Physical and Chemical Properties of the Composite Pipes

Feature	Value	Test Parameters		Test Method
		Parameter	**Value**	
Dimensional Stability	%2	Test Temperature (C°)	135	EN 743
		Test Duration (h°)		
		For e>8 mm	1	
		8 mm< e < 16 mm	2	
		For e>16 mm	4	
		Test Part/Piece	3	
Falling Ball Test – Impact Resistance	There should not be breakage, cracks.	Test Temperature (C°)	0	
		Test Part/Piece	10	
		Height (cm)	50	
		Test mass (gram)		
		For dn 20 mm;	250	
		For dn 25 mm;	500	
		For dn 32 mm;	800	
		For dn 40 mm;	1.250	
		For dn 50 mm;	2,000	
		For dn 63 mm;	3,200	
		For dn 75 mm;	10,000	
		For dn >90 mm;	16,000	
Melt Mass Flow Rate (Raw Material)	<0,5 gram / 10 minutes	Test Temperature (C°)	230	ISO 1133
		Mass (kg)	2,16	
		Test Part/Piece	3	
Melt Mass Flow Rate (Pipe)	Compared with the raw material result, the difference should be %30 at maximum.	Test Temperature (C°)	230	ISO 1133
		Mass (kg)	2,16	
		Test Part/Piece	3	

The Mechanical Properties of the Composite Pipes

Feature	Value	Test Parameters				Test Method
		Hydrostatic (circle) Stress (Mpa)	Test Temp. (°C)	Test Dur. (h)	The number of Test Parts	
Resistance to Inner Pressure	No damage should occur throughout the test.	16,0	20	1	3	TS EN ISO 1167-1/2
		4,3	95	22	3	
		3,8	95	165	3	
		3,5	95	1000	3	

The Hygienic Properties of the Composite Pipes

It is certified by the institutions TSEK and GOST that FIRAT Composite Pipes have no effect on human health, do not change the color, odor and flavor of the water.
Its Compliance to the Turkish Food Codex is approved and certified by the Sanitation Institute.

The Dimensions of the Composite Pipes

Rated Diameter (dn)	Average Outer Diameter		Pipe Series (S): 2,5 - Class 1/10 Bar	Weight (kg/m)
20	20.0	20.3	3.4	0.188
25	25.0	25.3	4.2	0.274
32	32.0	32.3	5.4	0.447
40	40.0	40.4	6.7	0.687
50	50.0	50.5	8.3	1.075
63	63.0	63.6	10.5	1.715

The Water Transportation Capacity of the Composite Pipes

Composite Pipe Volumes*

Diameter of Pipe (Ø'af)	Volume (lt/m)
20	0.137
25	0.216
32	0.353
40	0.556
50	0.876
63	1.385

*1 m. içinde

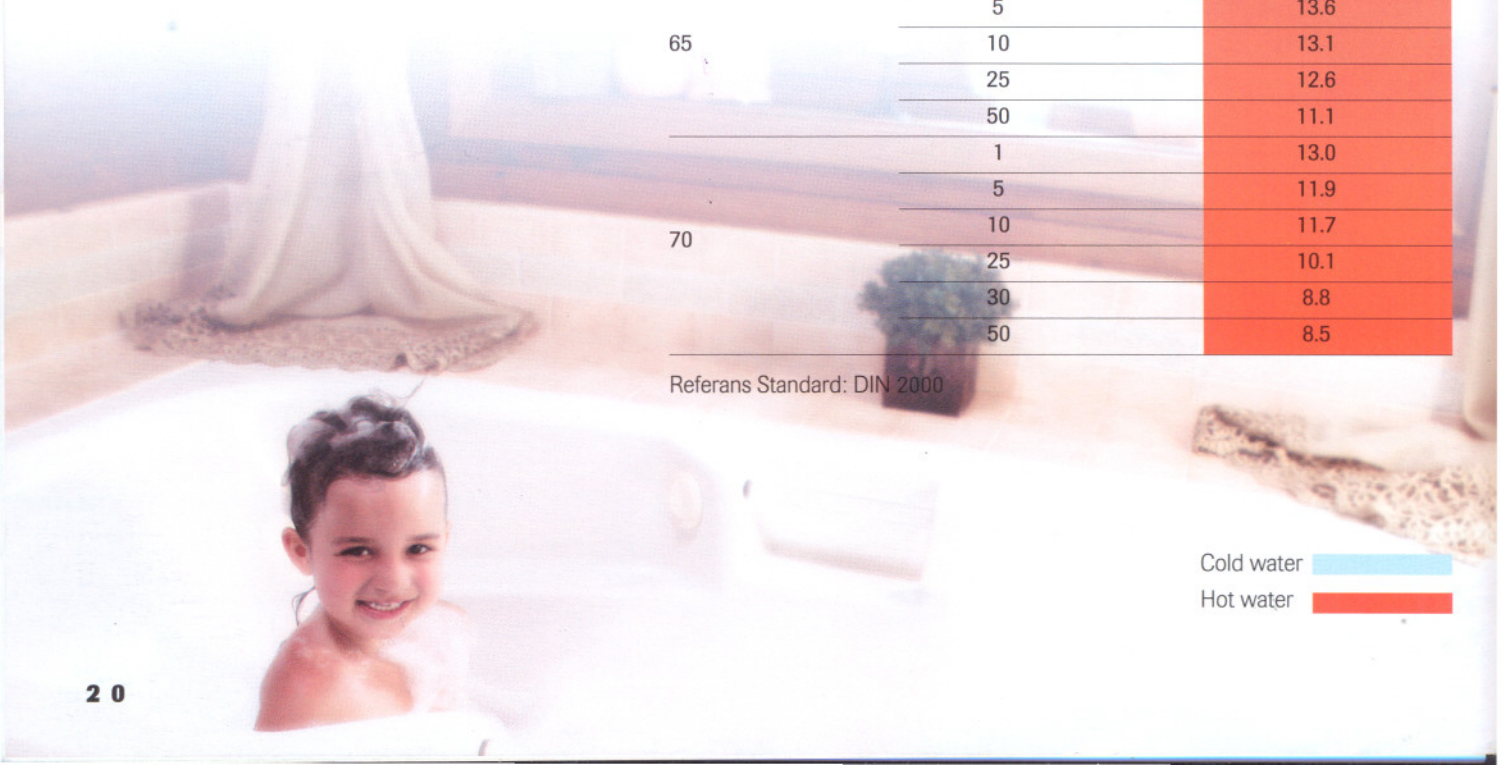
Metal attachment section that manufactured by the injection coating technique in a way that enables %100 sealing.

Service Lives of Composite Pipes

Service Lives of Composite Pipes used in Water Installations

Temperature [0C]	Service Life [Year]	Operating Pressure [Bar]
20	1	30.0
	5	28.1
	10	27.3
	25	26.5
	50	25.7
30	1	25.5
	5	23.9
	10	23.2
	25	22.3
	50	21.8
40	1	21.5
	5	20.2
	10	19.6
	25	18.8
	50	18.3
50	1	18.3
	5	17.0
	10	16.5
	25	15.9
	50	15.4
60	1	15.4
	5	14.3
	10	13.8
	25	13.3
	50	12.7
65	1	14.6
	5	13.6
	10	13.1
	25	12.6
	50	11.1
70	1	13.0
	5	11.9
	10	11.7
	25	10.1
	30	8.8
	50	8.5

Referans Standard: DIN 2000



Cold water

Hot water

Service Lives of Composite Pipes used in Heating Systems

Usage Period	Temperature (°C)	Service Life (Year)	Operating Pressure (Bar)
30 days/year	75	5	17.27
		10	13.79
		25	11.74
		45	10.18
	80	5	13.50
		10	13.80
		25	11.14
		42.5	9.79
	85	5	12.42
		10	11.87
		25	10.14
		37.5	9.18
	90	5	11.39
		10	10.94
		25	8.86
		35	8.16
60 days/year	75	5	14.11
		10	13.57
		25	11.58
		45	10.05
	80	5	13.12
		10	12.54
		25	10.56
		40	9.41
	85	5	12.03
		10	11.52
		25	9.22
		35	8.48
	90	5	11.04
		10	9.76
		25	7.81
		30	7.46
90 days/year	75	5	14.02
		10	13.38
		25	11.33
		45	9.82
	80	5	12.90
		10	12.35
		25	10.05
		37.5	9.08
	85	5	11.81
		10	10.72
		25	8.58
		32.5	8.03
	90	5	10.59
		10	8.96
		25	7.17

Linear Expansion of Composite Pipes

Composite Pipes produced from raw material Type-3 PP-R elongate under heat and shrink under cold due to their physical nature. The rule of expansion should be considered in installations to be implemented at distances longer than 5 meters.

Linear expansion is calculated according to the following formula;

$\Delta l = a \times L \times \Delta T$

Δl : Amount of elongation (mm)
a : Linear Expansion Coefficient (a = 0,04 mm/mK)
L : Pipe Length (m)
ΔT : Temperature Difference

Linear Expansion Table for Composite Pipes

Pipe Lenght	Tempereture Difference ΔT						
(m)	10°C	20°C	30°C	40°C	50°C	60°C	70°C
5	2	4	6	8	10	12	14
10	4	8	12	16	20	24	28
15	6	12	18	24	30	36	42
20	8	16	24	32	40	48	56

Linear Expansion Δl (mm)

Free Expansion in Composite Pipes

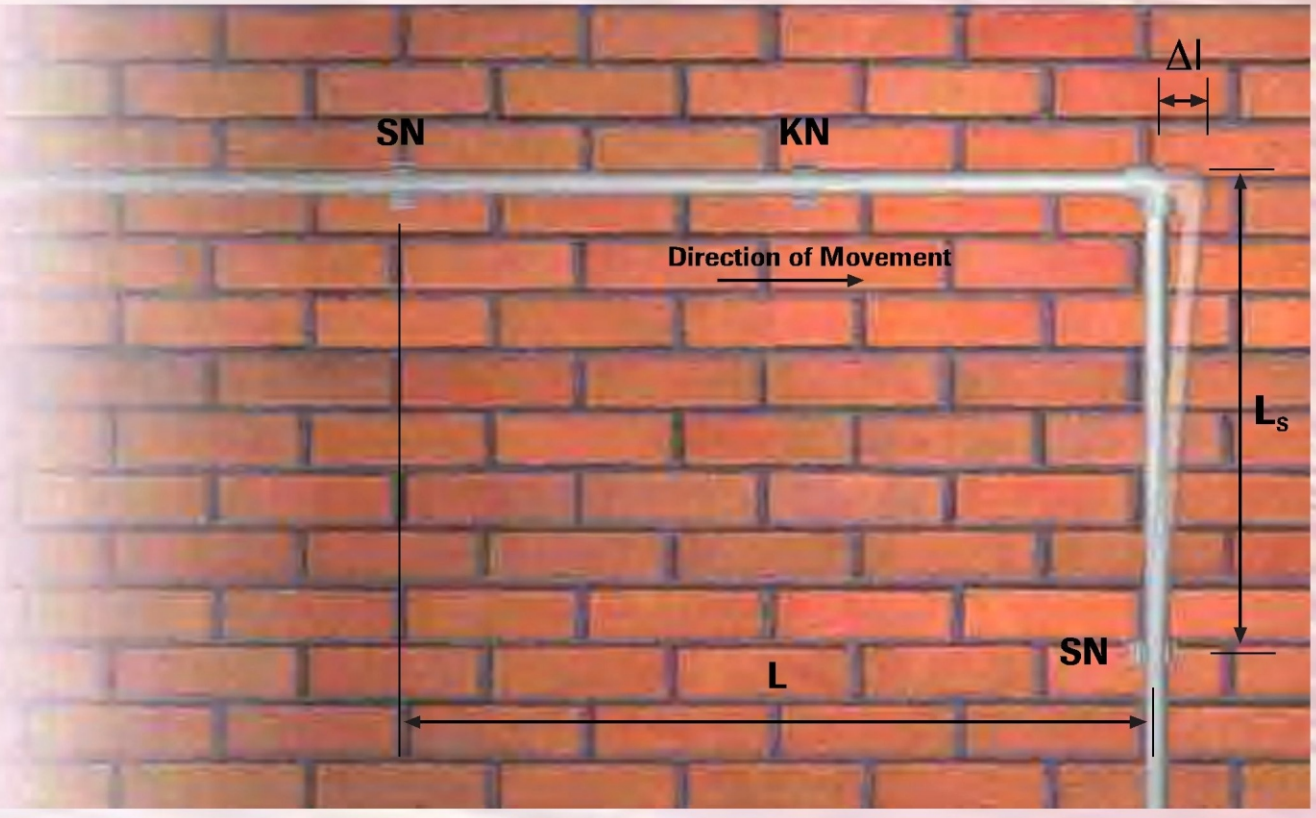
Free expansion parts are formed in order to prevent the installation from linear expansions which may arise in the pipes due to temperature variations.

Length of free bending part is calculated by the following formula:

$$L_s = K \times \sqrt{d \times \Delta l}$$

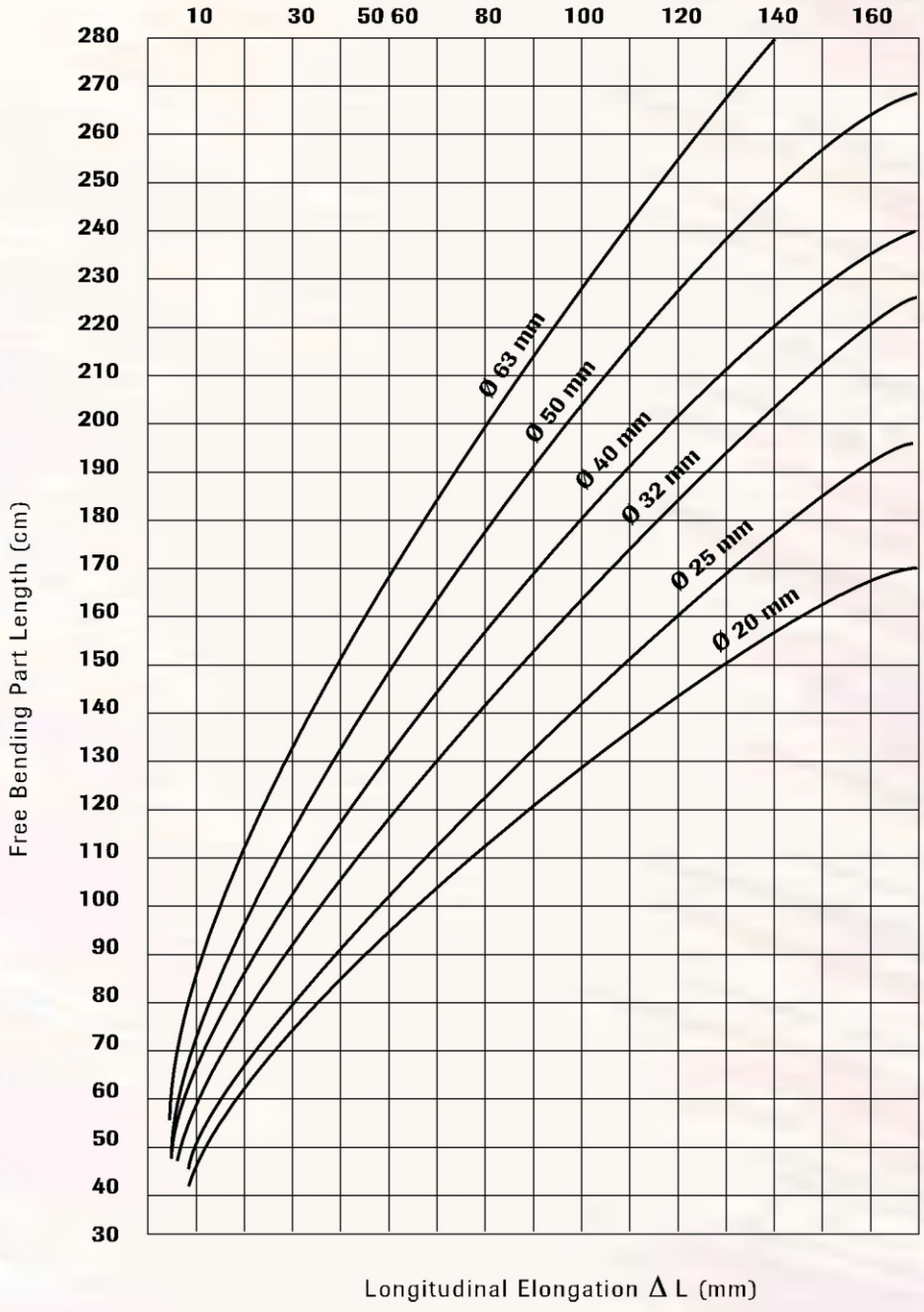
L_s : Length of free bending part (mm)
K : Specific Constant of Material (K = 30)
d : Pipe Outer Diameter
Δl : Amount of Elongation (mm)
L : Pipe Length (m)
KN : Varying Point
SN : Fixed Point

Length of Free Bending Part



Characteristics of Composite Pipes

Linear Expansion of Composite Pipes



Expansion Chambers in Composite Pipes

If linear expansion cannot be removed by direction change, an expansion chamber must be designed. Shape of this expansion chamber is given below.

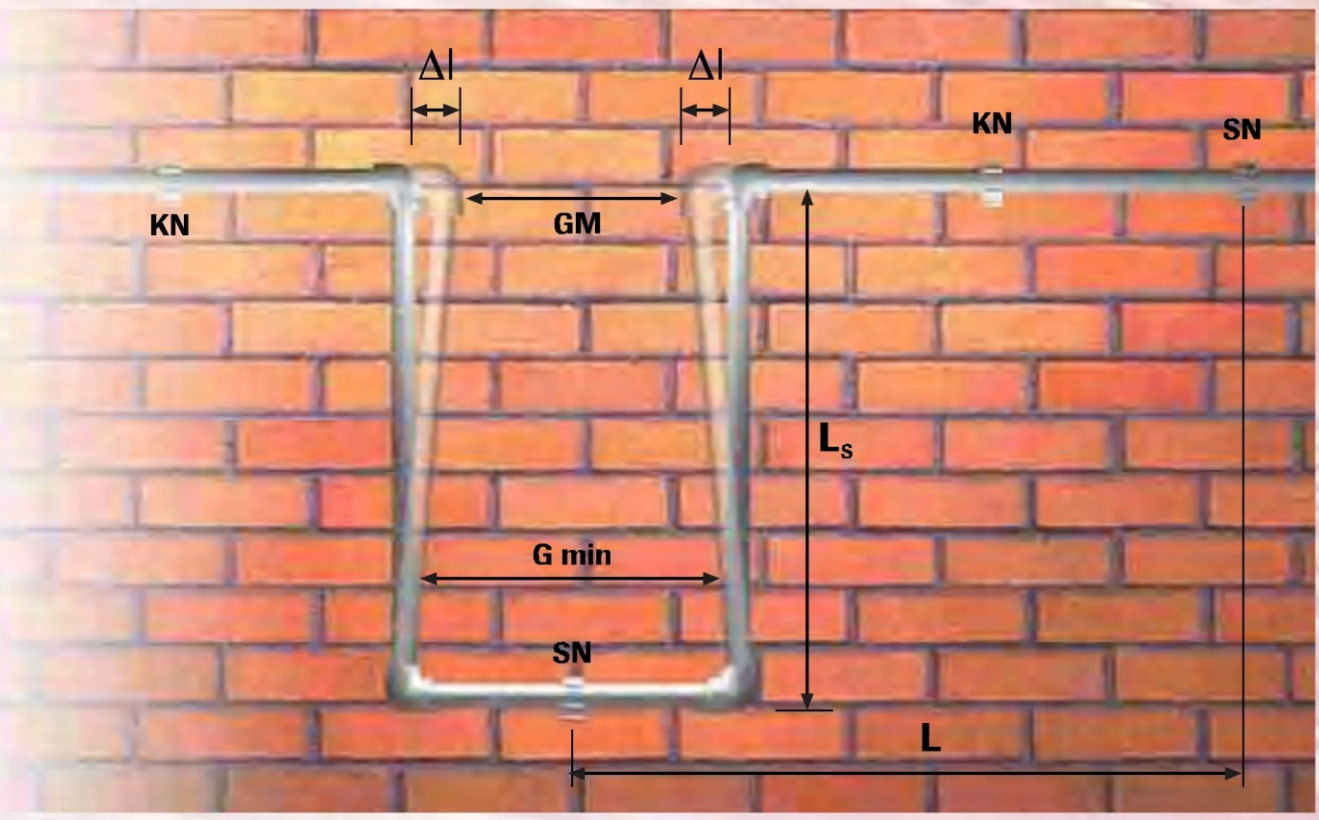
Calculation of minimum width of expansion chamber :
D L Elongation amount is found in table 1 by the use of temperature difference and the pipe.

Installation expands total of 2 Δ L, one Δ L at each ends. A safety margin (GM) of 150 mm is provided considering that elongation amount may increase under temperature differences. In this case, minimum width of expansion chamber becomes 150+2Δ.

$$Gmin = 2 \times \Delta l \times GM$$

Gmin : Minimum Width of Expansion Chamber (mm)
GM : Safety Margin (150 mm)
Δl : Elongation Amount (mm)
L_s : Length of Free Bending Part (mm)
L : Pipe Length (m)
KN : Varying Point
SN : Fixed Point

Width of Expansion Chambers



Clamp Spacings in Composite Pipes

Fixed clamp spacings at horizontally installed Composite Pipes can be found by the help of the table below. Clamp spacings in vertical installation should be the same with those in horizontal installation.

Fixed Points: Fixed points prevent non-controllable movements in the installation and separate entire installation into expansion sections. Elongation amount and weight of pipe, fluid inside the pipe and, if any, other forces play role in determination of the places of fixed points.

Fixed Points should be stronger than the repulsive force of the free bending part. Fixed points should be placed at appropriate distances for availability to expansion.

Fixed points are used to fix pipes tightly to a specified place. Fixed points should be implemented with connectors or double-sided attachment system. Bushing and fitting welding places are utilized in this double-sided attachment system.

Composite Pipe Clamp Spacings

Temperature Difference T	Pipe Diameter (mm)					
	20	**25**	**32**	**40**	**50**	**63**
0°C	115	130	150	165	185	215
20°C	90	100	115	130	145	165
30°C	90	100	115	130	145	165
40°C	80	90	105	120	135	155
50°C	80	90	105	120	135	155
60°C	75	85	100	115	130	145
70°C	65	75	90	105	120	135

Clamp Spacings (cm)

Diameter Selection and Pressure Drop in Composite Pipes

Pipe diameter selection in water installations is determined according to the pressure and discharge amount of existing water. Primarily, average discharge speed of water is calculated. Ratios between discharge speed amount and discharge and diameter are determined. Following table shows discharge amount and pressure per meter in Composite pipes.

Table Showing Pressure and Discharge Rates of Composite 20 Pipes