valuation of σ_{LPL}-values

The pipe material shall be evaluated in accordance with ISO 9080 or equivalent where internal pressure tests are made in accordance with ISO 1167-1 and ISO 1167-2 to find the σ_{LPL}-values. The σ_{LPL}-value thus determined shall at least be as high as the corresponding values of the reference curves given in Figure 1, 2, 3 or 4.

NOTE One equivalent way of evaluation is to calculate the σ_{LPL} -value for each temperature (for example 20 °C, 60 °C and 95 °C) individually.

The reference curves in Figures 1, 2, 3 and 4 in the temperature range of 10 °C to 95 °C are derived from the following equations:

First branch (i.e. the left hand portion of the lines as shown in Figures 1, 2 ,3 and 4)

for PP-H: $$\log t = -46{,}364 - \frac{9601{,}1 \log \sigma}{T} + \frac{20381{,}5}{T} + 15{,}24 \log \sigma \quad (1)$$

for PP-B: $$\log t = -56{,}086 - \frac{10157{,}8 \log \sigma}{T} + \frac{23971{,}7}{T} + 13{,}32 \log \sigma \quad (2)$$

for PP-R: $$\log t = -55{,}725 - \frac{9484{,}1 \log \sigma}{T} + \frac{25502{,}2}{T} + 6{,}39 \log \sigma \quad (3)$$

for PP-RCT: $$\log t = -119{,}546 + 52176{,}696 \frac{1}{T} + 31{,}279 \log(\sigma) - 23738{,}797 \frac{\log \sigma}{T} \quad (4)$$

Second branch (i. e. the right hand portion of the lines as shown in Figures 1, 2 and 3)

for PP-H: $$\log t = -18{,}387 + \frac{8918{,}5}{T} - 4{,}1 \log \sigma \quad (5)$$

for PP-B: $$\log t = -13{,}699 + \frac{6970{,}3}{T} - 3{,}82 \log \sigma \quad (6)$$

for PP-R: $$\log t = -19{,}98 + \frac{9507}{T} - 4{,}11 \log \sigma \quad (7)$$

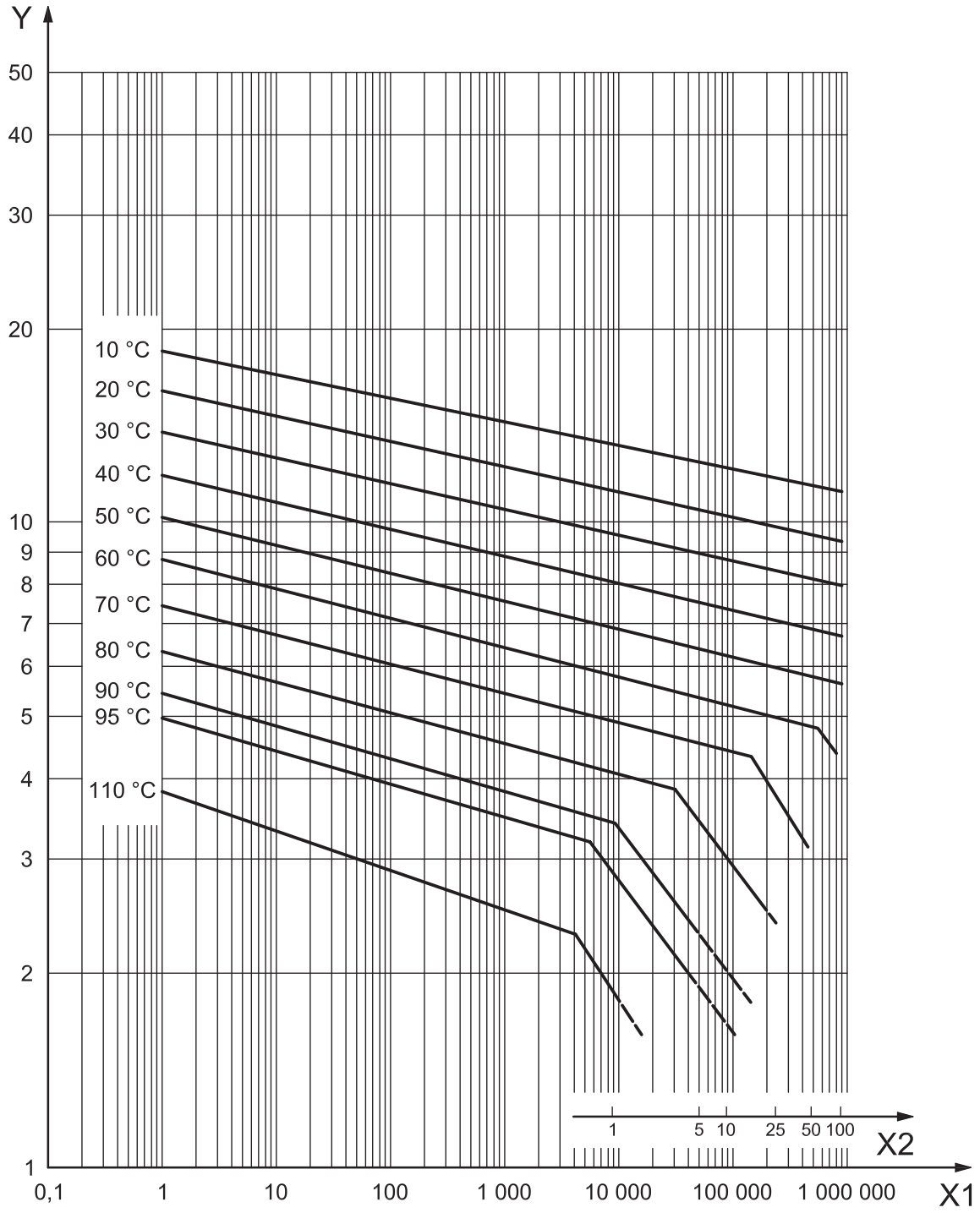
To demonstrate conformance to the reference lines pipe samples should be tested at following temperatures and at various hoop stresses such that, at each of the temperatures given, at least three failure times fall in each of the following time intervals:

Temperatures 20 °C; 60 °C to 70 °C; 95 °C;

Time intervals 10 h to 100 h, 100 h to 1000 h,1000h to 8760 h and above 8760 h.

In tests lasting more than 8760 h, once failure is reached at a stress and time at least on or above the reference line, any time after that may be considered as the failure time. Testing should be carried out in accordance with ISO 1167-1 and -2.

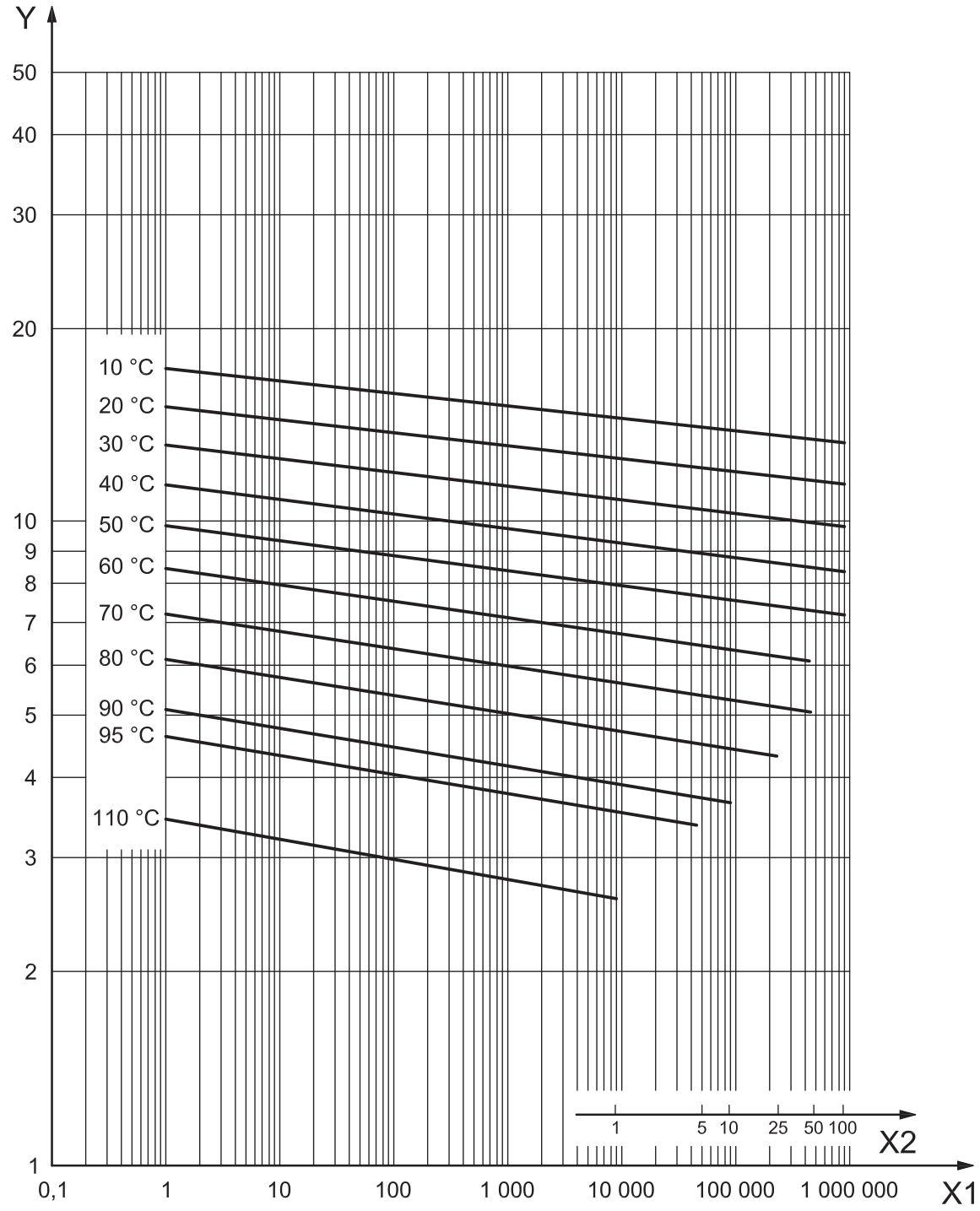
Conformance with the reference lines should be demonstrated by plotting the individual experimental results on the graph. At least 97,5% of them should lie on or above the reference line.



Key

X1	time, t_1, to fracture, in hours
X2	time, t_2, to fracture, in years
Y	hoop stress, σ, in megapascal

Reference curves for expected strength of PP-R



Key

X1	time, t_1, to fracture, in hours
X2	time, t_2, to fracture, in years
Y	hoop stress, σ, in megapascal

Figure 4 – Reference curves for expected strength of PP-RCT

General characteristics

Appearance

When viewed without magnification the internal and external surfaces of pipes shall be smooth, clean and free from scoring, cavities, and other surface defects to an extent that would prevent conformity to this standard. The material shall not contain visible impurities. Slight variations in appearance of the color are permitted. The ends of the pipe shall be cut cleanly and square to the axis of the pipe.

Geometrical characteristics

eneral

Dimensions shall be measured in accordance with ISO 3126.

The maximum calculated pipe value of $S_{calc,max}$, for the applicable class of service conditions and design pressure, p_D, is given in Table

$S_{calc,max}$-values for PP-R

p_D	Application			
	Class 1	Class 2	Class 4	Class 5
bar	$S_{calc,max}$-values [a]			
4	6,9	5,3	6,9	4,7
6	5,0	3,5	5,5	3,2
8	3,8	2,6	4,1	2,4
10	3,0	2,1	3,3	1,9

[a] The values are rounded to the first place of decimals.

Ta $S_{calc,max}$-values for PP-RCT

p_D	Application			
	Class 1	Class 2	Class 4	Class 5
bar	$S_{calc,max}$-values [a]			
4	8,2	8,2	8,2	7,3
6	6,1	5,7	6,1	4,9
8	4,5	4,3	4,6	3,7
10	3,6	3,4	3,7	2,9

[a] The values are rounded to the first place of decimals.

Dimensions of pipes

Outside diameters

For the applicable pipe dimension class, the mean outside diameter, d_{em}, of a pipe shall conform to Table , as applicable.

Wall thicknesses and their tolerances

For any particular class of service conditions, design pressure and nominal size, the minimum wall thickness, e_{min}, shall be chosen in such a way that the corresponding S series or S_{calc}-value is equal to or less than the values of $S_{calc,max}$ given

For the applicable pipe dimension class, the wall thickness of the base pipe or finished pipe (see clause 6.1), shall conform to Table , as applicable, in relation to the pipe series S and S_{calc}-values, respectively. However, pipes intended to be joined together by fusion shall have a minimum wall thickness of 2,0 mm.

The tolerance on the wall thickness, e, shall conform to Table

Pipe dimensions for dimension class A
(sizes in accordance with ISO 4065:1996 and applicable for all classes of service conditions

Dimensions in millimetres

Nominal size DN/OD	Nominal outside diameter	Mean outside diameter		Pipe series						
							S 4 [a]	S 3,2	S 2,5	
				Wall thicknesses						
	d_n	$d_{em,min}$	$d_{em,max}$	e_{min} and e_n						
16										
20	20	20	20,3				2,3	2,8	3,4	
25	25	25	25,3				2,8	3,5	4,2	
32	32	32	32,3				3,6	4,4	5,4	
40	40	40	40,4				4,5	5,5	6,7	
50	50	50	50,5				5,6	6,9	8,3	
63	63	63	63,6				7,1	8,6	10,5	
75	75	75	75,7				8,4	10,3	12,5	
90	90	90	90,9				10,1	12,3	15,0	
110	110	110	111				12,3	15,1	18,3	
125	125	125	126,2				14,0	17,1	20,8	

[a] Only valid for PP-RCT

Pipe dimensions for dimension class C
(non-preferred pipe sizes used for example for heating systems.)

Dimensions in millimetres

Nominal size DN/ OD	Nominal outside diameter	Mean outside diameter		Wall thicknesses	S_{calc}
	d_n	$d_{em,min}$	$d_{em,max}$	e_{min} and e_n	
14	14	14,0	14,3	2,0	3,0
15	15	15,0	15,3	2,0	3,2
16	16	16,0	16,3	2,0	3,5
17	17	17,0	17,3	2,0	3,8
18	18	18,0	18,3	2,0	4,0
20	20	20,0	20,3	2,0	4,5

Tolerance on wall thicknesses

Dimensions in millimetres

Minimum wall thickness e_{min}		Tolerance [a] X	Minimum wall thickness e_{min}		Tolerance [a] X
>	≤		>	≤	
1,0	2,0	0,3	17,0	18,0	1,9
2,0	3,0	0,4	18,0	19,0	2,0
3,0	4,0	0,5	19,0	20,0	2,1
4,0	5,0	0,6	20,0	21,0	2,2
5,0	6,0	0,7	21,0	22,0	2,3
6,0	7,0	0,8	22,0	23,0	2,4
7,0	8,0	0,9	23,0	24,0	2,5
8,0	9,0	1,0	24,0	25,0	2,6
9,0	10,0	1,1	25,0	26,0	2,7
10,0	11,0	1,2	26,0	27,0	2,8
11,0	12,0	1,3	27,0	28,0	2,9
12,0	13,0	1,4	28,0	29,0	3,0
13,0	14,0	1,5	29,0	30,0	3,1
14,0	15,0	1,6	30,0	31,0	3,2
15,0	16,0	1,7	31,0	32,0	3,3
16,0	17,0	1,8	32,0	33,0	3,4

[a] The tolerance is expressed in the form $^{+X}_{0}$ mm, where "x" is the value of the tolerance given.