN10. DIN/G joint is made with a rubber ring partially embedded in the concrete lining whereby interior concreting need not be finished on a building site.

Flange joint

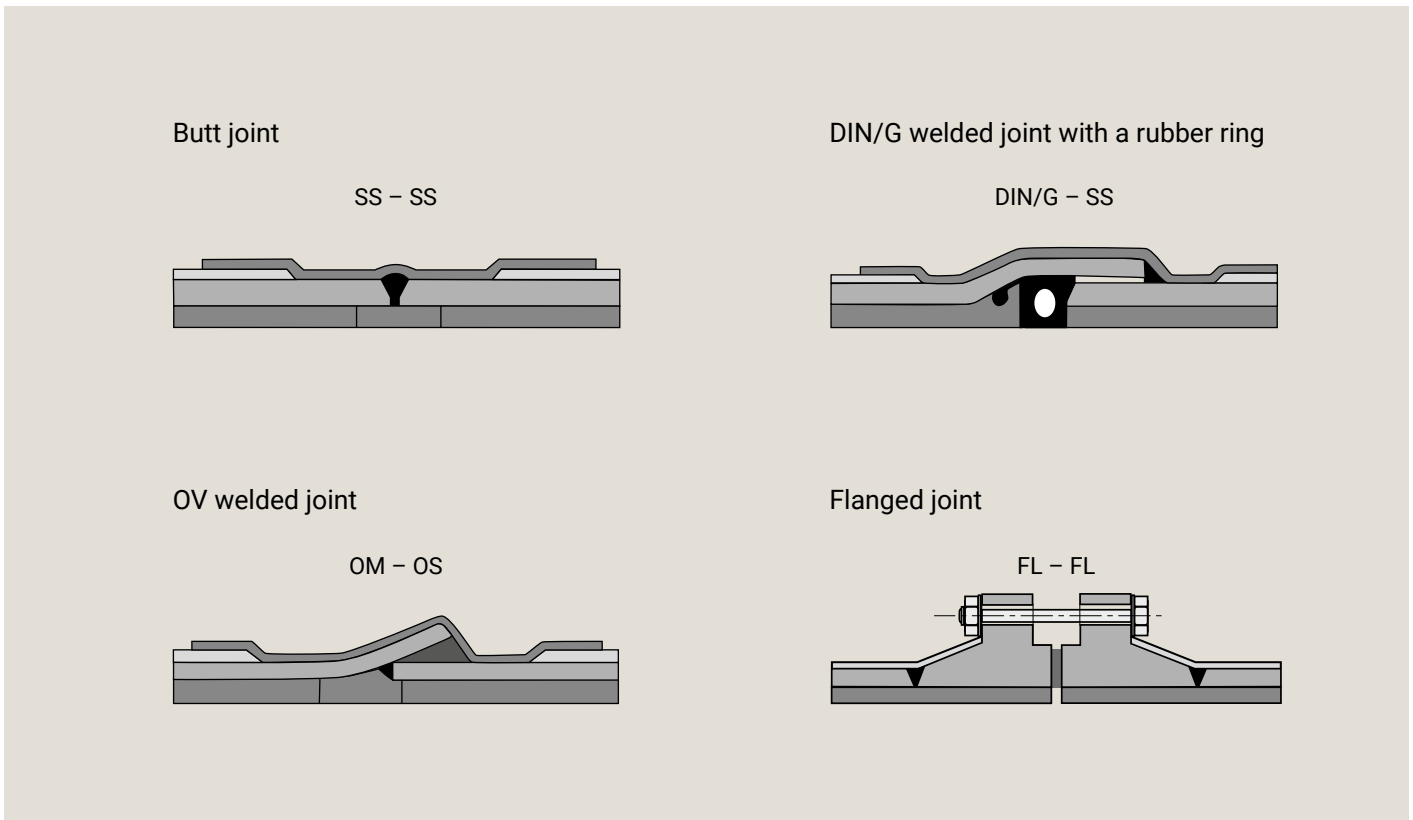
Flange joints are widely used in industry. In the case of underground pipes flange joints are used mainly to connect valves, drain pipe, air-discharge or manhole. Rubber gasket with inside steel ring is recommended, e.g. KLINGER-KGS.

Coupling joint

Steel pipes can also be joined by various mechanical couplings such as those manufactured by Straub, Teekay, Viking-Johnson and Victaulic. Then the ends of pipes are lathed and external weld seams are ground to fit the Often bare steel surfaces are painted under couplings.



Figure 1. Joining methods

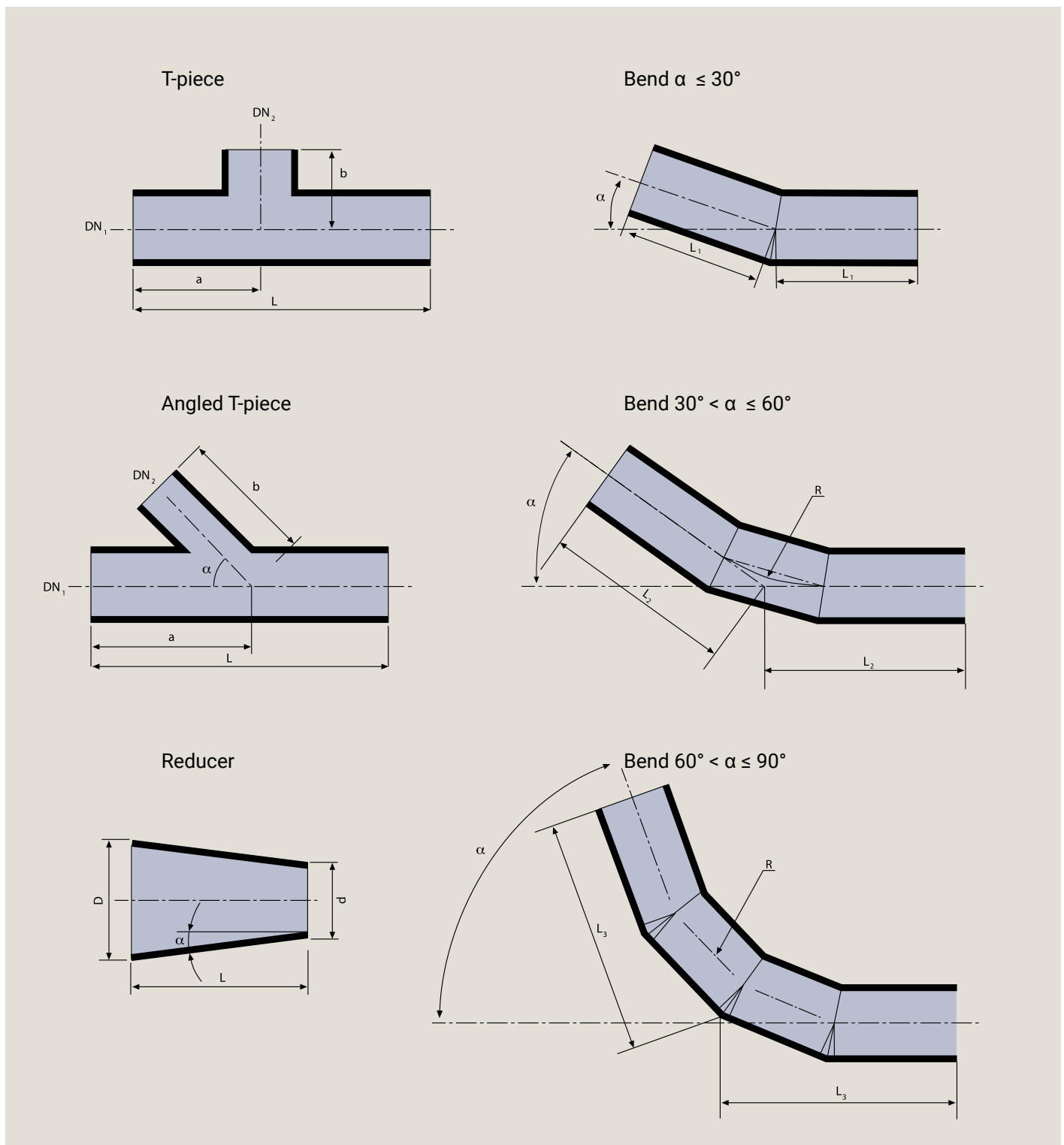


10. Pipe fittings

Internally and externally coated pipe fittings (Fig. 2) can be joined easily to each other because all joining methods (Fig.1) can be selected also for pipe fittings. Besides standard EN 10224 fittings, SSAB also delivers fittings for water mains tailored to customer specifications.

That improves considerably the modifiability of the system. More information is given in SSAB's data sheet "Water mains. Pipes and fittings".

Figure 2. Examples of SSAB's standard pipe fittings



11. Coatings

Table 5. External 3-layer coating DIN 30670 N-n (1991) for straight pipes¹⁾

Property	Typical values
Density grade	HDPE (High Density Polyethylene)
Thickness, mm	> 2.2 DN 400 – 450 > 2.5 DN 500 – 750 > 3.0 DN 800 – 1200
	Increased thickness (v) + 0.7 mm, max 6 mm
¹⁾ The 3-layer coating consists of polyethylene, adhesion and epoxy layers.	

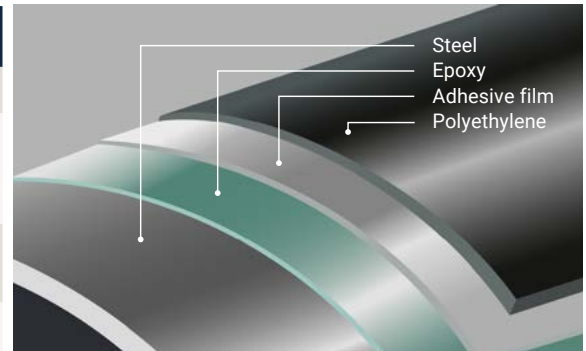


Table 6. External PUR-coating EN 10290 PUR class B Type 1 for pipe fittings

Property	Typical values
Thickness, mm	≥ 1.5 Increased thickness max 6 mm
Colour type	Two-component, black
Hardness	~ 80 Shore D

Table 7. Internal cement mortar lining EN 10298 CEM I N

Property	Typical values
Thickness, mm	8 -1/+3 DN 400 – 600 10 -1/+3 DN 700 – 900 12 -1/+4 DN 1000 – 1200
Flexural tensile strength N/mm ²	> 5
Compressive strength N/mm ²	> 50

Table 8. Internal painting

Property	Typical values
Colour type	Solvent-free, two-component
Thickness, mm	≥ 350 µm or as separately agreed
Hardness	> 65 Shore D
Wear resistance	Excellent
Bacteria resistance	Excellent
Paint type is selected according to application and customers need.	

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SSAB
Harvialantie 420
FI-13300 Hämeenlinna, Finland

Tel. +358 20 5911

www.ssab.com

The SSAB logo consists of the letters 'SSAB' in a bold, blue, sans-serif font. The 'S' and 'A' are connected, and the 'B' has a distinctive shape with a vertical bar on its right side.