بلاستيك الوطنية
Al-Watania Plastics

الوطنية للصناعة
AL WATANIA FOR INDUSTRIES

رؤية VISION 2030
المملكة العربية السعودية
KINGDOM OF SAUDI ARABIA

# PVC
## PIPES CATALOGUE
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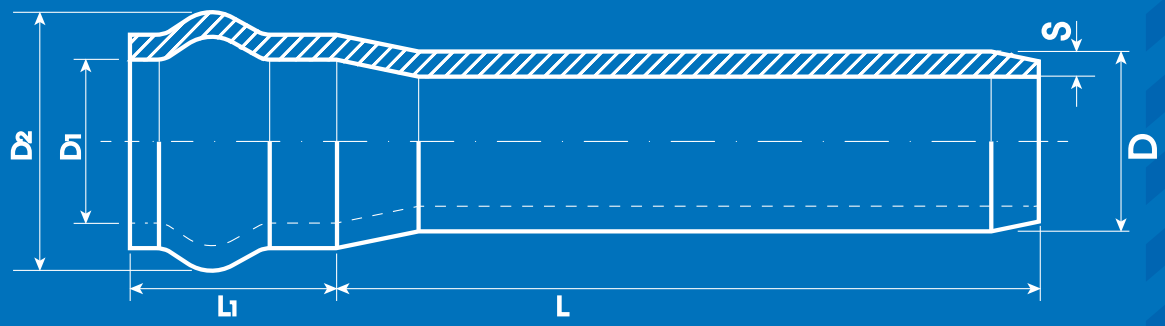
# INTERNATIONAL ORGANIZATION FOR STANDARDIZATION






تنتج بلاستك الوطنية أنابيب أنابيب اليو بي في سي وفق المواصفات السعودية التالية :

| Standard No. | SASO-ISO - 1452 | رقم المواصفة |
|---|---|---|
| Reference No. | ISO 1452 | مرجع المواصفة |
| Issue Year | 2009 | سنة الاصدار |
| Adoption Year | 2014 | سنة الاعتماد |
| **Numeric Coding** | **922 - 1452** | **الترميز الرقمي** |

## Table 1 - Nominal outside diameters and tolerances

| Dimensions in millimetres | | | |
|---|---|---|---|
| Nominal outside diameter | Tolerance for mean outside diameter, $d_{em}$[a] | Tolerance for out-of-roundness[b] | |
| $d_n$ | $x$ | S 20 to S 16[c] | S 12,5 to S 5[d] |
| 12 | 0,2 | — | 0,5 |
| 16 | 0,2 | — | 0,5 |
| 20 | 0,2 | — | 0,5 |
| 25 | 0,2 | — | 0,5 |
| 32 | 0,2 | — | 0,5 |
| 40 | 0,2 | 1,4 | 0,5 |
| 50 | 0,2 | 1,4 | 0,6 |
| 63 | 0,3 | 1,5 | 0,8 |
| 75 | 0,3 | 1,6 | 0,9 |
| 90 | 0,3 | 1,8 | 1,1 |
| 110 | 0,4 | 2,2 | 1,4 |
| 125 | 0,4 | 2,5 | 1,5 |
| 140 | 0,5 | 2,8 | 1,7 |
| 160 | 0,5 | 3,2 | 2,0 |
| 180 | 0,6 | 3,6 | 2,2 |
| 200 | 0,6 | 4,0 | 2,4 |
| 225 | 0,7 | 4,5 | 2,7 |
| 250 | 0,8 | 5,0 | 3,0 |
| 280 | 0,9 | 6,8 | 3,4 |

| Dimensions in millimetres | | | |
|---|---|---|---|
| Nominal outside diameter | Tolerance for mean outside diameter, $d_{em}$[a] | Tolerance for out-of-roundness[b] | |
| $d_n$ | $x$ | S 20 to S 16[c] | S 12,5 to S 5[d] |
| 315 | 1,0 | 7,6 | 3,8 |
| 355 | 1,1 | 8,6 | 4,3 |
| 400 | 1,2 | 9,6 | 4,8 |
| 450 | 1,4 | 10,8 | 5,4 |
| 500 | 1,5 | 12,0 | 6,0 |
| 560 | 1,7 | 13,5 | 6,8 |
| 630 | 1,9 | 15,2 | 7,6 |
| 710 | 2,0 | 17,1 | 8,6 |
| 800 | 2,0 | 19,2 | 9,6 |
| 900 | 2,0 | 21,6 | -- |
| 1 000 | 2,0 | 24,0 | -- |

*a*) The tolerance conforms to grade D of ISO 11922 - 1 [3] for $d_n \leq 50$ and to grade C for $d_n > 50$. The tolerance is expressed in the form $^{+x}_{0}$mm, where $x$ is the value of the tolerance.

*b*) The tolerance is expressed as the difference between the largest and the smallest outside diameter in a cross-section of the pipe (i.e. $d_e$, max – $d_e$, min).

*c*) For $d_n \leq 250$, the tolerance conforms to grade N of ISO 11922 - 1 [3]. For $d_n > 250$, the tolerance conforms to grade M of ISO 11922 - 1 [3]. The requirement for out-of-roundness is only applicable prior to storage.

## Table 2 - Nominal (minimum) wall thicknesses

| Nominal outside diameter, $d_n$ | Nominal pressure PN based on design coefficient $C$ = 2,0[a] | | | | | | |
|---|---|---|---|---|---|---|---|
| | PN 6 | PN 8 | PN 10 | PN 12.5 | PN 16 | PN 20 | PN 25 |
| 110 | 2,7 | 3,4 | 4,2 | 5,3 | 6,6 | 8,1 | 10,0 |
| 125 | 3,1 | 3,9 | 4,8 | 6,0 | 7,4 | 9,2 | 11,4 |
| 140 | 3,5 | 4,3 | 5,4 | 6,7 | 8,3 | 10,3 | 12,7 |
| 160 | 4,0 | 4,9 | 6,2 | 7,7 | 9,5 | 11,8 | 14,6 |
| 180 | 4,4 | 5,5 | 6,9 | 8,6 | 10,7 | 13,3 | 16,4 |
| 200 | 4,9 | 6,2 | 7,7 | 9,6 | 11,9 | 14,7 | 18,2 |
| 225 | 5,5 | 6,9 | 8,6 | 10,8 | 13,4 | 16,6 | — |
| 250 | 6,2 | 7,7 | 9,6 | 11,9 | 14,8 | 18,4 | — |
| 280 | 6,9 | 8,6 | 10,7 | 13,4 | 16,6 | 20,6 | — |
| 315 | 7,7 | 9,7 | 12,1 | 15,0 | 18,7 | 23,2 | — |
| 355 | 8,7 | 10,9 | 13,6 | 16,9 | 21,1 | 26,1 | — |
| 400 | 9,8 | 12,3 | 15,3 | 19,1 | 23,7 | 29,4 | — |
| 450 | 11,0 | 13,8 | 17,2 | 21,5 | 26,7 | 33,1 | — |
| 500 | 12,3 | 15,3 | 19,1 | 23,9 | 29,7 | 36,8 | — |
| 560 | 13,7 | 17,2 | 21,4 | 26,7 | — | — | — |
| 630 | 15,4 | 19,3 | 24,1 | 30,0 | — | — | — |
| 710 | 17,4 | 21,8 | 27,2 | — | — | — | — |
| 800 | 19,6 | 24,5 | 30,6 | — | — | — | — |
| 900 | 22,0 | 27,6 | — | — | — | — | — |
| 1000 | 24,5 | 30,6 | — | — | — | — | — |

| Nominal outside diameter, $d_n$ | Pipe series S | | | | | | |
|---|---|---|---|---|---|---|---|
| | Nominal (minimum) wall thickness | | | | | | |
| | S 20 (SDR 41) | S 16 (SDR 33) | S 12,5 (SDR 26) | S 10 (SDR 21) | S 8 (SDR 17) | S 6,3 (SDR 13,6) | S 5 (SDR 11) |
| | Nominal pressure PN based on design coefficient $C$ = 2,5 | | | | | | |
| | | PN 6 | PN 8 | PN 10 | PN 12.5 | PN 16 | PN 20 |
| 12 | | — | — | — | — | — | 1,5 |
| 16 | | — | — | — | — | — | 1,5 |
| 20 | | — | — | — | — | 1,5 | 1,9 |
| 25 | | — | — | — | 1,5 | 1,9 | 2,3 |
| 32 | | — | 1,5 | 1,6 | 1,9 | 2,4 | 2,9 |
| 40 | | 1,5 | 1,6 | 1,9 | 2,4 | 3,0 | 3,7 |
| 50 | | 1,6 | 2,0 | 2,4 | 3,0 | 3,7 | 4,6 |
| 63 | | 2,0 | 2,5 | 3,0 | 3,8 | 4,7 | 5,8 |
| 75 | | 2,3 | 2,9 | 3,6 | 4,5 | 5,6 | 6,8 |
| 90 | | 2,8 | 3,5 | 4,3 | 5,4 | 6,7 | 8,2 |

• a To apply a design coefficient of 2,5 (instead of 2,0) for pipes with nominal diameters above 90 mm, the next higher pressure rating, PN, shall be chosen.

• **NOTE 1** The nominal wall thicknesses conform to ISO 4065[4].

• **NOTE 2** The PN 6 values for S 20 and S 16 are calculated with the preferred number 6,3.

## Table 3 — Tolerance on wall thicknesses at any point

| Dimensions in millimetres | | | | | |
|---|---|---|---|---|---|
| Nominal (minimum) wall thickness - $e_n$ | | Tolerance for wall thickness $x$ | Nominal (minimum) wall thickness - $e_n$ | | Tolerance for wall thickness $x$ |
| > | ≤ | | > | ≤ | |
| 1,0 | 2,0 | 0,4 | 21,0 | 22,0 | 2,4 |
| 2,0 | 3,0 | 0,5 | 22,0 | 23,0 | 2,5 |
| 3,0 | 4,0 | 0,6 | 23,0 | 24,0 | 2,6 |
| 4,0 | 5,0 | 0,7 | 24,0 | 25,0 | 2,7 |
| 5,0 | 6,0 | 0,8 | 25,0 | 26,0 | 2,8 |
| 6,0 | 7,0 | 0,9 | 26,0 | 27,0 | 2,9 |
| 7,0 | 8,0 | 1,0 | 27,0 | 28,0 | 3,0 |
| 8,0 | 9,0 | 1,1 | 28,0 | 29,0 | 3,1 |
| 9,0 | 10,0 | 1,2 | 29,0 | 30,0 | 3,2 |
| 10,0 | 11,0 | 1,3 | 30,0 | 31,0 | 3,3 |
| 11,0 | 12,0 | 1,4 | 31,0 | 32,0 | 3,4 |
| 12,0 | 13,0 | 1,5 | 32,0 | 33,0 | 3,5 |
| 13,0 | 14,0 | 1,6 | 33,0 | 34,0 | 3,6 |
| 14,0 | 15,0 | 1,7 | 34,0 | 35,0 | 3,7 |
| 15,0 | 16,0 | 1,8 | 35,0 | 36,0 | 3,8 |
| 16,0 | 17,0 | 1,9 | 36,0 | 37,0 | 3,9 |
| 17,0 | 18,0 | 2,0 | 37,0 | 38,0 | 4,0 |
| 18,0 | 19,0 | 2,1 | | | |
| 19,0 | 20,0 | 2,2 | | | |
| 20,0 | 21,0 | 2,3 | | | |

**NOTE 1** The tolerance applies to the nominal (minimum) wall thickness and is expressed in the form 0 + x mm, where x is the value of tolerance for the mean wall thickness, em.

**NOTE 2** The tolerance for wall thickness, e, at any point, conforms to grade W of ISO 119223 ]1-[.

### 6.5 Length of pipe

The nominal pipe length, l, shall be a minimum length which does not include the depth of the socketed portions, as shown in Figure 1.

**NOTE**

The preferred nominal length of pipe is 6 m. Other lengths are subject to agreement between the manufacturer and the purchaser.

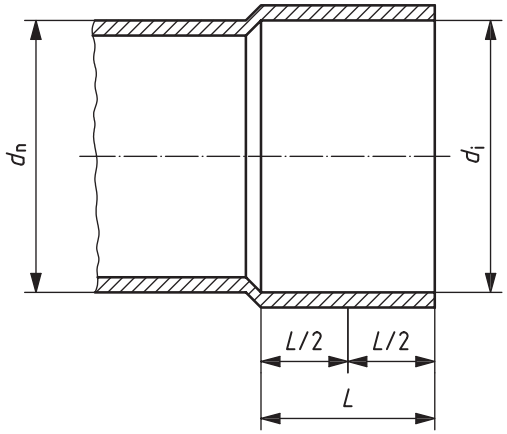



**Figure 2 — Socket for solvent cementing**

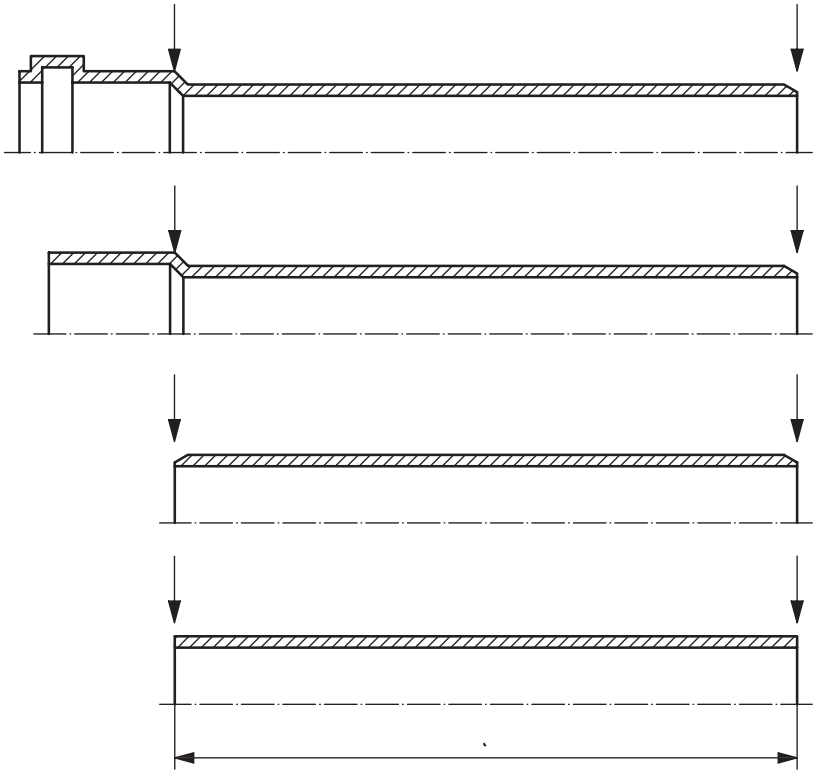


**Figure 1 — Points of measurement for nominal pipe lengths**

The nominal inside diameter of a socket shall be equal to the nominal outside diameter, dn, of the pipe.

The maximum included internal angle of the socketed portion shall not exceed 030) ‹30° min).

The requirements for mean inside diameters, dim, of sockets shall apply at the midpoint of the socket length.

**6.6 Pipes with sockets**

**6.6.1 Sockets for solvent cementing**

The dimensions of sockets for solvent cementing are given in Figure 2. They shall conform to Table 4.

## Table 4 — Dimensions of sockets for solvent cementing

| Dimensions in millimetres | | | | |
|---|---|---|---|---|
| Nominal inside diameter of socket | Mean inside diameter of socket | | Maximum out-of roundness for $d_i$ | Minimum socket length |
| $d_n$ | $d_{im,\ min}$ | $d_{im,\ max}$ | a | $L_{min}$ b |
| 12 | 12,1 | 12,3 | 0,25 | 12,0 |
| 16 | 16,1 | 16,3 | 0,25 | 14,0 |
| 20 | 20,1 | 20,3 | 0,25 | 16,0 |
| 25 | 25,1 | 25,3 | 0,25 | 18,5 |
| 32 | 32,1 | 32,3 | 0,25 | 22,0 |
| 40 | 40,1 | 40,3 | 0,25 | 26,0 |
| 50 | 50,1 | 50,3 | 0,3 | 31,0 |
| 63 | 63,1 | 63,3 | 0,4 | 37,5 |
| 75 | 75,1 | 75,3 | 0,5 | 43,5 |
| 90 | 90,1 | 90,3 | 0,6 | 51,0 |
| 110 | 110,1 | 110,4 | 0,7 | 61,0 |
| 125 | 125,1 | 125,4 | 0,8 | 68,5 |
| 140 | 140,2 | 140,5 | 0,9 | 76,0 |
| 160 | 160,2 | 160,5 | 1,0 | 86,0 |
| 180 | 180,2 | 180,6 | 1,1 | 96,0 |
| 200 | 200,2 | 200,6 | 1,2 | 106,0 |
| 225 | 225,3 | 225,7 | 1,4 | 118,5 |
| 250 | 250,3 | 250,8 | 1,5 | 131,0 |
| 280 | 280,3 | 280,9 | 1,7 | 146,0 |
| 315 | 315,4 | 316,0 | 1,9 | 163,5 |
| 355 | 355,4 | 356,1 | 2,0 | 183,5 |
| 400 | 400,4 | 401,2 | 2,0 | 206,0 |

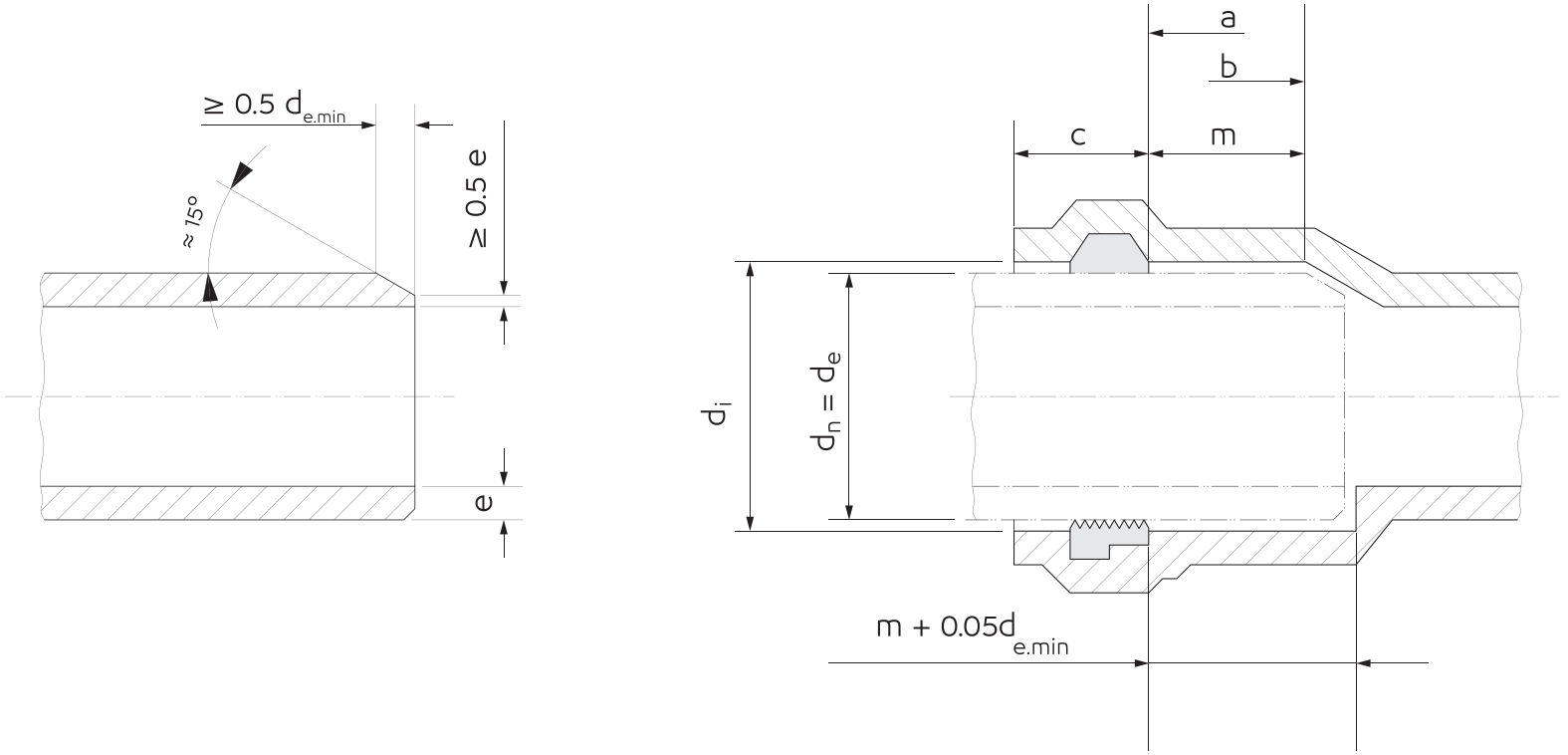
| | |
|---|---|
| a | The out-of-roundness tolerances are rounded values of 0,25 grade M to ISO 11922 - 1[3]. |
| b | The minimum socket lengths are equal to ($0,5d_n$ + 6 mm) or 12 mm if ($0,5d_n$ + 6 mm) ≤ 12 mm. |

**6.6.2 Sockets for elastomeric ring seal type joints**

The minimum depth of engagement, mmin, of single sockets with elastomeric ring seal joints (see Figure 3) is based on pipe lengths up to 12 m and shall conform to Table 5.

The wall thickness of the sockets at any point, except the sealing ring groove, shall not be less than the minimum wall thickness of the connecting pipe. The wall thickness of the sealing ring groove shall not be less than 0,8 times the minimum wall thickness of the connecting pipe.

The requirements for mean inside diameters, dim, of sockets shall apply at the midpoint of the depth of engagement, m.




**Key**

a/ Start of sealing area.

b/ End of cylindrical part of socket and pipe.

**Figure 3 — Socket and spigot end for pipes with elastomeric sealing**

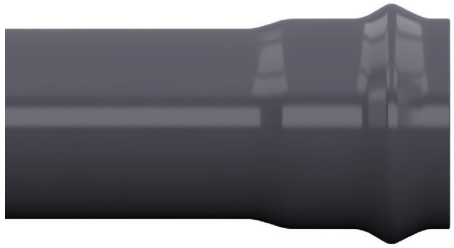
Figure 3 shows the engagement if the spigot end is pushed to the socket bottom.

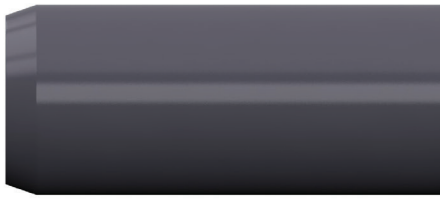
NOTE For assembly instructions, see ISO/TR 4191[1].

## Table 5 — Dimensions of sockets for elastomeric ring seal joints

| Nominal inside diameter of Socket | Minimum mean inside diameter of Socket | Maximum permissible out-of-roundness for $d_i$ [b] | | Minimum depth of engagement | Length of socket Entrance and Sealing Area |
|---|---|---|---|---|---|
| $d_n$ | $d_{im,\ min}$ [a] | S 20 to S 16 | S 12,5 to S 5 | $m_{min}$ [c] | $C$ [d] |
| 20 | 20,3 | — | 0,3 | 55 | 27 |
| 25 | 25,3 | — | 0,3 | 55 | 27 |
| 32 | 32,3 | 0,6 | 0,3 | 55 | 27 |
| 40 | 40,3 | 0,8 | 0,4 | 55 | 28 |
| 50 | 50,3 | 0,9 | 0,5 | 56 | 30 |
| 63 | 63,4 | 1,2 | 0,6 | 58 | 32 |
| 75 | 75,4 | 1,2 | 0,7 | 60 | 34 |
| 90 | 90,4 | 1,4 | 0,9 | 61 | 36 |
| 110 | 110,5 | 1,7 | 1,1 | 64 | 40 |
| 125 | 125,5 | 1,9 | 1,2 | 66 | 42 |
| 140 | 140,6 | 2,1 | 1,3 | 68 | 44 |
| 160 | 160,6 | 2,4 | 1,5 | 71 | 48 |
| 180 | 180,7 | 2,7 | 1,7 | 73 | 51 |
| 200 | 200,7 | 3,0 | 1,8 | 75 | 54 |
| 225 | 225,8 | 3,4 | 2,1 | 78 | 58 |

| Nominal inside diameter of Socket | Minimum mean inside diameter of Socket | Maximum permissible out-of-roundness for $d_i$ [b] | | Minimum depth of engagement | Length of socket Entrance and Sealing Area |
|---|---|---|---|---|---|
| $d_n$ | $d_{im,\ min}$ [a] | S 20 to S 16 | S 12,5 to S 5 | $m_{min}$ [c] | $C$ [d] |
| 250 | 250,9 | 3,8 | 2,3 | 81 | 62 |
| 280 | 281,0 | 5,1 | 2,6 | 85 | 67 |
| 315 | 316,1 | 5,7 | 2,9 | 88 | 72 |
| 355 | 356,2 | 6,5 | 3,3 | 90 | 79 |
| 400 | 401,3 | 7,2 | 3,6 | 92 | 86 |
| 450 | 451,5 | 8,1 | 4,1 | 95 | 94 |
| 500 | 501,6 | 9,0 | 4,5 | 97 | 102 |
| 560 | 561,8 | 10,2 | 5,1 | 101 | 112 |
| 630 | 632,0 | 11,4 | 5,7 | 105 | 123 |
| 710 | 712,3 | 12,9 | 6,5 | 109 | 136 |





Dimensions in millimetres



ISO

*a*) $d_{im,\ min}$ is measured in the middle of the engagement, $m$, and is calculated using the applicable Equation (1), (2) or (3):

$d_{im,\ min} = d_n + 0{,}3$ mm (1)

when $d_n \leq 50$;

$d_{im,\ min} = d_n + 0{,}4$ mm (2)

when $63 \leq d_n \leq 90$;

$d_{im,\ min} = 1{,}003\ d_n + 0{,}1$ mm (3)

when $d_n \geq 110$.

The values obtained shall be rounded to the next greater 0,1 mm.

*b*) The out-of-roundness tolerances are rounded values of 0,75 gradesto ISO 11922 - 1 [3] for S 20 to S 16 as follows:

0,75 grade M for $32 \leq d_n \leq 50$;

0,75 grade N for $63 \leq d_n \leq 250$;

0,75 grade M for $280 \leq d_n \leq 710$.

For pipe series S 12,5 to S 5: 0,375 grade M, except 0,3 grade M for $d_n \leq 32$.

*c*) The value of $m_{min}$ is calculated from the applicable Equation (4) or (5):

$m_{min} = 50$ mm $+ 0{,}22 d_n - 2e$ (S 10), (4)

when $d_n \leq 280$;

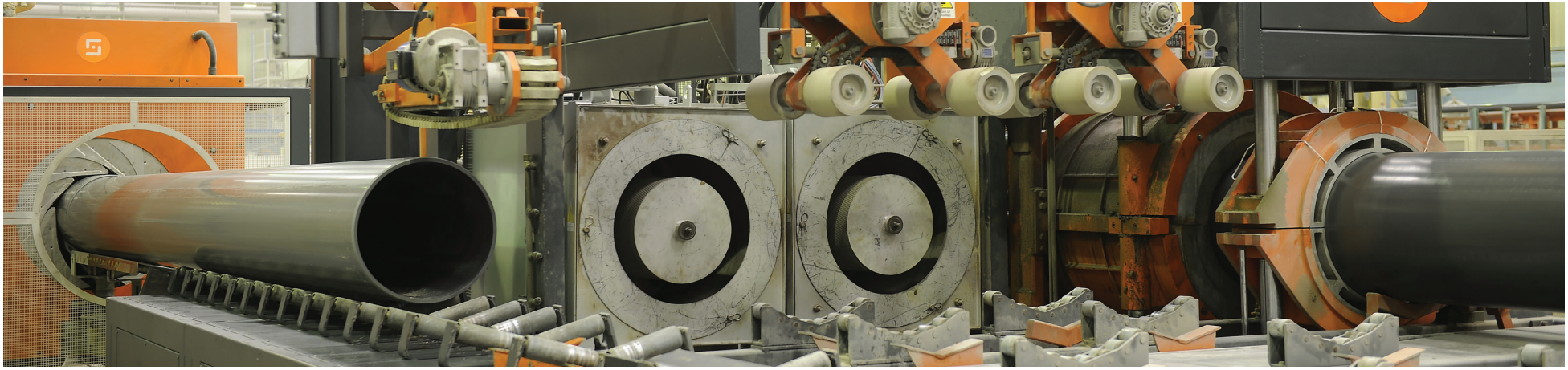
$m_{min} = 70$ mm $+ 0{,}15 d_n - 2e$ (S 10), (5)

when $d_n > 280$.

The values obtained shall be rounded to the next greater 1,0 mm.

*d*) The value of $c$ is calculated using the following equation: $c = 22 + 0{,}16 d_n$ and $c$ is given only for guidance in calculating minimum spigot lengths.

The manufacturer shall state the $c$-values in his catalogue



## Table 6 — Requirements for the falling weight impact test

| Nominal outside diameter dn mm | Medium level M | | | High level H | | |
|---|---|---|---|---|---|---|
| | Mass of falling weight | Fall height | Impact energyab | Mass of falling weight | Fall height | Impact energyab |
| | kg | m | Nm | kg | m | Nm |
| 20 | 0,5 | 0,4 | 2 | 0,5 | 0,4 | 2 |
| 25 | 0,5 | 0,5 | 2,5 | 0,5 | 0,5 | 2,5 |
| 32 | 0,5 | 0,6 | 3 | 0,5 | 0,6 | 3 |
| 40 | 0,5 | 0,8 | 4 | 0,5 | 0,8 | 4 |
| 50 | 0,5 | 1,0 | 5 | 0,5 | 1,0 | 5 |
| 63 | 0,8 | 1,0 | 8 | 0,8 | 1,0 | 8 |
| 75 | 0,8 | 1,0 | 8 | 0,8 | 1,2 | 9,5 |
| 90 | 0,8 | 1,2 | 9,5 | 1,0 | 2,0 | 20 |
| 110 | 1,0 | 1,6 | 16 | 1,6 | 2,0 | 31 |
| 125 | 1,25 | 2,0 | 25 | 2,5 | 2,0 | 49 |
| 140 | 1,6 | 1,8 | 28 | 3,2 | 1,8 | 57 |
| 160 | 1,6 | 2,0 | 31 | 3,2 | 2,0 | 63 |
| 180 | 2,0 | 1,8 | 35 | 4,0 | 1,8 | 71 |
| 200 | 2,0 | 2,0 | 39 | 4,0 | 2,0 | 78 |
| 225 | 2,5 | 1,8 | 44 | 5,0 | 1,8 | 88 |
| 250 | 2,5 | 2,0 | 49 | 5,0 | 2,0 | 98 |
| 280 | 3,2 | 1,8 | 57 | 6,3 | 1,8 | 111 |
| ≥ 315 | 3,2 | 2,0 | 63 | 6,3 | 2,0 | 124 |

*a* Based on $g$ = 9,81 m/s2.

*b* For less than 10, rounded off to 0,5; for greater than 10, rounded off to integers.

### 8.2 Resistance to internal pressure

Pipes shall withstand, without bursting or leakage, the hydrostatic stress induced by internal hydrostatic pressure when tested in accordance with ISO 11671-, using the test conditions specified in Table 7.

For this test, end caps type A or B in accordance with ISO 11671- may be used. In case of dispute, end caps type A shall be used.

**Table 7 — Pressure test requirements for pipes**

| Characteristic | Requirement | Test Parameters | | | | | Test method |
|---|---|---|---|---|---|---|---|
| | | Temp. | Circumferential stress | Time | Type of test | Number of test pieces *a* | |
| | | C | MPa | h | | | |
| Short- and longterm strength | No failure during the test | 20 | 42,0 | 1 | Water in water | 3 | ISO 11671- and ISO 1167 - 2 |
| | | 60 | 12,5 *b* | 100 | | | |

*a* The number of test pieces given indicates the number required to establish a value for the characteristic described in the table. The number of test pieces required for factory production control and process control should be listed in the manufacturer's quality plan.

*b* If tested with the circumferential stress of 12,5 MPa, due to statistical spread of the test results, test times less than 1 000 h can be achieved. In this case, a retest procedure with a circumferential stress of 12,5 MPa or 10,0 MPa shall be performed with pipes of the same production batch and double sampling. If the retest results are positive, the requirement of the minimum reference curve for PVCU 250, given in ISO 14524.4.2 ,1:2009-, is deemed to be verified.

Integral sockets shall be tested in accordance with ISO 11671-, using the test parameters given in Table 8. For this test, end caps type B in accordance with ISO 1167-1 may be used and the socket entrance may be externally reinforced to prevent a displacement of the sealing ring.

**Table 8 — Pressure test requirements for all types of integral sockets on pipes**

| Characteristic | Requirement | Test Parameters | | | | | | Test method |
|---|---|---|---|---|---|---|---|---|
| | | Nominal diameter | Temp | Pressure | Time | Type of test | Number of test piecesa | |
| | | $d_n$ | °C | bar | h | | | |
| Short term strength | No failure during the test | ≤ 90 mm | 20 | 4,2 × PN | 1 | Water in water | 3 | ISO 1167- 1 and ISO 1167- 2 |
| | | > 90 mm | 20 | 3,36 × PN | 1 | | 3 | |

*a* The number of test pieces given indicates the number required to establish a value for the characteristic described in the table. The number of test pieces required for factory production control and process control should be listed in the manufacturer's quality plan.

## 9 Physical characteristics

When tested in accordance with the test methods as specified in Table 9 using the indicated parameters, the pipe shall have physical characteristics conforming to the requirements given in Table 9.

**Table 9 — Physical characteristics**

| Characteristic | Requirement | Test Parameters | | Test Method |
|---|---|---|---|---|
| Vicat softening temperature (VST) | ≥ 80 °C | Shall conform to ISO 2507 - 1<br>Number of test piecesa: 3 | | ISO 2507 - 1 |
| Longitudinal reversion | Maximum 5 % | Test temperature:<br>Number of test pieces[a]<br>**Test period for :**<br>$e \leq 8$ mm<br>$e > 8$ mm | (150 ± 2) °C<br>3<br><br>15 min<br>30 min | ISO 2505,<br><br>Method:<br>liquid bath[b] |
| | | Or | | |
| | | Test temperature<br>Number of test piecesa<br>Test period for:<br>8 mm< $e \leq$ 8 mm<br>$e \leq$ 8 mm<br>$e \leq$ 8 mm | (150 ± 2) °C<br>**3**<br>60 min<br>120 min<br>240 min | ISO 2505,<br><br>Method:<br>hot air oven |
| Resistance to dichloromethane at a specific temperature (Degree of gelation) | No attack at any part of the surface of the test piece | Temperature of bath<br>Number of test pieces[a]<br>Immersion time Min.<br>Wall thickness | (15 ± 1) °C<br>1<br>30 min<br>1,5 mm | ISO 9852 |
| Uniaxial tensile test (Alternative test method. In case of dispute resistance to dichloromethane shall be used) | Maximum stress ≥ 45 MPa<br><br>Strain at break ≥ 80 % | Test speed<br>Test temperature | 5 ± 1 mm/min<br>(23 ± 2) °C | ISO 6259 - 1<br>and<br>ISO 6259 - 2 |
| DSC (Alternative test method to resistance to dichloromethane)[c] | B onset temperature<br>**≥ 185 °C** | Shall conform to ISO 18373 - 1<br>Number of test pieces: 4 | | ISO 18373 - 1 |

*a* The number of test pieces given indicates the number required to establish a value for the characteristic described in the table. The number of test pieces required for factory production control and process control should be listed in the manufacturer's quality plan.

*b* In case of dispute, the liquid bath method shall be used.

*c* This test is not intended to be used for factory production control. In case of dispute, the resistance to dichloromethane shall be used.

# Annex A

## (normative) Allowable operating pressures

### A.1 Nominal pressures of pipes

The nominal pressure, PN, of a pipe shall be designated in accordance with Table A.1, depending on the diameter of the pipe and the pipe series S.

**Table A.1 — Nominal pressures of pipes**

| Nominal diameter $d_n$ | Nominal pressures | | | | | | |
|---|---|---|---|---|---|---|---|
| | Pipe series | | | | | | |
| | S 20 | S 16 | S 12,5 | S 10 | S 8 | S 6,3 | S 5 |
| | (SDR 41) | (SDR 33) | (SDR 26) | (SDR 21) | (SDR 17) | (SDR 13,6) | (SDR 11) |
| ≤ 90 | – | PN 6 | PN 8 | PN 10 | PN 12,5 | PN 16 | PN 20 |
| > 90 | PN 6 | PN 8 | PN 10 | PN 12,5 | PN 16 | PN 20 | PN 25 |

### A.2 Nominal pressures of the system

All system components conforming to this part of ISO 1452 shall be classified and marked with PN and optionally with the pipe series S. Every component can be used at a temperature up to and including 25 °C for an operating pressure in bar equal to or less than the indicated PN.

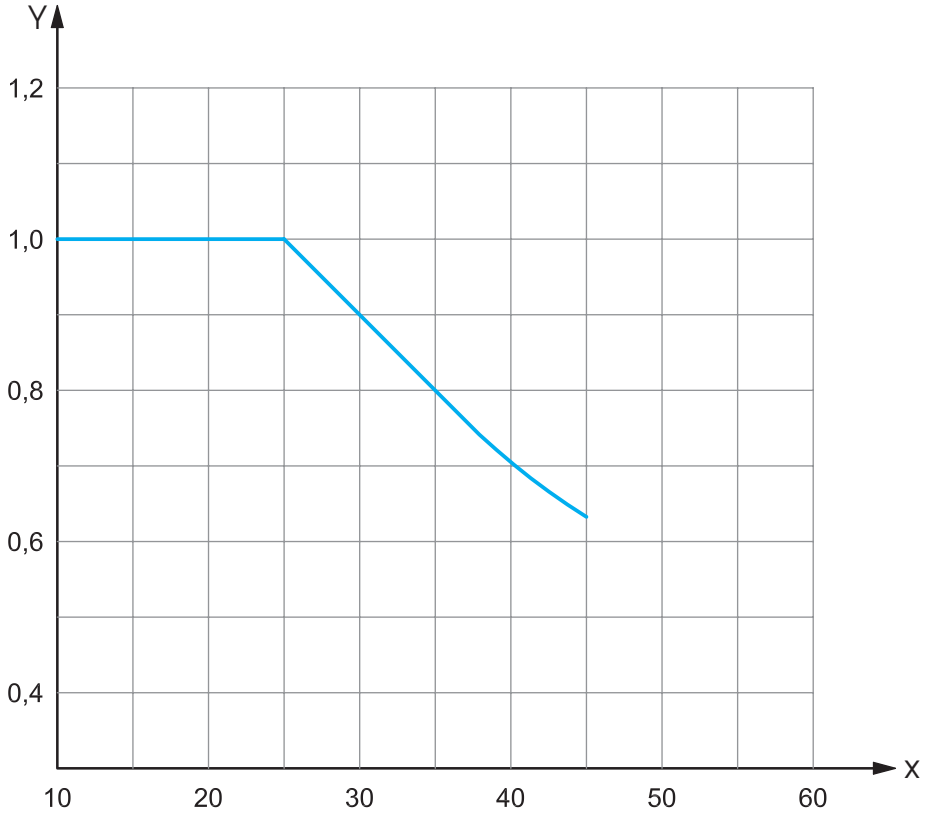
This means that fittings and valves may be used in combination with pipes marked with the same or lower PN.

The whole system allows the operating pressure to be equal to or less than that of the component having the lowest pressure rating.

### A.3 Derating factor for service temperatures between 25 °C and 45 °C

The derating factor, fT, for service temperatures between 25 °C up to 45 °C shall be taken from Figure A.1. The derating factor is based on long-term experience and test results.

EXAMPLE Consider a pipe with PN 12,5 to be applied for water at 40 °C. From Figure A.1 the derating factor at 40 °C is 0,71. Therefore the maximum allowable operating pressure at 40 °C in continuous use is: 0,71 × 12,5 bar = 8,88 bar.




**Key**
X service temperature, in degrees Celsius
Y derating factor, $f$T

Figure A.1 — Derating factor, $f$T , for service temperatures up to 45 °C

## A.4 Derating factor related to application of the system

For applications which need additional derating factors, e.g. more safety than included in the overall service (design) coefficient of 2,0 or 2,5, an additional factor, $f$A, shall be chosen at the design stage.

The allowable operating pressure, PFA, in continuous use shall be calculated using Equation (A.1):

$$PFA = f_T \times f_A \times PN \quad \text{..... (A.1)}$$

where:

PFA is the allowable operating pressure;

$f$T is the derating factor for service temperatures between 25 °C and 45 °C;

$f$A is the derating factor related to the application;

PN is the nominal pressure.

NOTE 1 PFA and PN are expressed in the same unit of pressure, preferably in bars.

NOTE 2 Where there is no specific requirement, $f$A = 1.

# Annex B

## (normative) Imperial (inch)-sized pipes

**B.1 General :** All clauses of this part of ISO 1452 shall apply, together with the following clauses. The specifications given in this annex are for the requirements which differ from those given in Clauses 1 to 13.

**B.2 Geometrical characteristics**

**B.2.1 Mean outside diameters and their tolerances :** For the purposes of 6.3, Table B.1 shall apply in place of Table 1.

### Table B.1 — Mean outside diameters and tolerances

| Nominal size | Mean outside diameter | | Tolerance for out-of-roundness |
|---|---|---|---|
| in | $d_{em,\,min}$ | $d_{em,\,max}$ | |
| ⅜ | 17,0 | 17,3 | 0,3 |
| ½ | 21,2 | 21,5 | 0,3 |
| ¾ | 26,6 | 26,9 | 0,3 |
| 1 | 33,4 | 33,7 | 0,5 |
| 1¼ | 42,1 | 42,4 | 0,5 |
| 1½ | 48,1 | 48,4 | 0,5 |
| 2 | 60,2 | 60,5 | 0,7 |
| 3 | 88,7 | 89,1 | 1,0 |
| 4 | 114,1 | 114,5 | 1,2 |
| 6 | 168,0 | 168,5 | 1,7 |
| 8 | 218,8 | 219,4 | 2,2 |
| 10 | 272,6 | 273,4 | 2,8 |
| 12 | 323,4 | 324,3 | 3,3 |
| 16 | 405,9 | 406,9 | 4,2 |
| 18 | 456,7 | 457,7 | 4,6 |
| 20 | 507,5 | 508,5 | 5,2 |
| 24 | 609,1 | 610,1 | 6,2 |

Dimensions in millimetres

**B.2.2 Wall thicknesses and their tolerances**

For the purposes of 6.4, the following shall apply.

The nominal wall thicknesses, en, shall be classified according to the PN rating of the pipe, as given in
Table B.2.

The tolerances on the wall thickness at any point shall conform to Table B.3.

## Table B.2 — Nominal wall thicknesses

| Nominal Size | Nominal wall thickness $e$ | | |
|---|---|---|---|
| in | PN 9 | PN 12 | PN 15 |
| ⅜ | — | — | 1,5 |
| ½ | — | — | 1,7 |
| ¾ | — | — | 1,9 |
| 1 | — | — | 2,2 |
| 1¼ | — | 2,2 | 2,7 |
| 1½ | — | 2,5 | 3,1 |
| 2 | 2,5 | 3,1 | 3,9 |
| 3 | 3,5 | 4,6 | 5,7 |
| 4 | 4,5 | 6,0 | 7,3 |
| 6 | 6,6 | 8,8 | 10,8 |
| 8 | 7,8 | 10,3 | 12,6 |
| 10 | 9,7 | 12,8 | 15,7 |
| 12 | 11,5 | 15,2 | 18,7 |
| 16 | 14,5 | 19,0 | 23,4 |
| 18 | 16,3 | 21,4 | — |
| 20 | 18,1 | — | — |
| 24 | 21,7 | — | — |

Dimensions in millimetres

## Table B.3 — Tolerance on wall thickness at any point

| Nominal Size | Nominal wall thickness $e$ | | |
|---|---|---|---|
| in | PN 9 | PN 12 | PN 15 |
| ⅜ | — | — | 0,4 |
| ½ | — | — | 0,4 |
| ¾ | — | — | 0,6 |
| 1 | — | — | 0,6 |
| 1¼ | — | 0,5 | 0,6 |
| 1½ | — | 0,5 | 0,6 |
| 2 | 0,5 | 0,6 | 0,6 |
| 3 | 0,6 | 0,7 | 0,9 |
| 4 | 0,7 | 0,9 | 1,1 |
| 6 | 1,0 | 1,4 | 1,7 |
| 8 | 1,2 | 1,6 | 1,9 |
| 10 | 1,5 | 2,0 | 2,4 |
| 12 | 1,8 | 2,3 | 2,9 |
| 16 | 2,2 | 2,9 | 3,6 |
| 18 | 2,5 | 3,3 | — |
| 20 | 2,8 | — | — |
| 24 | 3,3 | — | — |

*a* The tolerance is expressed in the form of 0 + x mm, where x is the value of the tolerance on the minimum wall thickness.

### B.2.3.1 Sockets for solvent cementing

For the purposes of 6.6.1, the following shall apply. The dimensions of sockets for solvent cementing are shown in Figure B.1. They shall conform to the values given in Table B.4.

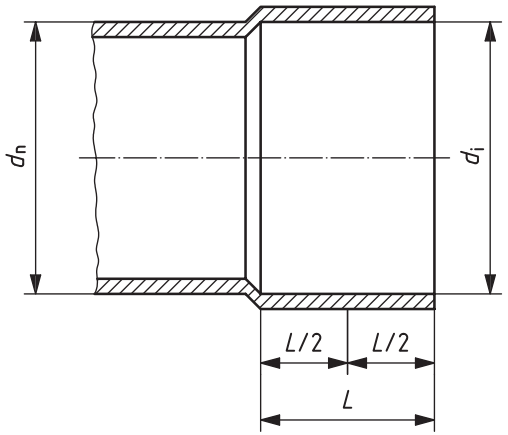



**Figure B.1 — Socket on pipe end for solvent cementing**

At no point shall the inside diameter of the socket be greater than the mouth inside diameter of the associated socket. The mean inside diameter of the socket may decrease from mouth to root by the following maximum total included angle of taper:

⅜" to 2" nominal size : 0° 40
3" nominal size and greater: 0° 30

An out-of-roundness tolerance of ± 0,2 % is allowed on the mean inside diameter of the socket at the midpoint of the socket length.

**Table B.4 — Dimensions of sockets for solvent cementing**

| Nominal size | Socket length | Mean inside diameter of socket at midpoint of socket length | |
|---|---|---|---|
| in | $L_{min}$ | $d_{im,\,min}$ | $d_{im,\,max}$ |
| ⅜ | 14,5 | 17,1 | 17,3 |
| ½ | 16,5 | 21,3 | 21,5 |
| ¾ | 19,5 | 26,7 | 26,9 |
| 1 | 22,5 | 33,5 | 33,7 |
| 1¼ | 27,0 | 42,2 | 42,4 |
| 1½ | 30,0 | 48,2 | 48,4 |
| 2 | 36,0 | 60,3 | 60,5 |
| 3 | 50,5 | 88,8 | 89,1 |
| 4 | 63,0 | 114,2 | 114,5 |
| 6 | 90,0 | 168,2 | 168,5 |
| 8 | 115,5 | 219,0 | 219,4 |
| 10 | 142,5 | 272,8 | 273,4 |
| 12 | 168,0 | 323,7 | 324,3 |

**NOTE**
The minimum socket lengths, Lmin, are calculated using Equation (B.1):

$$L_{min} = 0{,}5\, d_{em,\,min} + 6\ mm \quad \text{..... (B.1)}$$

where dem, min is the minimum mean outside diameter of the Corresponding pipe (see ISO 1452- 1).

### B.2.3.2 Sockets for elastomeric ring seal joints

For the purposes of 6.6.2, the following shall apply.

The depth of engagement, m, of single sockets with elastomeric sealing ring type joints are shown in Figure B.2. The minimum value for m shall conform to the applicable value given in Table B.5.

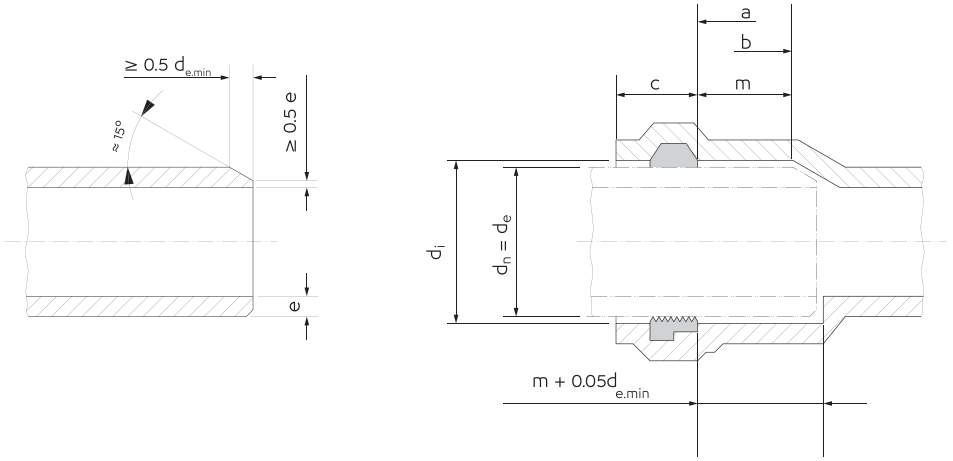



**Figure B.2 - Socket and spigot end for pipes with elastomeric sealing ring**

**Key**

*a* Start of sealing area.

*b* End of cylindrical part of socket and pipe.

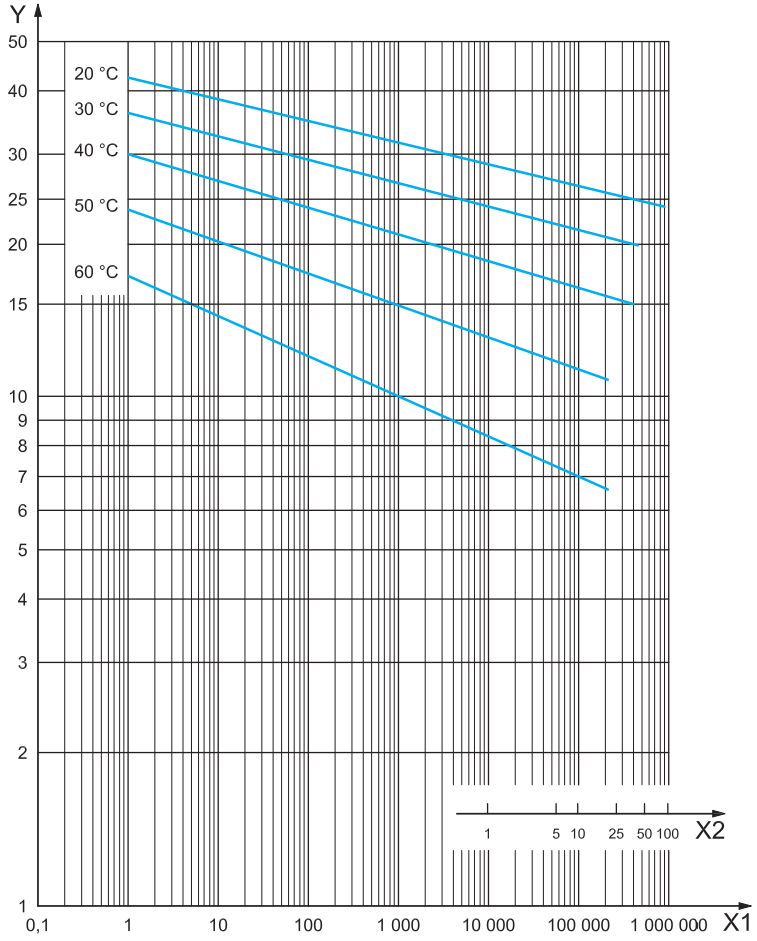
**NOTE 1** : Figure B.2 shows the engagement if the spigot end is pushed to the socket bottom.

**NOTE 2 :** For assembly instructions, see ISO/TR 4191[1].

**Table B.5 — Dimensions of sockets for elastomeric ring seal joints**

| Nominal size | Minimum depth of engagement $m_{min}$ | |
|---|---|---|
| in | Single socket | Double socket |
| 2 | 67 | 39 |
| 3 | 70 | 43 |
| 4 | 75 | 47 |
| 6 | 87 | 55 |
| 8 | 98 | 63 |
| 10 | 110 | 71 |
| 12 | 121 | 78 |
| 16 | 139 | 91 |
| 18 | 150 | 98 |
| 20 | 171 | 106 |
| 24 | 183 | 121 |

Dimensions in millimetres




**Key** : $X1$ time, $t$, to fracture, in hours | $X2$ time, in years
$Y$ hoop stress, σ, in megapascals

Figure 1 — Minimum reference curve for PVC-U 250

## Wall thickness and their tolerances

- The nominal wallthickness, en, is classified with the pipe series S. The nominal wall thickness corresponds to the minimum allowable wall thickness.
- The nominal wall thickness shall conform to Table2, as appropriate to the pipe series.
- The tolerance for wall thickness, e, shall conform to Table3.

## Table2 - Nominal ( minimum ) wall thicknesses

| Pipe Series S | | | | | | | |
|---|---|---|---|---|---|---|---|
| Nominal (minimum) wall thickness | | | | | | | |
| Nominal outside diameter. dn | S 20 ( SDR 41) | S 16 ( SDR 33) | S 12.5 ( SDR 26) | S 10 ( SDR 21) | S 8 ( SDR 17) | S 6.3 ( SDR 13.6) | S 5 ( SDR 11) |
| | Nominal Pressure PN bassed on design coefficient C=2.5 | | | | | | |
| | | PN 6 | PN 8 | PN 10 | PN 12.5 | PN 16 | PN 20 |
| 12 | | - | - | - | - | - | 1.5 |
| 16 | | - | - | - | - | - | 1.5 |
| 20 | | - | - | - | - | 1.5 | 1.9 |
| 25 | | - | - | - | 1.5 | 1.9 | 2.3 |
| 32 | | - | 1.5 | 1.6 | 1.9 | 2.4 | 2.9 |
| 40 | | 1.5 | 1.6 | 1.9 | 2.4 | 3.0 | 3.7 |
| 50 | | 1.6 | 2.0 | 2.4 | 3.0 | 3.7 | 4.6 |
| 63 | | 2.0 | 2.5 | 3.0 | 3.8 | 4.7 | 5.8 |
| 75 | | 2.3 | 2.9 | 3.6 | 4.5 | 5.6 | 6.8 |
| 90 | | 2.8 | 3.5 | 4.3 | 5.4 | 6.7 | 8.2 |

| Nominal Pressure PN bassed on design coefficient C=2.0a | | | | | | | |
|---|---|---|---|---|---|---|---|
| | PN 6 | PN 8 | PN 10 | PN 12.5 | PN 16 | PN 20 | PN 25 |
| 110 | 2.7 | 3.4 | 4.2 | 5.3 | 6.6 | 8.1 | 10.0 |
| 125 | 3.1 | 3.9 | 4.8 | 6.0 | 7.4 | 9.2 | 11.4 |
| 140 | 3.5 | 4.3 | 5.4 | 6.7 | 8.3 | 10.3 | 12.7 |
| 160 | 4.0 | 4.9 | 6.2 | 7.7 | 9.5 | 11.3 | 14.6 |
| 180 | 4.4 | 5.5 | 6.9 | 8.6 | 10.7 | 13.3 | 16.4 |
| 200 | 4.9 | 6.2 | 7.7 | 9.6 | 11.9 | 14.7 | 18.2 |
| 225 | 5.5 | 6.9 | 8.6 | 10.8 | 13.4 | 16.6 | - |
| 250 | 6.2 | 7.7 | 9.6 | 11.9 | 14.8 | 18.4 | - |
| 280 | 6.9 | 8.6 | 10.7 | 13.4 | 16.6 | 20.6 | - |
| 315 | 7.7 | 9.7 | 12.1 | 15.0 | 18.7 | 23.2 | - |
| 355 | 8.7 | 10.9 | 13.6 | 16.9 | 21.1 | 26.1 | - |
| 400 | 9.8 | 12.3 | 15.3 | 19.1 | 23.7 | 29.4 | - |
| 450 | 11.0 | 13.8 | 17.2 | 21.5 | 26.7 | 33.1 | - |
| 500 | 12.3 | 15.3 | 19.1 | 23.9 | 29.7 | 36.8 | - |
| 560 | 13.7 | 17.2 | 21.4 | 26.7 | - | - | - |
| 630 | 15.4 | 19.3 | 24.1 | 30.0 | - | - | - |
| 710 | 17.4 | 21.8 | 27.2 | - | - | - | - |
| 800 | 19.6 | 24.5 | 30.6 | - | - | - | - |

a To apply a design coeffcient of 2.5 ( instead of 2.0 ) for pipes with nominal diameters above 90 mm, the next higher pressure rating, PN, shall be chosen.

NOTTE 1 The nominal wall thicknesses conform to ISO 4065 (4).

NOTTE 2 The PN 6 values for S 20 and S 16 are calculated with the preferred number 6.3

## Quality Control Testing

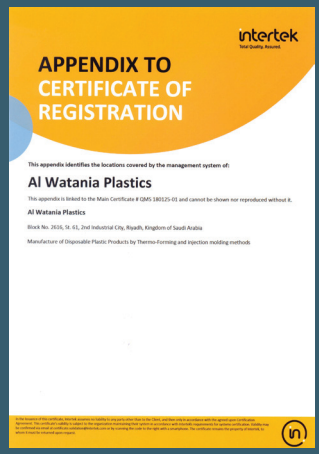
Al-Watania PVC Factory is equipped with a testing laboratory having a fully trainend staff for evaluation of raw materials and finished pipes.

In order to maintain uniform quality level, all our routine control tests are carried out as per SAS, and DIN Standards.


## إختـبارت الجــودة

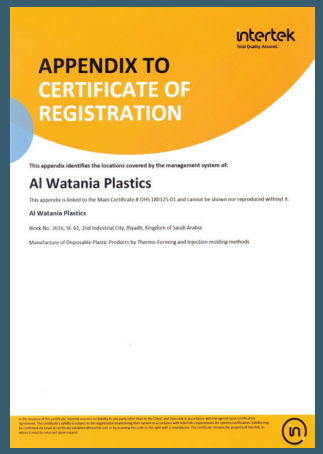
لقد زود مصنع بلاستيك الوطنية بمختبرات على أعلى المستويات الفنية تحت إشراف مجموعة من المختصين من ذوي الخبرة ليؤكدوا أفضل مستويات الجودة بدأء من المواد الأولية وانتهاء بالأنابيب الجاهزة للاستعمال .

إن هذة المجموعة تعمل وبكل كفاءة لتبقى أنابيب الوطنية بجودتها المميزة و المطابقة بمواصفاتها لنظام المواصفات السعودية المتفق مع نظام المواصفات الألماني .









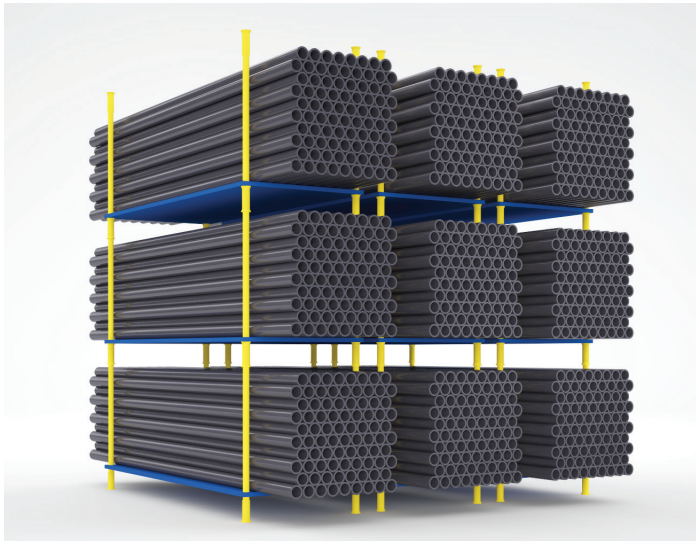


# AL WATANIA

## CERTIFICATES





## التحميل و التخزين

مواسير الوطنية بى فى سى ، يجب نقلها وتحميلها وتنزيلها بكل عناية وإهتمام لتجنب حدوث أية أضرار ميكانيكية أثناء ذلك ، ويجب تكديسها على شكل طبقات وبحيث تكون المواسير بعكس بعضها وكما هو موضح بالصور ولا يجب رصها بكميات كبيرة خاصة عند درجات حرارة مرتفعة حتى لا يؤدي ذلك الى اية إنبعاجات أو تلف فى الوصلات .

وفي حال تخزينها في مستودعات ولمدة طويلة يجب وضعها على أرضية مستقيمة أو عوارض أو دعامات مستقيمة لا يقل عرضها عن 75 ملم وأن لا يذيد المسافات بين الدعامات عن متر واحد ويجب أيضاً أن لا يذيد ارتفاع الرصة عن 7 طبقات أو 1,75 متر أيها أقل , وفي حال رص أصناف مختلفة يجب أن تكون الاصناف من النوع الواحد فى نفس الصف و الأصناف ذات السماكة الأعلى في الأسفل .

## Handling & Storage

U-PVC Shold be handled with care to avoid mechanical damage before installation. pipes should not be stacked in large pipes especially as under warm temperature condition the bottom pipes may distort, thus giving rise to difficultly in pipe alignment and joining at sites.

Socketed pipes should be stacked in layers with sockets placed at alternate ends of the stack and with sockets protuding so as to avoid lop - sided stacks and the imparting of a permanent set to the pipes.

For long term storage, the pipes should be stored either on flat level floors or pipe racks which provide continous support. If this is not possible supports of at least 75mm bearing width at spacing not greater than 1 meter centres should be placed beneath the pipes.

In such racks the pipes may be stored not more than seven layers high or max 1.75 meters whichever is lower if different classes of pipes are kept in the same rack then the thickest classes must always be at the bottom.

## التخزين في الموقع

يجب الاهتمام في تخزين المواسير فى مواقع العمل والتنفيذ بحيث يتم وضع المواسير على أرضية مستقيمة خالية من الأحجار ولا يجب أن يزيد تكديسها عن ثلاث طبقات ويجب ان تكون المواسير في جميع الأحوال محمية من أشعة الشمس المباشرة ومن درجات الحرارة العالية خاصة في فصل الصيف .

## Field Storage

For temporary storage in the field / site where racks are not provided, care should be taken that the ground is level and free from loose stones.

Pipes stored in the field should not exceed three layers and should be either stored in the shade or covered to prevent excess heating under direct sunlight when the temperature of dark colored UPVC pipes can reach 60oC to 70oC in summer.

## طـرق التركـيب

تتوفر أنابيب الوطنية بأطوال قياسية بطول 6 أمتار. ويمكن توفيرها بأطوال أخرى حسب طلب العميل .

**توصيل الأنابيب :**

يتم توصيل أنابيب الوطنية بطرق عديدة:

1 - انبوب ذات نهاية عادية (PE) مع وصلات منفصلة.

2 - انبوبة ذات الحلقة المطاطية (RR)

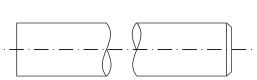
3 - انبوب ذات وصلة غراء (SC)

يمكن توفير الأنابيب مع طرفي النهايات مشنفرة (DC) بأطوال 6 أمتار أو أطول مختلفة ، حسب الطلب .

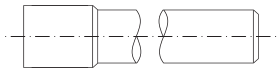
## installation

Al-Watania pipes are available in nominal standard lengths of 6 meters. Other lenghts can be supplied by arrangement castomer requiremnt.

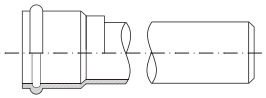
Pipe Joint- Al-Watania pipes are supplied with various joint system.
Plain Ended (PE) pipe for use with separate Couplings, Rubber Ring, Solvent (Adhesive) Weld or Special Fittings. Pipe can also be supplied with both ends chamfered (DC) if requested, in lengths of 6 metres ather lenghts can be supplied.



Plain End / Chamfreed End



Plain Socket Solvent Weld Joint



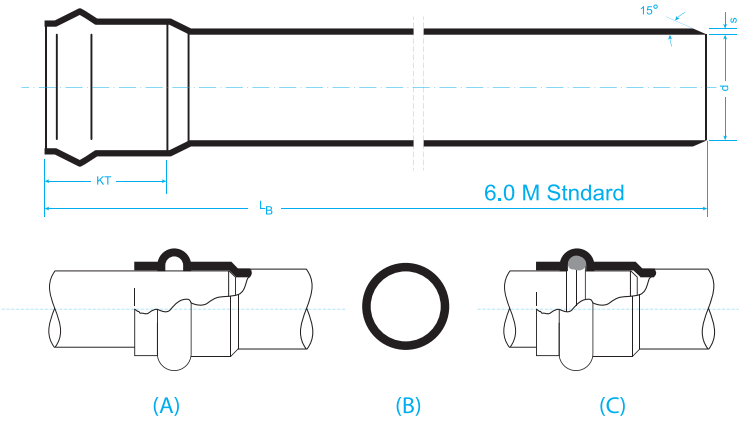
Rubber Ring joint

توصيل الحلقات المطاطية (RRJ) :

يتم تصنيع الانابيب بنهاية ذات تجويف داخلي لوضع حلقة مطاطية مانعة للتسرب.

Rubber ring joints (R/J).
Pipes are supplied with integral grooved socket at one end incorporating elastomeric sealing ring.

uPVC Pipe with wallthickened socket joint ( Rubber Joint)
of unplasticized Poly vinyle chloride (uPVC) .




- يجب تأكد من أن نهاية الانبوبة والوصله خاليان من الغبار ، وجافة .
- دخل الأنبوبة في الوصله بدون الحلقة المطاطية ثم ضع علامة على الأنبوب عند إدخاله بالكامل.
- ثم ضع الحلقة المطاطية في فتحة التجويف
- يجب ان تكون نهاية الماسورة مشطوفة بحيث يمكنها الدخول فى نهاية الماسورة الاخرى بسهولة
- ادخل الأنبوب في الجلبة إلى العلامة التي تم إجراؤها مسبقًا.

- Ensure that the spigot and socket are free from dust, and as dry as possible .
- Insert pipe into the socket without seal ring place and mark pipe when it fully inserted.
- Place seal in groove of socket ensuring that seal is correct way round .
- Must be the end of the pipe chamfered , so be viable to enter into the other end of the pipe easily.
- Push the pipe firmly into the socket up to the insertion mark previously made .

يمكن توصيل المواسير حتى 110 مم بسهولة باستخدام المواد اللاصقة المذيبة.

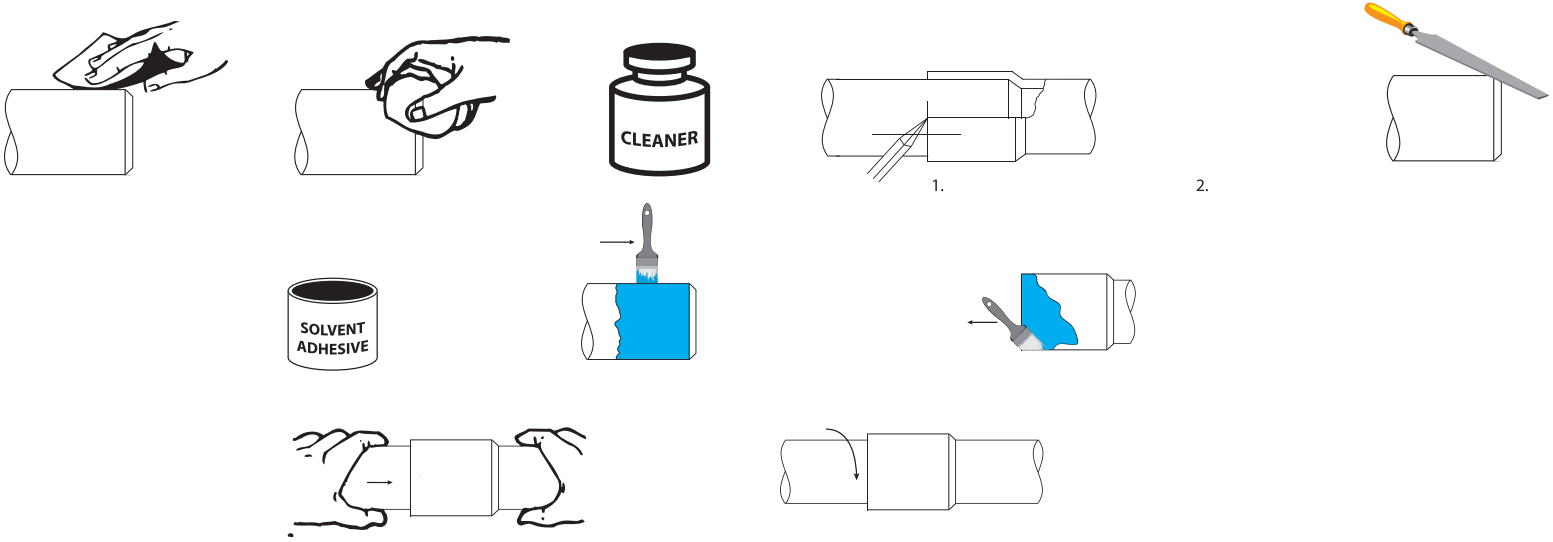
تتطلب الأحجام الأكبر تقنيات أكثر خصوصية وتتطلب من الفنين سحب هذه الوصلات .

1 - إجراءات الربط: ضع علامة على دخول الأنبوب في الجلبة وعلامة المحاذاة.
2 - جعل الشطب الصغير على حافة الأنبوب وفى الوسط تماماً .
-3 قم بتخشين الجزء الخارجي من الأنبوب والجزء الداخلي من المقبس باستخدام ورق الصنفرة حتى علامة الإدخال.
-4 نظف السطح الخارجي ، وقم بإزالة جميع الأتربة والشحوم باستخدام قطعة قماش نظيفة.
5. تحرك المادة اللاصقة جيدا.
-6 ضع المادة اللاصقة دون تأخير بعد التنظيف باستخدام فرشاة نظيفة.

Pipes up to 110 mm may be jointed easily with solvent adhesives.

Larger sizes require more special techniques and require tow men to make such joints.

1- Jointing Procedure. Mark dephth of entry of the pipe into the socket and alignment mark.
2- Make small chamfer on the edge of the pipe and with medium file.
3- Roughen the outside of the pipe and the inside of the socket using sand paper or emery cloth upto the entry mark.
4- Clean both surfaces and remove all dust, grease and swaerf using a dry clean cloth and cleaner.
5- Stir adhesive thoroughly.
6- Apply adhesive without delay after cleaning , using a flat clean brush .




٧ - قم بإدخال نهاية الأنبوب على الفور حتى يصل إلى علامة الإدخال ،
قم بمحاذاة الأنبوب والمقبس.
قم بتثبيتها على هذا الوضع لبضع ثوان ، ثم امسح الغراء الفائض مع مراعاه عدم لف الانبوب فى اى اتجاة .

7- Immediately insert the pipe info the socket up to the entrya mark, align pipe and socket. Hold in position for a few seconds, then wipe off excess cement ( DO NOT TWIST).