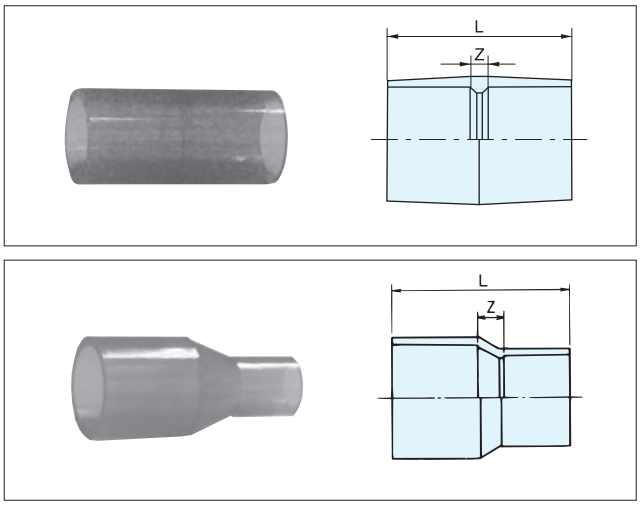
3. Transparent Fittings for Water Supply

Meaning of symbols
Ⓜ : Product conforms to the manufacturer's standards

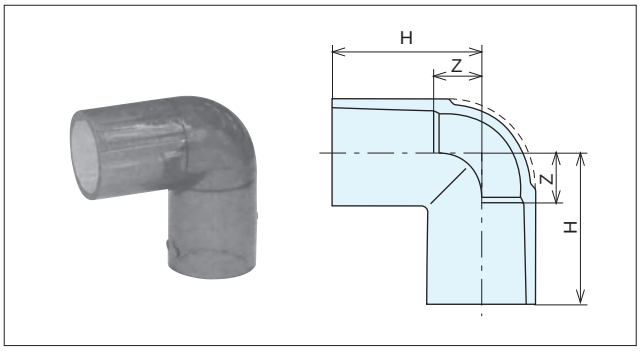
Transparent Sockets for Water Supply Code No. 6011



Unit : mm

Nominal Dia.	Z	L	Standards
13	5	57	Ⓜ
16	7	67	
16×13	5	61	
20	7	77	
20×13	7	68	
20×16	6	71	
25	7	87	
25×13	20	86	
25×16	15	85	
25×20	9	84	
30	7	95	
30×20	14	93	
30×25	9	93	
40	7	117	
40×25	19	114	
40×30	15	114	
50	7	133	
50×30	29	136	
50×40	18	136	

Transparent Elbows for Water Supply Code No. 6012

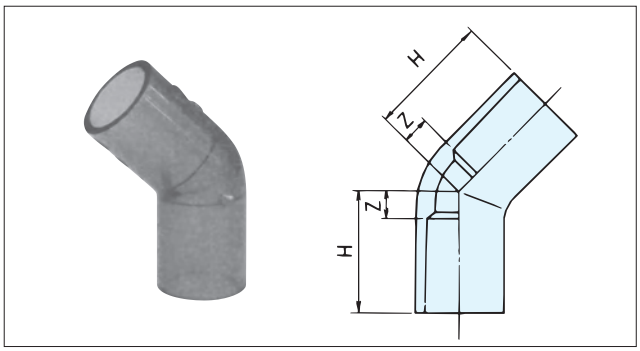


Unit : mm

Nominal Dia.	Z	H	Standards
13	10	36	Ⓜ
16	13	43	
20	15	50	
20×13	12 (side 20) | 15 (side 13)	47 (side 20) | 41 (side 13)	
25	18	58	
30	21	65	
40	27	82	
50	33	96	

Note Elbow sections must not be applied with a bending force or vibration.

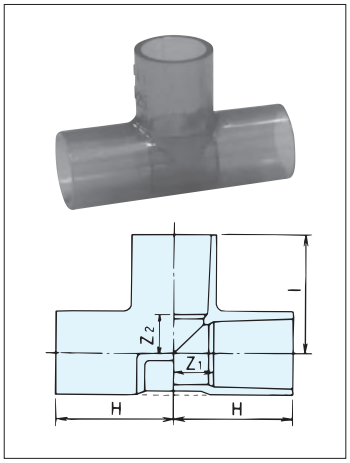
Transparent 45° Elbows for Water Supply Code No. 6012



Unit : mm

Nominal Dia.	Z	H	Standards
13	7	33	Ⓜ
20	9	44	
25	11	51	
30	12	56	
40	14	69	
50	17	80	

Transparent Tees for Water Supply Code No. 6013

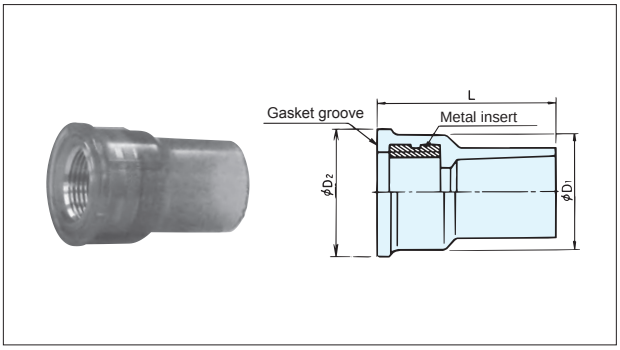


Unit : mm

Nominal Dia.	Z_1	Z_2	H	l	Standards
13	10	10	36	36	Ⓜ
16	13	13	43	43	
16×13	11	12	41	38	
20	15	15	50	50	
20×13	11	14	46	40	
20×16	13	15	48	45	
25	18	18	58	58	
25×13	11	17	51	43	
25×16	13	18	53	48	
25×20	15	18	55	53	
30	21	21	65	65	
30×13	11	20	55	46	
30×16	15	21	57	51	
30×20	15	21	59	56	
30×25	18	21	62	61	

Nominal Dia.	Z_1	Z_2	H	l	Standards
40	27	27	82	82	Ⓜ
40×13	11	26	66	52	
40×16	13	27	68	57	
40×20	15	27	70	62	
40×25	18	27	73	67	
40×30	21	27	76	71	
50	33	33	96	96	
50×13	11	32	74	58	
50×16	16	34	76	63	
50×20	15	33	78	68	
50×25	18	33	81	73	
50×30	21	33	84	77	
50×40	27	33	90	88	

Transparent Hydrant Sockets with Metal Insert Code No. 7028

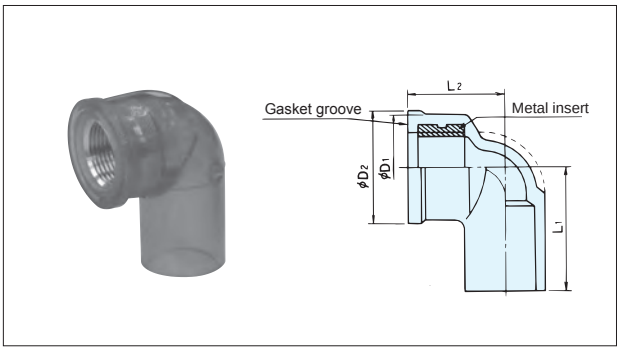


Unit : mm

Nominal Dia.	D1	D2	Nominal Thread Dia.	L	Standards
13	30	34	Rp1/2	47	Ⓜ
16×13	30	34	Rp1/2	52	
20	37	42	Rp3/4	59	
20×13	30	34	Rp1/2	57	
25	46	52	Rp1	68	

Notes
1. The threads are parallel female threads conform to JIS B0203 (taper pipe threads).
2. The material of the thread insert of the products with nominal diameters of 13, 16 and 20 conforms to JIS H3250 C3601, C3602 or C3604 (free-cutting brass) and that of the product with nominal diameter of 25 conforms to JIS H5121 CAC406C (cast brass).
3. Use seal tape on threads for firm sealing. A solvent-free sealing agent must be used when seal tape and sealing agent are used together. If a solvent-containing sealing agent is used, cracks may occur in the hydrant joint.
4. Excessive tightening of the tapered male threads may cause the RP female thread section to expand and break.
5. Do not connect the product to a steel pipe with tapered male threads that are fabricated at construction sites.

Transparent Hydrant Elbows with Metal Insert Code No. 7033

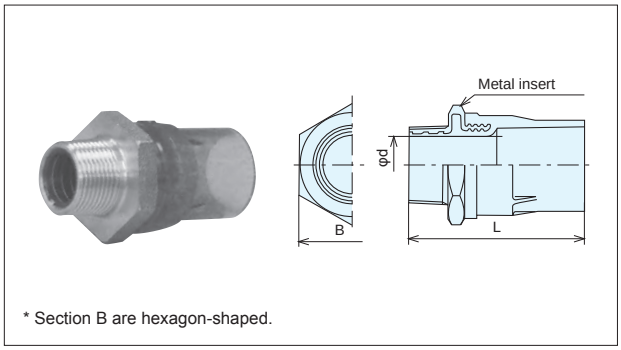


Unit : mm

Nominal Dia.	D1	D2	Nominal Thread Dia.	L1	L2	Standards
13	30	34	Rp1/2	38	29	Ⓜ
16×13	30	34	Rp1/2	43	32	
20	37	42	Rp3/4	51	36	
20×13	30	34	Rp1/2	47	33	
25	46	52	Rp1	59	40	

Notes
1. The threads are parallel female threads conform to JIS B0203 (taper pipe threads).
2. The material of the thread insert of the products with nominal diameters of 13, 16 and 20 conforms to JIS H3250 C3601, C3602 or C3604 (free-cutting brass) and that of the product with nominal diameter of 25 conforms to JIS H5121 CAC406C (cast brass).
3. Use seal tape on threads for firm sealing. A solvent-free sealing agent must be used when seal tape and sealing agent are used together. If a solvent-containing sealing agent is used, cracks may occur in the hydrant joint.
4. Excessive tightening of the tapered male threads may cause the RP female thread section to expand and break.
5. Do not connect the product to a steel pipe with tapered male threads that are fabricated at construction sites.

Transparent Valve Sockets with Metal Insert (Type II) Code No. 7031



* Section B are hexagon-shaped.

Unit : mm

Nominal Dia.	d	B	Nominal Thread Dia.	L	Standards
13× 1/2	13	32	R1/2	60	Ⓜ
16× 1/2	13	32	R1/2	67	
20× 3/4	18	40	R3/4	75	
25×1	23	50	R1	85	
30×1 1/4	31	55	R1 1/4	95	
40×1 1/2	37	65	R1 1/2	110	
50×2	48	75	R2	125	

Notes
1. The threads are tapered male threads conform to JIS B0203 (taper pipe threads).
2. The material of the thread insert conforms to JIS H5120 CAC406 (cast brass).
3. The shape of the socket with nominal diameter of 16 differs partially from that shown in the diagram.

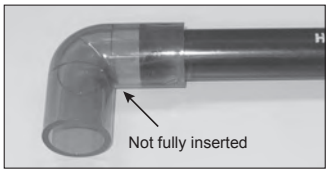
Tough dyne HI (White) Specially designed adhesive

Conform to JWWA S101
Be sure to apply **Tough dyne HI (White)** for bonding.

500 g can **1 kg can**

Correct connection
*note

Improper connection



*Note: It may be difficult to insert the pipe all the way to the stopper depending on the type of fitting.
In that case, insert the pipe to the following position: Zero point + Min. 1/3ℓ.

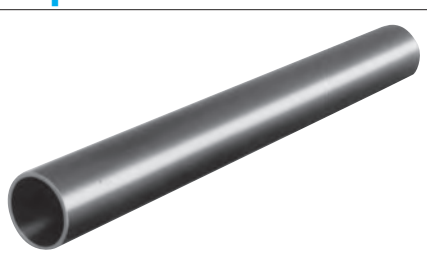
* Color Tough dyne Blue cannot be used to bond pipes that are used for drinking water.

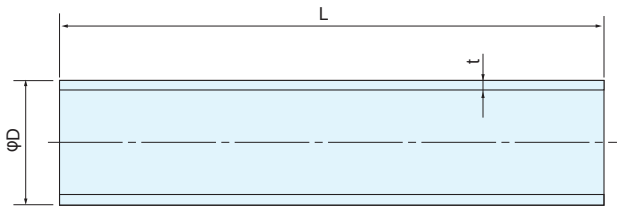
Product Specifications

I PVC-U Pipes and Fittings for Water Supply and Pressure Pipeline

1. Pipes

Meaning of symbols
JIS K6741: Product conforms to Japanese Industrial Standards JIS K6741
JIS K6742: Product conforms to Japanese Industrial Standards JIS K6742
AS20: Product conforms to Japan PVC Pipe and Fittings Association's standards and approved by Japan Water Works Association





HI-VP Pipes for Water Supply Code No. 6001 (Japanese Industrial Standards JIS K6742 : 2007)

VP Pipes for Water Supply Code No. 1001 (Japanese Industrial Standards JIS K6742 : 2007)

Unit : mm

Nominal Dia.	Outside Dia.D			Thickness t		Approx. Inside Dia. (Reference)	Length L +30 −10	Reference Weight				Standards
								VP		HI·VP		
	Basic Dimension	Max./Min. OD Tolerance	Average OD Tolerance	Basic Dimension	Tolerance			g/m	kg/piece	g/m	kg/piece	
13	18	±0.2	±0.2	2.5	±0.2	13	4000	174	0.696	170	0.680	JIS K 6742
16	22	±0.2	±0.2	3.0	±0.3	16	4000	256	1.024	251	1.004	
20	26	±0.2	±0.2	3.0	±0.3	20	4000	310	1.240	303	1.212	
25	32	±0.2	±0.2	3.5	±0.3	25	4000	448	1.792	439	1.756	
30	38	±0.3	±0.2	3.5	±0.3	31	4000	542	2.168	531	2.124	
40	48	±0.3	±0.2	4.0	±0.3	40	★2 4000	791	3.164	774	3.096	
							5000		3.955		3.870	
50	60	±0.4	±0.2	4.5	±0.4	51	★2 4000	1122	4.488	1098	4.392	
							5000		5.610		5.490	
65	76	±0.5	±0.2	4.5	±0.4	67	★ 4000	1445	5.780	1415	5.660	AS20
							★ 5000					
75	89	±0.5	±0.2	5.9	±0.4	77	★2 4000	2202	8.808	2156	8.624	JIS K 6742
							5000		11.010		10.780	
100	114	±0.6	±0.2	7.1	±0.5	100	★2 4000	3409	13.636	3338	13.352	
							5000		17.045		16.690	
125	140	±0.8	±0.3	7.5	±0.5	125	★ 4000	4464	17.856	4370	17.484	AS20
							★ 5000					
150	165	±1.0	±0.3	9.6	±0.6	146	★2 4000	6701	26.804	6561	26.244	JIS K 6742
							5000		33.505		32.805	

Notes
1. The "★" mark indicates a made-to-order product, and the "★ 2" mark indicates a made-to-order VP product.
2. The maximum/minimum OD tolerance is the difference between the basic dimension and the maximum/minimum outside diameter measured at randomly selected cross section.
3. The average OD tolerance is the difference between the basic dimension and the average outside diameter obtained by averaging diameters measured in two directions perpendicular to each other at randomly selected cross section.
4. The thickness applies to any location on the circumference of the pipe.
5. For pipe lengths other than those listed above, contact our company.
6. The reference weights are calculated by the basic dimension and pipe material density of 1.43 g/cm³ for VP or 1.40 g/cm³ for HI-VP.

HI-VP Pipes for General Purposes Code No. 6001 (Japanese Industrial Standards JIS K 6741 : 2007)

Unit : mm

Nominal Dia.	Outside Dia.			Thickness		Approx. Inside Dia. (Reference)	Length	Reference Weight		Standards
	Basic Dimension	Max./Min. OD Tolerance	Average OD Tolerance	Min. Dimension	Tolerance			Weight/m (g/m)	Weight/m (kg/piece)	
65	76.0	±0.5	±0.2	4.1	+0.8	67	4000	1415	5.7	JIS K 6741
125	140.0	±0.8	±0.3	7.0	+1.0	125	4000	4370	17.5	
200	216.0	±1.3	±0.7	10.3	+1.4	194	4000	10129	40.5	
250	267.0	±1.6	±0.9	12.7	+1.8	240	4000	15481	61.9	
300	318.0	±1.9	±1.0	15.1	+2.2	286	4000	21962	87.8	

Note For nominal diameters smaller than those listed above, refer to the section for HI pipes for water supply.

VP Pipes for General Purposes Code No. 1001 (Japanese Industrial Standards JIS K 6741 : 2007)

Unit : mm

Nominal Dia.	Outside Dia.			Thickness		Approx. Inside Dia. (Reference)	Length	Reference Weight		Standards
	Basic Dimension	Max./Min. OD Tolerance	Average OD Tolerance	Min. Dimension	Tolerance			Weight/m (g/m)	Weight/m (kg/piece)	
40	48.0	±0.3	±0.2	3.6	+0.8	40	4000	791	3.2	JIS K 6741
50	60.0	±0.4	±0.2	4.1	+0.8	51	4000	1122	4.5	
65	76.0	±0.5	±0.3	4.1	+0.8	67	4000	1445	5.8	
75	89.0	±0.5	±0.3	5.5	+0.8	77	4000	2202	8.8	
100	114.0	±0.6	±0.4	6.6	+1.0	100	4000	3409	13.6	
125	140.0	±0.8	±0.5	7.0	+1.0	125	4000	4464	17.9	
150	165.0	±1.0	±0.5	8.9	+1.4	146	4000	6701	26.8	
200	216.0	±1.3	±0.7	10.3	+1.4	194	4000	10129	40.5	
250	267.0	±1.6	±0.9	12.7	+1.8	240	4000	15481	61.9	
300	318.0	±1.9	±1.0	15.1	+2.2	286	4000	21962	87.8	

Note For nominal diameters of 13 to 30, use VP pipes for water supply.

⚠HI-VP pipes and VP pipes for general purposes cannot be used as pipes for drinking water.

VM Pipes Code No. 1002 (Japanese Industrial Standards JIS K 6741 : 2007)

Unit : mm

Nominal Dia.	Outside Dia.		Thickness		Approx. Inside Dia. (Reference)	Length	Reference Weight		Standards
	Basic Dimension	Average OD Tolerance	Min. Dimension	Tolerance			Weight/m (g/m)	Weight/m (kg/piece)	
350	370.0	±1.2	14.3	+2.0	339	4000	24380	97.5	JIS K 6741
400	420.0	±1.3	16.2	+2.2	385	4000	31298	125.2	
★450	470.0	±1.5	18.1	+2.6	431	4000	39272	157.1	
500	520.0	±1.6	20.0	+2.8	477	4000	47935	191.7	

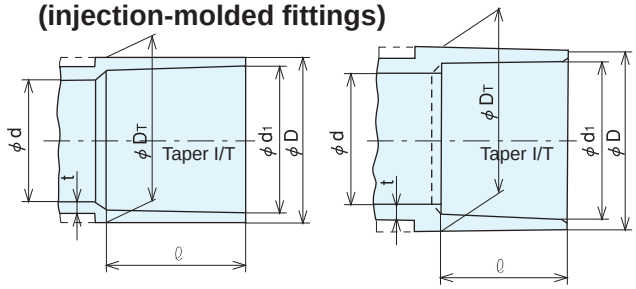
Note The "★" mark indicates a made-to-order product.

2. TS Fittings

Common joint dimensions

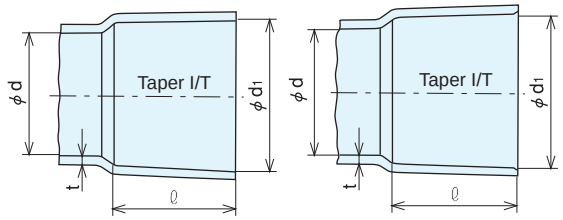
Meaning of symbols
JIS K6743: Product conforms to Japanese Industrial Standards JIS K6743
AS21: Product conforms to Japan PVC Pipe and Fittings Association's standards and approved by Japan Water Works Association
Ⓜ: Product conforms to the manufacturer's standards

Type A (nominal diameter: 150 and less) (injection-molded fittings)



(Nominal Dia. : 13 to 50) (Nominal Dia. : 65 to 150)

Type B (nominal diameter: 13 to 300) (fabricated fittings)



(Nominal Dia. : 13 to 50, 200 and more) (Nominal Dia. : 65 to 150)

Unit : mm

Nominal Dia.	d1	Tolerance of d1	D	DT	Tolerance of D, DT	I/T	ℓ	d (min.)	t (min.)
13	18.40	±0.20	24	24	−0.6	1/30	26	13	2.7
16	22.40	±0.20	29	29	−0.7	1/34	30	16	2.7
20	26.45	±0.20	33	33	−0.8	1/34	35	20	3.2
25	32.55	±0.25	40	40	−1.0	1/34	40	25	3.6
30	38.60	±0.25	46	46	−1.0	1/34	44	31	3.6
40	48.70	±0.30	57	57	−1.2	1/37	55	40	4.1
50	60.80	±0.30	70	70	−1.5	1/37	63	51	4.5
65	76.60	±0.30	87	88.5	−1.5	1/48	61	67	4.1
75	89.60	±0.30	102	104.5	−1.5	1/49	64	77	7.5
100	114.70	±0.30	130	133.5	−1.8	1/56	84	100	9.4
125	140.85	±0.35	157	161	−1.8	1/58	104	125	7.0
150	166.00	±0.40	186	190	−2.0	1/63	132	146	12.2
200	217.90	±0.80	−	−	−	1/50	200	194	10.3
250	269.30	±0.90	−	−	−	1/50	250	240	12.7
300	320.70	±1.00	−	−	−	1/50	300	286	15.1

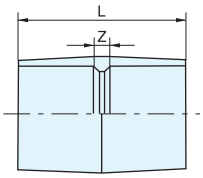
Notes 1. There is no limit on the plus tolerances of D and DT.
2. The thickness value t for Type B indicates the thickness of the unfabricated part.
3. The tolerance of ℓ is $^{+4}_{-0.5}$ mm for nominal diameters 150 mm and less and $^{+10}_{0}$ mm for nominal diameters 200 mm and more.

⚠ **Be sure to use the Tough dyne HI adhesive (see page 36) for the bonding HI pipes and fittings.**

HI-TS Sockets Code No. 6011
TS Sockets Code No. 5011

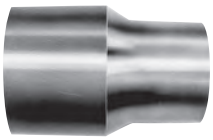
Unit : mm

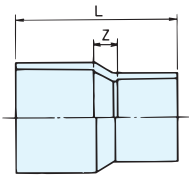
(Abbreviation : S)



Type A
(Nominal Dia. : 150 and less)

(Abbreviation : RS)





Type A
(Nominal Dia. : 150 x 100 and less)

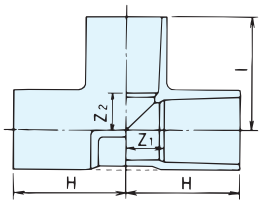
Nominal Dia.	Z	L	Standards
13	5	57	JIS K 6743
16	7	67	
16×13	5	61	
20	7	77	
20×13	7	68	
20×16	6	71	
25	7	87	
25×13	20	86	
25×16	15	85	
25×20	9	84	
30	7	95	
30×20	14	93	
30×25	9	93	
40	7	117	
40×20	23	113	AS21
40×25	19	114	JIS K 6743
40×30	15	114	
50	7	133	
50×25	37	140	AS21
50×30	29	136	JIS K 6 743
50×40	18	136	

Nominal Dia.	Z	L	Standards
65	23	145	AS21
65× 50	25	149	
75	27	155	JIS K 6743
75× 50	38	165	
75× 65	31	156	Ⓜ
100	32	200	JIS K 6743
100× 75	42	190	
125	22	230	Ⓜ
125×100	42	230	AS21
150	36	300	JIS K 6743
150×100	79	295	

HI-TS Tees Code No. 6013
TS Tees Code No. 5013

Unit : mm

(Abbreviation : T) Type A



Nominal Dia.	Z_1	Z_2	H	I	Standards
13	10	10	36	36	JIS K 6743
16	13	13	43	43	
16×13	11	12	41	38	
20	15	15	50	50	
20×13	11	14	46	40	
20×16	13	15	48	45	
25	18	18	58	58	
25×13	11	17	51	43	
25×16	13	18	53	48	
25×20	15	18	55	53	
30	21	21	65	65	
30×13	11	20	55	46	
30×16	15	21	57	51	
30×20	15	21	59	56	
30×25	18	21	62	61	
40	27	27	82	82	
40×13	11	26	66	52	
40×16	13	27	68	57	
40×20	15	27	70	62	
40×25	18	27	73	67	
40×30	21	27	76	71	

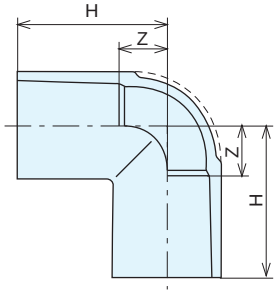
Nominal Dia.	Z_1	Z_2	H	I	Standards
50	33	33	96	96	JIS K 6743
50× 13	11	32	74	58	
50× 16	16	34	76	63	
50× 20	15	33	78	68	
50× 25	18	33	81	73	
50× 30	21	33	84	77	
50× 40	27	33	90	88	
65	49	49	110	110	AS21
65× 50	40	41	101	104	
75	56	56	120	120	JIS K 6743
75× 25	29	48	93	88	
75× 40	36	47	100	102	
75× 50	41	47	105	110	
75× 65	49	56	113	117	AS21
100	68	68	152	152	JIS K 6743
100× 50	41	59	125	122	
100× 75	56	68	140	132	
125	86	86	190	190	Ⓜ
125× 75	64	66	168	150	
125×100	73	85	177	169	
150	98	98	230	230	JIS K 6743
150× 75	63	94	195	158	
150×100	76	98	208	182	
150×125	87	101	219	205	Ⓜ

Notes 1. When uneven settlement or a change in water pressure is expected, SGR-NA Tees or cast-iron SGR T-shape pipes should be used for branching pipes with nominal diameter of 125 and more.
2. Nominal diameter 125 x 75 is not available for HI-VP products.

HI-TS Elbows Code No. 6012
TS Elbows Code No. 5012

Unit : mm

(Abbreviation : L) Type A

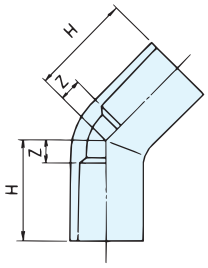


Nominal Dia.	Z	H	Standards
13	10	36	JIS K 6743
16	13	43	
20	15	50	
20×13	12 (side 20) | 15 (side 13)	47 (side 20) | 41 (side 13)	Ⓜ
25	18	58	JIS K 6743
30	21	65	
40	27	82	
50	33	96	
65	49	110	AS21
75	56	120	
100	69	153	
125	88	192	Ⓜ
150	98	230	

Notes 1. Elbow part must not be applied with bending force or vibration.
2. HI 90° Bends, TS 90° Bends or SGR 90° Bends is recommended for buried applications.
3. The dashed line in the diagram indicates the shape of elbows with nominal diameters of 50 and less.

HI-TS 45° Elbows　Code No. 6012
TS 45° Elbows　Code No. 5012

(Abbreviation : 45L) Type A



Unit : mm

Nominal Dia.	Z	H	Standards
13	7	33	JIS K 6743
16	8	38	Ⓜ
20	9	44	JIS K 6743
25	11	51	
30	12	56	
40	14	69	
50	17	80	
Ⓩ 75*	33	97	Ⓜ
Ⓩ 100	38	122	

Notes 1. The HI-VP products with nominal diameter of 75 mm are now under planning.
2. The Ⓩ mark indicates that the product is manufactured by Maezawa Kasei Industries Co., Ltd.

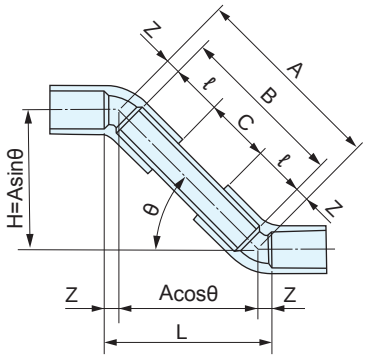
For Water Supply and Pressure Pipeline

<Reference> Guideline dimensions for S Bends formed with TS 45° Elbows

Calculation of guideline dimensions of S Bends formed with TS 45° Elbows

Item	Formula
Length of Diagonal Section	A=2Z+B
Cut Pipe Length	B=2ℓ+C
Distance between Fittings	C=B-2ℓ
Distance between Staggered Pipes	H=Asinθ
Effective Length of S-shape Section	L=2Z+Acosθ

Trigonometric Function	
sin45°	0.707
cos45°	0.707



Results of calculations of guideline dimensions for S Bends formed with TS 45° Elbows

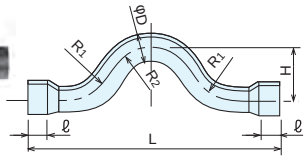
Unit : mm

Item / Nominal Dia.	TS 45° Elbow Dimension		Calculation Results by Joint Type									
	Effective Length	Length of Socket	When C = 0					When H = 200 mm				
	Z	ℓ	A	B	C	L	H	A	B	C	L	H
13	7	26	66	52	0	61	47	283	269	217	214	200
16	8	30	76	60	0	70	54	283	267	207	216	200
20	9	35	88	70	0	80	62	283	265	195	218	200
25	11	40	102	80	0	94	72	283	261	181	222	200
30	12	44	112	88	0	103	79	283	259	171	224	200
40	14	55	138	110	0	126	98	283	255	145	228	200
50	17	63	160	126	0	147	113	283	249	123	234	200
75	33	64	194	128	0	203	137	283	217	89	266	200
100	38	84	244	168	0	249	173	283	207	39	276	200

Note The above table shows the results of calculations when Z•ℓ is equal to the tolerance center dimension. However, Z•ℓ does not always equal to the tolerance center dimension in actual products. It is sometimes not possible to insert the pipe all the way to the stopper in the socket of the TS joint. Consequently, the dimension of S Bends formed with a combination of pipes and fittings may differ from the dimension in the above table. Therefore, consider the above dimensions as guideline figures.

HI-TS (Crossover) 180° Bends　Code No. 9662

(Abbreviation : S-B) Type B

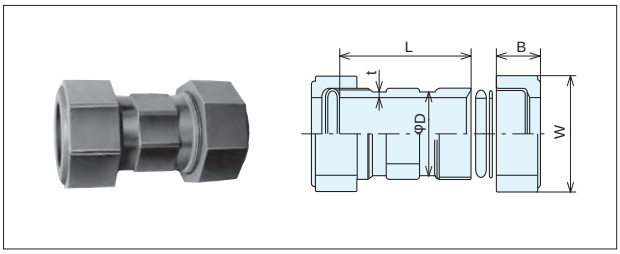


Unit : mm

Nominal Dia.	H	L	D	ℓ	R1	R2	Standards
★13	50	250	18	26	40	40	Ⓜ
20	50	270	26	35	60	43	

Note The "★" mark indicates a made-to-order product.

Injection-Molded Unions (Expansion Joints) Code No. 1066



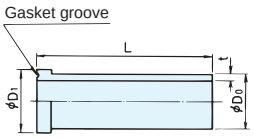
Unit : mm

Nominal Dia.	D	t	L	B	W	Standards
13	26	3.0	68	25	38	JIS K 6743
Ⓐ 16	—	—	110	28	43	Ⓜ
20	35	3.5	78	29	50	JIS K 6743
25	43	4.0	89	29	56	
30	48	4.0	98	33.5	63	
40	59	4.5	108	38.5	79	
50	72	5.0	118	39	93	

Notes
1. The product with nominal diameter of 16 is not injection-molded and it's shape differ from that shown in the diagram.
2. The material of the rubber ring conforms to JIS K6353 Type I-A (rubber goods for water works).
3. The Ⓐ mark indicates that the product is manufactured by Aronkasei Co., Ltd.

HI-TS Union Sockets Code No. 6041
TS Union Sockets Code No. 5041

(Abbreviation : US) Type A



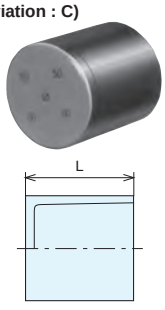
Unit : mm

Nominal Dia.	D_0	D_1	t	L	Standards
13	18	23	2.5	80	JIS K 6743
16	22	27.5	3.0	85	
20	26	29.5	3.0	90	
25	32	36.5	3.5	100	
30	38	42	3.5	110	
40	48	53	4.0	120	
50	60	71	4.5	130	

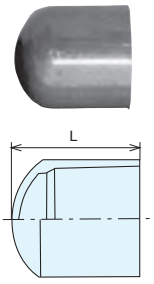
Note Nominal diameter 16 mm is presently only available for HI-TS union sockets.

HI-TS Caps Code No. 6042
TS Caps Code No. 5042

(Abbreviation : C)



Type A
Nominal Dia. : 50 mm and less



Type A
Nominal Dia. : 65 mm and more

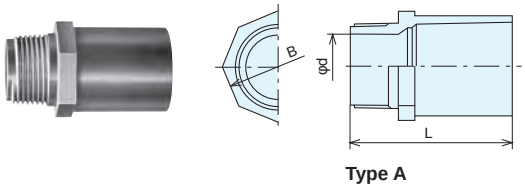
Unit : mm

Nominal Dia.	L	Standards
13	29	JIS K 6743
16	33.5	
20	38.5	
25	44	
30	48	
40	59.5	
50	68	
65	96	AS21
75	105	JIS K 6743
100	138	
150	205	

Note Nominal diameter 65 mm is only available for TS caps.

HI-TS Valve Sockets Code No. 6031
TS Valve Sockets Code No. 5031

(Abbreviation : VS) Type A



Type A

* The sockets with nominal diameters of 30 x $1^{1}/_{4}$ and less are hexagon-shaped, and the sockets with nominal diameters of 40 x $1^{1}/_{2}$ and more are octagon-shaped.

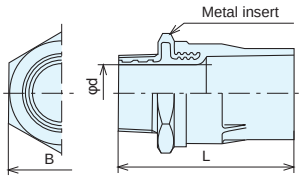
Unit : mm

Nominal Dia.	d	B	Nominal Thread Dia.	L	Standards
13× $^{1}/_{2}$	13	24	$R^{1}/_{2}$	50	JIS K 6743
16× $^{1}/_{2}$	13	29	$R^{1}/_{2}$	57	
20× $^{3}/_{4}$	18	33	$R^{3}/_{4}$	64	
25×1	23	40	R1	71	
30×$1^{1}/_{4}$	31	46	$R1^{1}/_{4}$	80	
40×$1^{1}/_{2}$	37	57	$R1^{1}/_{2}$	92	
50×2	48	70	R2	106	
65×$2^{1}/_{2}$	63	86	$R2^{1}/_{2}$	119	Ⓜ
75×3	74	101	R3	128	
100×4	97	129	R4	157	

Notes
1. The threads are tapered male threads conform to JIS B0203 (taper pipe threads).
2. When the sockets are installed in a place where bending force or vibration applies, or where the sockets are disconnected and reconnected frequently, valve sockets with metal insert should be used.

HI-TS Valve Sockets with Metal Insert — Code No. 7031
TS Valve Sockets with Metal Insert — Code No. 4031

(Abbreviation : MVS) Type II **PVC Inner Surface Type**



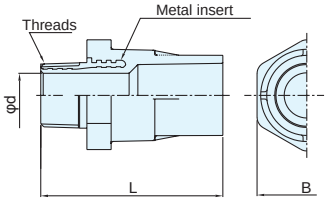
* The sockets with nominal diameters of 50 x 2 and less are hexagon-shaped at the section B and the sockets with nominal diameter of 65 x 2-1/2 and more are octagon-shaped.

Unit : mm

Nominal Dia.	d	B	Nominal Thread Dia.	L	Standards
13× 1/2	13	32	R1/2	60	JIS K 6743
16× 1/2	13	32	R1/2	67	
20× 3/4	18	40	R3/4	75	
25×1	23	50	R1	85	
30×1 1/4	31	55	R1 1/4	95	
40×1 1/2	37	65	R1 1/2	110	
50×2	48	75	R2	125	
65×2 1/2	61	98	R2 1/2	134	Ⓜ
75×3	72	112	R3	151	
100×4	96	140	R4	189	

Notes
1. The threads are tapered male threads conform to JIS B0203 (taper pipe threads).
2. The material of the thread insert conforms to JIS H5120 CAC406 (cast brass).
3. The shape of the socket with nominal diameter of 16 differs partially from that shown in the diagram.

(Abbreviation : MVS) Type I



* Section B is hexagon-shaped.

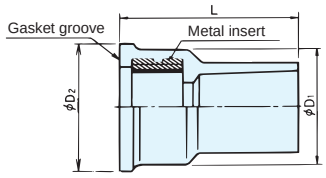
Unit : mm

Nominal Dia.	d	B	Nominal Thread Dia.	L	Standards	
					VP	HI-VP
13× 1/2	13	32	R1/2	60	JIS K 6743	
16× 1/2	13	34	R1/2	65		
20× 1/2	13	34	R1/2	72	—	Ⓜ
20× 3/4	18	41	R1/4	75	JIS K 6743	
25×1	23	50	R1	85		
30×1 1/4	31	56	R1 1/4	95		

Notes
1. The threads are tapered male threads conform to JIS B0203 (taper pipe threads).
2. The material of the thread insert conforms to JIS H3250 C3602 (free-cutting brass) or C3604 (free-cutting brass).

HI-TS Hydrant Sockets with Metal Insert — Code No. 7028
HI-TS Hydrant Sockets — Code No. 6021

(Abbreviation: MWS = With metal insert, WS = Without metal insert) Type A



TS Hydrant Sockets with Metal Insert — Code No. 4028
TS Hydrant Sockets — Code No. 5021

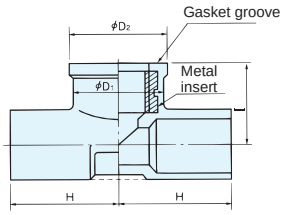
Unit : mm

Nominal Dia.	D1	D2	Nominal Thread Dia.	L	Standards	
					MWS	WS
13	30	34	Rp1/2	47	JIS K 6743	Ⓜ
16×13	30	34	Rp1/2	52		
20	37	42	Rp3/4	59		
20×13	30	34	Rp1/2	57		–
25	46	52	Rp1	68		Ⓜ

Notes
1. The threads are parallel female threads conform to JIS B0203 (taper pipe threads).
2. The material of the thread insert of the products with nominal diameters of 13, 16 and 20 conforms to JIS H3250 C3601, C3602 or C3604 (free-cutting brass) and that of the product with nominal diameter of 25 conforms to JIS H5121 CAC406C (cast brass).
3. Use seal tape on threads for firm sealing. A solvent-free sealing agent must be used when seal tape and sealing agent are used together. If a solvent-containing sealing agent is used, cracks may occur in the hydrant joint.
4. Excessive tightening of the tapered male threads may cause the RP female thread section to expand and break.
5. Do not connect the product to a steel pipe with tapered male threads that are fabricated at construction sites.

HI-TS Hydrant Tees with Metal Insert — Code No. 7030
HI-TS Hydrant Tees — Code No. 6023

(Abbreviation: MWT = With metal insert, WT = Without metal insert) Type A



TS Hydrant Tees with Metal Insert — Code No. 4030
TS Hydrant Tees — Code No. 5023

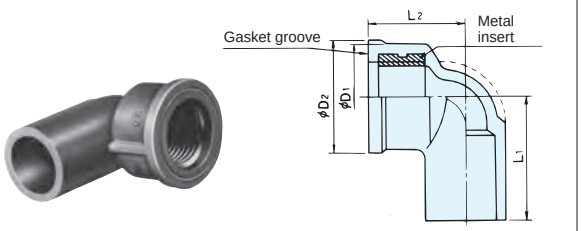
Unit : mm

Nominal Dia.	D1	D2	Nominal Thread Dia.	H	I	Standards	
						MWT	WT
13	30(28)	34	Rp1/2	38	29	JIS K 6743	Ⓜ
16×13	30	34	Rp1/2	43	32		
20	37	42	Rp3/4	51	36		
20×13	30	34	Rp1/2	47	34		
25	46	52	Rp1	59	42		

Notes
1. The threads are parallel female threads conform to JIS B0203 (taper pipe threads).
2. The material of the thread insert of the products with nominal diameters of 13, 16 and 20 conforms to JIS H3250 C3601, C3602 or C3604 (free-cutting brass) and that of the product with nominal diameter of 25 conforms to JIS H5121 CAC406C (cast brass).
3. Use seal tape on threads for firm sealing. A solvent-free sealing agent must be used when seal tape and sealing agent are used together. If a solvent-containing sealing agent is used, cracks may occur in the hydrant joint.
4. Excessive tightening of the tapered male threads may cause the RP female thread section to expand and break.
5. Do not connect the product to a steel pipe with tapered male threads that are fabricated at construction sites.
6. HI-TS Hydrant Tees with a nominal diameter of 20 x 13 or 25 are not available. Note that the numeric value in ( ) is the dimension of WT product.

HI-TS Hydrant Elbows with Metal Insert — Code No. 7033
HI-TS Hydrant Elbows — Code No. 6022

(Abbreviation: MWL = With metal insert, WL = Without metal insert)
Type A



TS Hydrant Elbows with Metal Insert — Code No. 4033
TS Hydrant Elbows — Code No. 5022

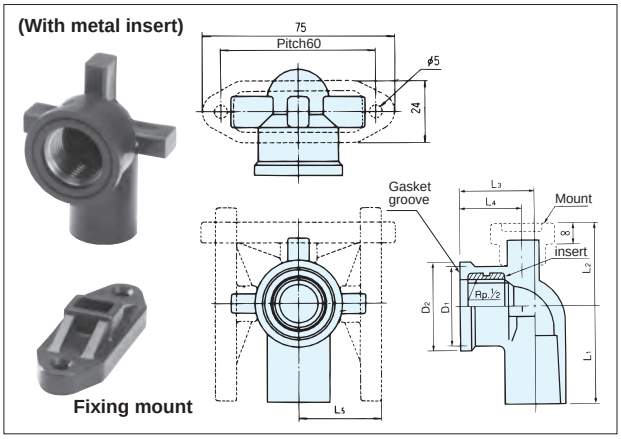
Unit : mm

Nominal Dia.	D1	D2	Nominal Thread Dia.	L1	L2	Standards		
						MWL		WL
						VP	HI	
13 (Type S)	30	34	Rp1/2	38	29	JIS K 6743	JIS K 6743	Ⓜ
13 (Type L)	30	34	Rp1/2	38	45	–		–
16×13	30	34	Rp1/2	43	32	JIS K 6743		Ⓜ
20	37	42	Rp3/4	51	36			
20×13	30	34	Rp1/2	47	33			–
25	46	52	Rp1	59	40			Ⓜ

Notes
1. For products with nominal diameter of 13, Type S (short size) and Type L (long size) are available.
2. The threads are parallel female threads conform to JIS B0203 (taper pipe threads).
3. The material of the thread insert of the products with nominal diameters of 13, 16 and 20 conforms to JIS H3250 C3601, C3602 or C3604 (free-cutting brass) and that of the product with nominal diameter of 25 conforms to JIS H5121 CAC406C (cast brass).
4. Use seal tape on threads for firm sealing. A solvent-free sealing agent must be used when seal tape and sealing agent are used together. If a solvent-containing sealing agent is used, cracks may occur in the hydrant joint.
5. Excessive tightening of the tapered male threads may cause the RP female thread section to expand and break.
6. Do not connect the product to a steel pipe with tapered male threads that are fabricated at construction sites.

HI-TS Hydrant Elbows with Mount — Code No. 7034

(With metal insert)



Fixing mount

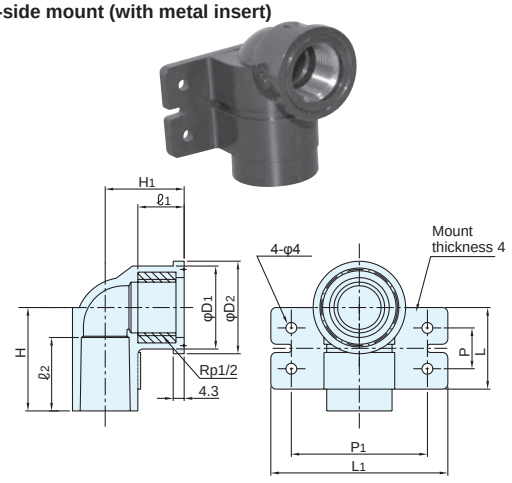
Unit : mm

Nominal Dia.	D1	D2	Nominal Thread Dia.	L1	L2	L3	L4	L5	Standards
13	31	34	Rp1/2	38	33	29	24.5	33	Ⓜ
16×13	33	35	Rp1/2	44	34	33	24.5	33	
20×13	32	34	Rp1/2	51	33.5	36	24.5	33	

Notes
1. The threads are parallel female threads conform to JIS B0203 (taper pipe threads).
2. The material of the thread insert conforms to JIS H3250 C3601 (free-cutting brass) or C3602 (free-cutting brass).
3. Use seal tape on threads for firm sealing. A solvent-free sealing agent must be used when seal tape and sealing agent are used together. If a solvent-containing sealing agent is used, cracks may occur in the hydrant joint.
4. Excessive tightening of the tapered male threads may cause the RP female thread section to expand and break.
5. Do not connect the product to a steel pipe with tapered male threads that are fabricated at construction sites.

HI-TS Hydrant Elbows with Mount (Back-Side Mount) — Code No. 7036

Back-side mount (with metal insert)



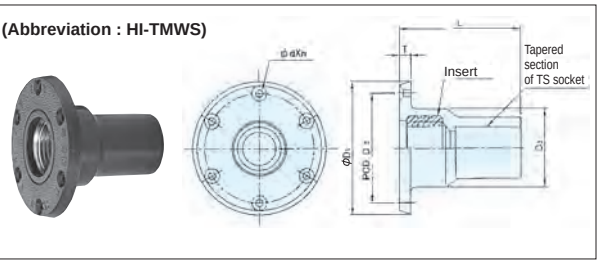
Unit : mm

Nominal Dia.	D1	D2	ℓ1	ℓ2	Nominal Thread Dia.	H	H1	L	L1	P	P1	Standards
13	30.5	34.5	17	27	Rp1/2	38	29	30	65	15	50	Ⓜ
16×13	30.5	34.5	17	31	Rp1/2	43	33	33	70	18	55	
20×13	31.0	34.5	17	35	Rp1/2	47	36	36	75	20	60	

Notes
1. The threads are parallel female threads conform to JIS B0203 (taper pipe threads).
2. The material of the metal insert conforms to JIS H3250 C371BD (brass for casting).
3. Use seal tape on threads for firm sealing. A solvent-free sealing agent must be used when seal tape and sealing agent are used together. If a solvent-containing sealing agent is used, cracks may occur in the hydrant joint.
4. Excessive tightening of the tapered male threads may cause the RP female thread section to expand and break.
5. Do not connect the product to a steel pipe with tapered male threads that are fabricated at construction sites.

HI-TS Hydrant Sockets with Flange — Code No. 7035

(Abbreviation : HI-TMWS)



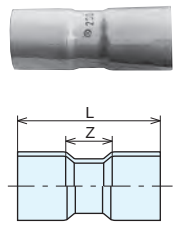
Unit : mm

Nominal Dia.	L +5 −1	D1	D2	D3	Nominal Thread Dia.	T	d	n	Standards
13	47	54	45	30	Rp1/2	4	3	6	Ⓜ
20×13	59	54	45	33	Rp1/2	4	3	6	

Notes
1. The threads are parallel female threads conform to JIS B0203 (taper pipe threads).
2. The material of the thread insert conforms to JIS H3250 C3602 (free-cutting brass).
3. Use seal tape on threads for firm sealing. A solvent-free sealing agent must be used when seal tape and sealing agent are used together. If a solvent-containing sealing agent is used, cracks may occur in the hydrant joint.
4. Excessive tightening of the tapered male threads may cause the RP female thread section to expand and break.
5. Do not connect the product to a steel pipe with tapered male threads that are fabricated at construction sites.

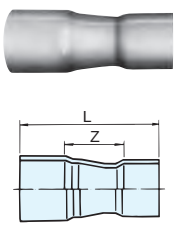
HI-TS Sockets Code No. 9661
TS Sockets Code No. 9061

(Abbreviation : S)



(Nominal Dia. : 200 and more)

(Abbreviation : RS)



(Nominal Dia. : 150 x 125 and more)

TS sockets with nominal diameter of 200 and more cannot be used on pipes for drinking water.

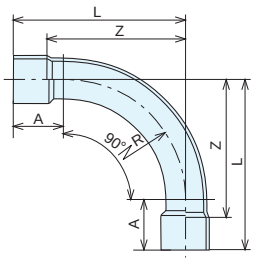
Unit : mm

Nominal Dia.	Z	L	Standards	
			For general purposes	
			VP	HI-VP
150×125	184	420	Ⓜ	★Ⓜ
200	150	550		
200×150	328	660		
250	200	700		
250×200	350	800		
300	250	850		
300×250	350	900		

Note The "★" mark indicates a made-to-order product.

HI-TS 90° Bends Code No. 9662
TS 90° Bends Code No. 9062

(Abbreviation : 90B) Type B



TS 90° Bends with nominal diameter of 200 and more cannot be used on pipes for drinking water.

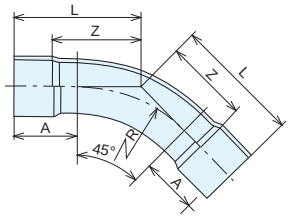
Unit : mm

Nominal Dia.	A	R (Reference)	Z	L	Standards			
					For water supply		For general purposes	
					VP	HI-VP	VP	HI-VP
13	40	40	54	80	★JIS K 6743	JIS K 6743	–	
16	50	50	170	100		★JIS K 6743		
20	55	60	180	115		JIS K 6743		
25	60	75	195	135	JIS K 6743			
30	65	90	111	155				
40	85	110	140	195				
50	100	150	187	250				
65	110	200	249	310	AS21	★AS21		
75	120	250	306	370	JIS K 6743	JIS K 6743		
100	145	300	361	445				
125	165	400	461	565	AS21	★AS21		
150	195	475	538	670	JIS K 6743	★JIS K 6743		
200	300	700	800	1000	–		Ⓜ	★Ⓜ
250	350	1000	1100	1350			★Ⓜ	–
300	400	1200	1300	1600				

Note The "★" mark indicates a made-to-order product.

HI-TS 45° Bends Code No. 9662
TS 45° Bends Code No. 9062

(Abbreviation : 45B) Type B



TS 45° Bends with nominal diameter of 200 and more cannot be used on pipes for drinking water.

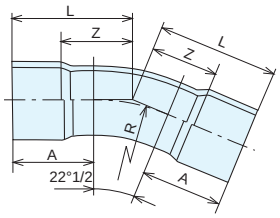
Unit : mm

Nominal Dia.	A	R (Reference)	Z	L	Standards			
					For water supply		For general purposes	
					VP	HI-VP	VP	HI-VP
13	40	40	31	57	★JIS K 6743	★JIS K 6743	–	
16	50	50	41	71				
20	55	60	45	80		JIS K 6743		
25	60	75	51	91				
30	65	90	58	102	JIS K 6743			
40	85	110	76	131				
50	100	150	99	162				
65	110	200	132	193	AS21	AS21		
75	120	250	160	224	JIS K 6743	JIS K 6743		
100	145	300	185	269				
125	165	400	227	331	AS21	★AS21		
150	195	475	260	392	JIS K 6743	JIS K 6743		
200	310	700	400	600	–		Ⓜ	★Ⓜ
250	336	1000	500	750				–
300	403	1200	600	900				

Note The "★" mark indicates a made-to-order product.

HI-TS 22° 1/2 Bends Code No. 9662
TS 22° 1/2 Bends Code No. 9062

(Abbreviation : 22 1/2B) Type B



⚠ TS 22 ° 1/2 bends with nominal diameter of 200 and more cannot be used on pipes for drinking water.

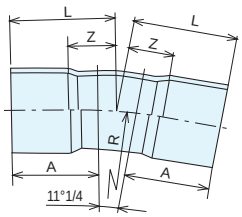
Unit : mm

Nominal Dia.	A	R (Reference)	Z	L	Standards			
					For water supply		For general purposes	
					VP	HI-VP	VP	HI-VP
13	40	40	22	48	★JIS K 6743	★JIS K 6743	–	–
16	50	50	30	60				
20	55	60	32	67		JIS K 6743		
25	60	75	35	75				
30	65	90	39	83	JIS K 6743			
40	85	110	52	107				
50	100	150	67	130				
65	110	200	89	150	AS21	AS21		
75	120	250	106	170	JIS K 6743	JIS K 6743		
100	145	300	121	205				
125	165	400	141	245	AS21	★AS21		
150	195	475	157	289	JIS K 6743	★JIS K 6743		
200	312	700	250	450	–		Ⓜ	★Ⓜ
250	352	1000	300	550				–
300	413	1200	350	650				

Note The "★" mark indicates a made-to-order product.

HI-TS 11° 1/4 Bends Code No. 9662
TS 11° 1/4 Bends Code No. 9062

(Abbreviation : 11 1/4B) Type B



⚠ TS 11 ° 1/4 bends with nominal diameter of 200 and more cannot be used on pipes for drinking water.

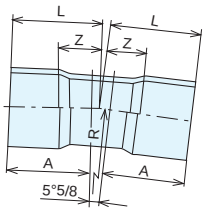
Unit : mm

Nominal Dia.	A	R (Reference)	Z	L	Standards			
					For water supply		For general purposes	
					VP	HI-VP	VP	HI-VP
13	40	40	18	44	★JIS K 6743	★JIS K 6743	–	–
16	50	50	25	55				
20	55	60	26	61				
25	60	75	27	67				
30	65	90	30	74		JIS K 6743		
40	85	110	41	96	JIS K 6743			
50	100	150	52	115				
65	110	200	67	128	AS21	★AS21		
75	120	250	81	145	JIS K 6743	JIS K 6743		
100	145	300	91	175				
125	165	400	97	201	AS21	★AS21		
150	195	475	110	242	JIS K 6743	★JIS K 6743		
200	281	700	150	350	–		Ⓜ	★Ⓜ
250	351	1000	200	450				–
300	381	1200	200	500				

Note The "★" mark indicates a made-to-order product.

HI-TS 5° 5/8 Bends Code No. 9662
TS 5° 5/8 Bends Code No. 9062

(Abbreviation : 5 5/8B) Type B



⚠ TS 5 ° 5/8 bends with nominal diameter of 200 and more cannot be used on pipes for drinking water.

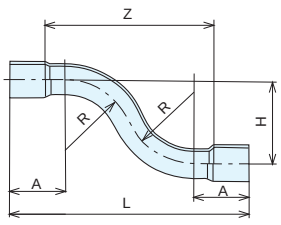
Unit : mm

Nominal Dia.	A	R (Reference)	Z	L	Standards			
					For water supply		For general purposes	
					VP	HI-VP	VP	HI-VP
40	85	110	35	90	★JIS K 6743	★JIS K 6743	–	–
50	100	150	44	107				
65	110	200	59	120	★AS21	★AS21		
75	120	250	68	132	JIS K 6743	★JIS K 6743		
100	145	300	76	160				
125	165	400	81	185	AS21	★AS21		
150	195	475	86	218	JIS K 6743	★JIS K 6743		
200	272	700	100	300	–		Ⓜ	★Ⓜ
250	330	1000	120	370				–
300	392	1200	140	440			★Ⓜ	

Note The "★" mark indicates a made-to-order product.

HI-TS S Bends Code No. 9660
TS S Bends Code No. 9060

(Abbreviation : S-B) Type B



Unit : mm

Nominal Dia.	A	R (Reference)	Z	H	L	Standards	
						VP	HI-VP
13	40	90	208	150	260	–	★JIS K 6743
16	55	100	240	150	300		
20	55	105	250	150	320		JIS K 6743
25	60	120	280	150	360		
30	65	130	302	200	390		★JIS K 6743
40	85	150	360	200	470	★JIS K 6743	JIS K 6743
50	100	150	399	200	525		
75	120	250	572	300	700		★JIS K 6743
100	145	300	642	300	810		
150	195	475	841	300	1105		

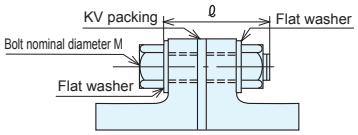
Note The "★" mark indicates a made-to-order product.

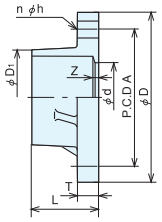
4. TS Flanges and KV Packings

Meaning of symbols
Ⓜ : Product conforms to the manufacturer's standards

TS Flanges

■ **Reference: Length of bolts used to connect TS flanges.**





Notes
1. **Use KV packings (gaskets). For JIS 5K flanges, use commercially available packings.**
2. **Install flat washers on both bolt side and nut side.**
3. **Be sure to tighten all bolts evenly to the same torque.**
4. **When installing a butterfly valve, check the product dimensions to make sure that the valve can open fully. When installing, align the centers of the parts.**

HI-JIS 10K Flanges Code No. 7642

JIS 10K Flanges Code No. 7142

Unit : mm

Nominal Dia.	D	A	d	D_1	L	T	Z	n-h	Bolt nominal length M-ℓ	Standards
15(16)	95	70	16	31	36	14	6	4-15	M12-55	
20	100	75	20	35	42	14	7	4-15	M12-55	
25	125	90	25	43	46	14	6	4-19	M16-60	
32(30)	135	100	31	49	51	16	7	4-19	M16-60	
40	140	105	40	61	62	16	7	4-19	M16-60	
50	155	120	51	73	72	20	9	4-19	M16-70	
65	175	140	67	88	69	22	8	4-19	M16-75	Ⓜ
80(75)	185	150	77	103	72	22	8	8-19	M16-75	
100	210	175	100	132	94	24	10	8-19	M16-80	
125	250	210	125	156	116	24	12	8-23	M20-80	
150	280	240	146	185	146	26	14	8-23	M20-85	
200	330	290	194	240	168	28	15	12-23	M20-90	
250	400	355	247	292	173	30	15	12-25	M22-95	
300	445	400	298	344	195	31	15	16-25	M22-95	

Notes
1. The flange dimensions conform to JIS B2220 (steel pipe flanges) 10 K.
2. The TS socket dimensions conform to JIS K6741, JIS K6743 and AS21.
3. The design pressure (hydrostatic pressure + water hammer) is 1.0 MPa for products with nominal diameters of 250 and less and 0.65 MPa for products with nominal diameter of 300.

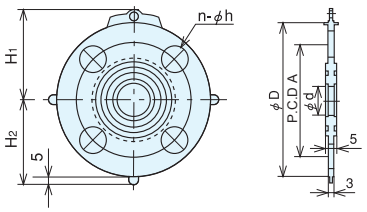
JIS 5K Flanges Code No. 7144

Unit : mm

Nominal Dia.	D	A	d	D_1	L	T	Z	n-h	Bolt nominal length M-ℓ	Standards
★15(16)	80	60	18	29	35	9	5	4-12	M10-40	
20	85	65	22	33	40	10	5	4-12	M10-40	
★25	95	75	25	42	46	10	6	4-12	M10-40	
32(30)	115	90	31	51	50	12	6	4-15	M12-50	
40	120	95	41	57	61	12	6	4-15	M12-50	
50	130	105	51	70	70	14	7	4-15	M12-50	Ⓜ
65	155	130	67	87	70	14	9	4-15	M12-50	
80(75)	180	145	77	102	72	14	8	4-19	M16-55	
100	200	165	100	130	93	16	9	8-19	M16-60	
125	235	200	125	157	114	16	10	8-19	M16-60	
150	265	230	146	186	143	18	11	8-19	M16-65	

Notes
1. The "★" mark indicates a made-to-order product.
2. The flange dimensions conform to JIS B2220 (steel pipe flanges) 5K.
3. The TS socket dimensions conform to JIS K6743 and AS21.
4. The shape differs partially from that shown in the diagram depending on the size.
5. The design pressure (hydrostatic pressure + water hammer) is 0.5 MPa.

KV Packings (Flange Gaskets)



JIS 10K Flange Type Code No. 9742

Unit : mm

Nominal Dia.	D	A	d	H_1	H_2	n-h	Standards
★ 15	95	70	18	57.0	52.5	4-15	
20	100	75	22	59.5	55.0	4-15	
25	125	90	30	73.0	67.5	4-19	
32	135	100	37	78.0	72.5	4-19	
40	140	105	43	80.5	75.0	4-19	
50	155	120	54	88.5	82.5	4-19	
65	175	140	69	99.0	92.5	4-19	Ⓜ
80	185	150	80	104.0	97.5	8-19	
100	210	175	102	118.5	110.0	8-19	
125	250	210	127	138.5	130.0	8-23	
150	280	240	150	153.5	145.0	8-23	
200	330	290	198	180.5	170.0	12-23	
★250	400	355	249	215.5	205.0	12-25	
★300	445	400	300	238.0	227.5	16-25	

Notes
1. The "★" mark indicates a made-to-order product.
2. The material is EPT (EPDM) and the operating temperature range is from -40°C to 90°C.

Flange Gaskets for Water Supply Code No. 9743

Unit : mm

Nominal Dia.	D	A	d	H_1	H_2	n-h	Standards
★ 40	140	105	43	81.0	75.0	4-19	
★ 50	155	120	54	88.5	82.5	4-19	
75	211	168	80	117.0	110.5	4-19	
100	238	195	102	132.5	124.0	4-19	
★125	263	220	127	145.0	136.5	6-19	Ⓜ
★150	290	247	151	158.5	150.0	6-19	
★200	342	299	200	184.5	176.0	8-19	
★250	410	360	252	218.5	210.0	8-23	
★300	464	414	300	245.5	237.0	10-23	

Notes
1. The "★" mark indicates a made-to-order product.
2. The material is SBR and the operating temperature range is from 5°C to 35°C.

Types of Packings That Can Be Used

TS Flange \ Packing		JIS 10K Type
		EPT(EPDM)
JIS 10K Flange	VP	○
	HI-VP	○

Note Use commercially available packings for JIS 5K flanges.

IV Adhesives

1. Vinyl-Base Adhesives

⚠ The adhesive must not be mixed with other adhesive. If the adhesive is mixed with other adhesive or a solvent, the adhesive strength decreases significantly.

Usage range of nominal diameters covered by supplied brush

Can size	Guideline range of nominal diameter
100g	13~50
500g	13~50
1kg	65~150

Tough dyne HI — Code No. 1039

Product conforms to Japan Water Works Association's standards JWWA S101

100 g can (with brush) 500 g can (with brush) 1 kg can (with brush)

Use Bonding of HI products (can be used on general pipes and fittings)
Property Low viscosity (A), quick drying (viscosity: 500 MPa·s)
Color Colorless

Tough dyne HI (White) — Code No. 1039

Product conforms to Japan Water Works Association's standards JWWA S101

500 g can (with brush) 1 kg can (with brush)

Use Bonding of HI products (can be used on general pipes and fittings)
Property Low viscosity (A), quick drying (viscosity: 500 MPa·s)
Color White

Tough dyne Red — Code No. 1039

Product conforms to Japan Water Works Association's standards JWWA S101

500 g can (with brush) 1 kg can (with brush)

Use Bonding of general pipes and fittings
Property High viscosity (B), quick drying (viscosity: 1,700 MPa·s)
Color Colorless

⚠ Caution
- **This adhesive cannot be used to bond HI products.**

Tough dyne Blue — Code No. 1039

Product conforms to Japan Water Works Association's standards JWWA S101

100 g can (with brush) 500 g can (with brush) 1 kg can (with brush)

Use Bonding of general pipes and fittings
Property Low viscosity (A), quick drying (viscosity: 150 MPa·s)
Color Colorless

⚠ Caution
- **This adhesive dries quickly; therefore, it is not suitable for bonding pipes with nominal diameter of 200 and more.**
- **This adhesive cannot be used to bond HI products.**

Tough dyne HT — Code No. 2039

Product conforms to the manufacturer's standards

100 g can (with brush) 250 g can (with brush) 500 g can (with brush)

Use Bonding of HT products
Property Low viscosity, quick drying (viscosity: 500 MPa·s)
Color Colorless

⚠ Caution
- **This adhesive cannot be used to bond general pipes/fittings or HI products.**

(Note) Expiration date is indicated only on the Tough dyne HT can. Please check the expiration date before using.

Color Tough dyne Blue — Code No. 1039

Product conforms to the manufacturer's standards

500 g can (with brush) 1 kg can (with brush)

Use Bonding of DV fittings
Property Low viscosity, quick drying (viscosity: 500 MPa·s)
Color Blue

⚠ Caution
- **Use Tough dyne Yellow for drain pipes with nominal diameter of 200 and more.**
- **This adhesive must not be used to bond pipes and fittings for water supply such as for drinking water.**
- **Be sure to wipe off the adhesive adhered on the base material. The dye contained in the adhesive penetrates the sheet over time. As a result, the blue dye appears on the surface.**

Tough dyne Yellow — Code No. 1039

Product conforms to the manufacturer's standards

1 kg can (with brush) 3 kg can

Use Bonding of general pipes and fittings (nominal diameter of 200 and more)
Property High viscosity, slow drying (viscosity: 1,000 MPa·s)
Color Colorless

⚠ Caution
- **This adhesive must not be used to bond pipes and fittings for water supply such as for drinking water.**
- **When applying to pipes with large diameters, pour a necessary amount of adhesive into a different metal container and use a large brush.**

2. Selection of Vinyl-Base Adhesive to Use

◎Recommended ○Usable × Cannot be used

Pipeline Classification	Pressurized Pipeline						Nonpressurized Pipeline		
Application Classification	Water Supply/Hot Water Supply			General Pressurized Pipe			Drain and Vent		
Pipe Product Classification	HI Product	General Pipe	HT Product	HI Product	General Pipe		HT Product	General Pipe	
Nominal Diameter Classification	150 and less			150 and less	150 and less	200 and more (Note 1)	150 and less	150 and less	200 and more (Note 1)
Tough dyne HI	◎	○	×	◎	○	×	×	○	×
Tough dyne HI (White)	◎	○	×	◎	○	×	×	○	×
Tough dyne Red	×	○(Note 4)	×	×	○(Note 4)	◎	×	○ (Note 4)	◎
Tough dyne Blue	×	◎	×	×	◎	× (Note 2)	×	◎	× (Note 2)
Tough dyne HT	×	×	◎	×	×	×	◎(Note 3)	×	×
Color Tough dyne Blue	×	×	×	×	◎	×	×	◎	× (Note 2)
Tough dyne Yellow	×	×	×	×	×	◎(Note 2)	×	×	◎

Note 1. When applying the adhesive to pipes with nominal diameter of 200 and more, pour a necessary amount of adhesive into a different metal container and use a large brush.
Note 2. Tough dyne Blue and Color Tough dyne Blue dry quickly; therefore, they are not suitable for bonding pipes with nominal diameter of 200 and more.
Note 3. When bonding HT-DV products to general pipes, such as for the connection of the drain pipe from a dishwasher, use Tough dyne HT.
Note 4. Tough dyne Red is recommended for nominal diameters of 65 and more.
Note 5. Tough dyne Yellow must not be used to bond pipes and fittings for water supply such as for drinking water.
Note 6. Use Tough dyne HI for HI pipes and fittings with nominal diameter of 200 and more.

3. Lubricants for Rubber Ring Joints

V Soap

Code No. 7000 Product conforms to the manufacturer's standards

1 kg resin container (with brush)

2 kg resin container

Use Connecting pipes to fittings with rubber ring
Property Liquid
Main component Potassium soap

V Spray

Code No. 7000 Product conforms to the manufacturer's standards

340ml

Use Connecting pipes to fittings with rubber ring
Property Spray
Main component Silicone oil

4. Amount of Adhesive and Lubricant to Apply

1. The amount of adhesive/lubricant indicated in the tables are guideline figures. When ordering, add 20% to 30% more to compensate for the loss that can occur at the construction site.
2. The indicated amount is the amount applied on the socket and pipe at one location.

Amount of vinyl-base adhesive to apply (reference)

For TS socket

g/location

Nominal Dia.	13	16	20	25	28	30	35	40	50	65	75	100	125	150	200	250	300	350	400	450	500	600
Tough dyne HI/ HI (White)	0.6	0.8	1.1	1.6	—	2.1	—	3.3	4.8	6.6	8.1	13	20	30	55	—	—	—	—	—	—	—
Tough dyne Red	0.9	1.2	1.7	2.4	2.6	3.2	3.5	5.0	7.1	9.9	12	20	30	45	80	130	180	—	—	—	—	—
Tough dyne Blue	0.6	0.8	1.1	1.6	1.7	2.1	2.3	3.3	4.8	6.6	8.1	13	20	30	—	—	—	—	—	—	—	—
Tough dyne HT	0.6	0.8	1.1	1.6	—	2.1	—	3.3	4.8	6.6	8.1	13	20	30	—	—	—	—	—	—	—	—
Tough dyne Yellow	—	—	—	—	—	—	—	—	—	—	—	—	—	—	70	105	150	205	265	330	410	595

Note The indicated amount is for a surface area of 1m^2. The amount in the table were calculated based on 300 g for Tough dyne Red, 200 g for Tough dyne HI and Tough dyne HI (White) , and 250 g for Tough dyne Yellow.

For DV socket

g/location

Nominal Dia.	20	25	40	50	65	75	100	125	150	200	250	300	350	400	450	500	600	700
Tough dyne Blue	—	—	4	5	7	10	15	20	30	—	—	—	—	—	—	—	—	—
Color Tough dyne Blue	—	—	4	5	7	10	15	20	30	—	—	—	—	—	—	—	—	—
Tough dyne HT	0.8	1.1	4	5	—	10	—	—	—	—	—	—	—	—	—	—	—	—
Tough dyne Yellow	—	—	—	—	—	—	—	—	—	55	90	125	175	220	275	350	525	700

Amount of lubricant for rubber ring joint to apply (reference)

g/location

Nominal Dia.	40	50	75	100	125	150	200	250	300	350	400	450	500	600
Amount of V Soap used	5	5	7	10	15	20	25	35	50	65	90	115	140	190

Number of application locations per can

Nominal Dia.	150	200	250
Number of joint location per V Spray can	35	23	15

I Performance and Quality

1.Operating Temperature and Pressure

(1) Operating temperature ranges and operating pressure for HI-VP, VP, VU and major fittings

Pipe	Major fitting	Use	Operating temperature range (see notes)		Operating pressure range (see notes)
HI-VP pipe for water supply VP pipe for water supply	HI-TS fitting TS fitting	Water pipe	Ordinary temperature (5 - 35ºC)		0.75 MPa (hydrostatic pressure)
VP pipe for general purposes	TS fitting	Pressure pipe	Ordinary temperature (5 - 35ºC)		1.0 MPa (hydrostatic + water hammer pressure)
	DV fitting	Non-pressure pipe	W/o external pressure	5 - 60 ºC	–
			W/ external pressure	5 - 45 ºC	
VU pipe for general purposes	VU fitting	Non-pressure pipe	W/o external pressure	5 - 60 ºC	–
			W/ external pressure	5 - 45 ºC	

Notes: 1. The operating temperature range and pressure may vary with the fitting type or joint technique.
2. Since PVC-U pipes expand and contract due to temperature differences, exposed PVC-U pipes require a means to absorb thermal expansion and contraction.

(2) Maximum operating pressures for HT pipes at various temperature

Use	Nominal Dia	Max. operating pressure various temperatures (hydrostatic + water hammer pressure)				
Pipes for hot water and hot-spring water supply (pressure pipe)	13-50	Operating temperature (ºC)	50-40	41-60	61-70	71-90 (see Notes)
		Max. operating pressure	1.0 MPa	0.6 MPa	0.4 MPa	0.2 MPa
	65-150	Operating temperature (ºC)	50-40	41-60	61-70	71-85 (see Notes)
		Max. operating pressure	1.0 MPa	0.6 MPa	0.25 MPa	0.15 MPa

Notes: 1. The continuous operating temperature range for pressure pipes is 5 to 85ºC for nominal diameters of 13 to 50 and 5 to 80ºC for nominal diameters of 65 to 150.
2. Since the thermal expansion coefficient of HT pipes due to temperature differences is four to six times those of copper and steel pipes, a means to absorb thermal expansion and contraction are important for HT pipes.

2. Performance Specification for VP and HI-VP Pipes for Water Supply

(excerpt from JIS K 6742: 2007)

Performance attribute		Performance	Applicable pipe
Tensile yield strength		Min. 45 MPa for the tensile strength at yield at 23ºC.	VP
		Min. 40 MPa for the tensile strength at yield at 23ºC.	HI -VP
Pressure resistance (hydrostatic pressure 4.0 MPa x 1 min at ordinary temperature)[1]		There shall be no leaks and other defects.	VP, HI-VP
Flatness		There shall be no cracks.	VP, HI-VP
Impact resistance		There shall be no anomalies.	HI-VP
Vicat softening temperature		MIn. 76ºC	VP, HI-VP
Opacity		Visible light transmittance shall be 0.2% or less.	VP
Leachability	Turbidity	Max. 0.5 degree	VP, HI-VP
	Chromaticity	Max. 1 degree	
	Organic matter (TOC)	Max. 1 mg/L	
	Lead	Max. 0.008 mg/L	
	Zinc	Max. 0.5 mg/L	
	Reduction in residual chlorine	Max. 0.7 mg/L	
	Odor	There shall be no anomalies.	
	Taste	There shall be no anomalies.	

Note: 1. 4.0 MPa is the pressure for the hydrostatic pressure test to check product quality. The maximum operating pressure of VP and HI-VP Pipes for water supply is 0.75 MPa and the maximum operating pressure (water hammer + hydrostatic pressure) is 1.0 MPa.

3. Performance Specification for VP Pipes for General Purposes

(excerpt from JIS K 6741: 2007)

Performance attribute	Performance	Applicable pipe
Tensile yield strength	Min. 45 MPa for the tensile strength at yield at 23ºC.	VP,VM, VU
Pressure resistance (VP: hydrostatic pressure 2.5 MPa x 1 min at ordinary temperature)[1]	There shall be no leaks or other defects.	VP,VM, VU
Joint pressure resistance[1,2]	There shall be no leaks or other defects.	VP,VM, VU
Flatness	There shall be no cracks.	VP,VM, VU
Vicat softening temperature	Min. 76ºC	VP,VM, VU

Notes: 1. 2.5 MPa is the pressure for the hydrostatic pressure test to check product quality. The maximum operating pressure (water hammer + hydrostatic pressure) of VP pipes for general purposes is 1.0 MPa.
2. The joint pressure resistance applies to pipes with rubber ring and bonding-type ends for pressure applications. For these pipes, this joint pressure resistance test may be substituted for a pressure test.

4. Performance Specification for HT-VP Pipes for Hot Water Supply

(excerpt from JIS K 6776: 2007)

Performance attribute		Performance		Applicable pipe
Tensile yield strength		Min. 50 MPa for the tensile strength at yield at 23ºC.		HT
Pressure resistance (hydrostatic pressure 4.0 MPa x 1 min at ordinary temperature)[1]		There shall be no leaks other defects.		HT
Hot internal pressure creep performance		There shall be no leaks other defects.		HT
Flatness		There shall be no cracks.		HT
Vicat softening temp erasure		Min. 95ºC		HT
Leachability[2]	Turbidity	Max. 0.5 degree		HT
	Chromaticity	Max. 1 degree		
	Organic matter (TOC)	Max. 1 mg/L		
	Lead	Max. 0.008 mg/L		
	Zinc	Max. 0.5 mg/L		
	Odor	There shall be no anomalies.		
	Taste	There shall be no anomalies.		
	Reduction in residual chlorine	Leachate at 90±2ºC[3]	Max. 1mg/L	
		Leachate at ordinary temperature[4]	Max. 0.7mg/L	

Notes: 1. 4.0 MPa is the pressure for the hydrostatic pressure test to check product quality. The operating temperature and the maximum operating pressure of HT Pipes for hot water supply are as per item1.
2. Unless otherwise specified, a leachate at 90±2ºC shall be used in the leaching test.
3. “Leachate at 90±2ºC” means a leaching test using a leachate at 90±2ºC.
4. “Leachate at ordinary temperature” means a leaching test using a leachate at ordinary temperature.

5. General Properties of VP, HI-VP and HT-VP Products

	Attribute	Units	VP	HI	Test method	HT	Test method
Physical properties	Color	—	Gray	Grayish blue	—	Brown	—
	Specific gravity	—	1.43	1.40	JIS K 7112 Sink-float method 20ºC	1.48	ASTM D 792 20ºC
	Hardness	Rockwell R	115	115	ASTM D 785 20ºC	140	JIS K 7202 20ºC
	Water absorption	One week at ordinary temperature mg/cm^2	Max. 0.15	Max. 0.15		Max. 0.15	
Mechanical properties	Tensile strength	MPa (kgf/cm^2)	49-54(500-550)	49-54(500-530)	JIS K 6742 23ºC, eta.	49-54 (500-550)	JIS K 6776 20ºC
	Longitudinal elastic modulus	MPa (kgf/cm^2)	2942 (3X10^4)	2942 (3X10^4)	JIS K 7113 20ºC	2942 (3X10^4)	ASTM D 747 20ºC
	Elongation at fracture	%	50-150	50-150	JIS K 6741 20ºC	40-80	JIB K 6741 20ºC
	Bending strength	MPa (kgf/cm^2)	78.5-98.1 (800-1000)	78.5-98.1 (800-1000)	JIS K 7203 20ºC 65%RH	89 (900)	ASTM D 970 20ºC
	Bending elastic modulus	MPa (kgf/cm^2)	2746(2.8X10^4)	2746(2.8X10^4)	JIS K 7203 20ºC 65%RH	—	—
	Compression strength	MPa (kgf/cm^2)	69(700)	64(650)	JIS K 7208 20ºC 85%RH	69 (700)	ASTM D 695 20ºC
	Poisson's ratio	—	0.35-0.40	0.35-0.40		0.38	—
	Charpy impact strength	kJ/m^2 (kgf•cm/cm^2)	6.9-9.8(7-10)	Min. 17.7		7.84X10^{-2} (8.0)	ASTM D 256
Thermal properties	Vicat softening temperature	ºC	Min. 76	Min. 76	JIS K 6742	Min. 95	JIS K 6776
	Linear expansion coefficient	1/ºC	6-8X10^{-5}	6-8X10^{-5}		6-8X10^{-5}	
	Specific heat	J/(kg•K) (cal/g•ºC)	1.05X10^3 (0.25)	1.05X10^3 (0.25)		1.05X10^3(0.25)	
	Thermal conductivity	W/(m^2•K) (kcal/m•h•ºC)	0.15 (0.13)	0.15 (0.13)	DIN 8061	0.15 (0.13)	DIN 8061
	Combustibility	—	Self-extinguishability	Self-extinguishability		Self-extinguishability	—
Electrical properties	Voltage resistance	kV/mm	Min. 40	Min. 40		Min. 40	—
	Volume resistivity	Ωcm	5.3X10^{15}	5.3X10^{15}	30ºC 65%RH	5.3X10^{15}	ASTM D 257
	Dielectricity 60 Hz	—	3.2	3.2	30ºC 55%RH	3.2	ASTM D 150
	Dielectricity 10^3 Hz	—	3.1	3.1		—	—
	Dielectricity 10^6 Hz	—	3.0	3.0		—	—
	Power factor 60 Hz	10^2	1.18	1.18	30ºC 55%RH	—	—
	Power factor 10^3 Hz	10^2	1.91	1.91		—	—
	Power factor 10^6 Hz	10^2	1.72	1.72		—	—

Note: The above values indicate typical values.

6. Chemical Resistance of VP and HI-VP Products

The chemical resistance in the table is only for reference. Please consult us when using VP and HI-VP products for chemicals.

	Chemical name	Temperature (ºC) 20	40	60		Chemical name	Temperature (ºC) 20	40	60		Chemical name	Temperature (ºC) 20	40	60
Acids	Hydrochloric acid 35%	◎	◎	△	Alkali	Aqueous ammonia 30%	◎	○	△	Organic chemicals	Ethyl acetate	×	×	×
	Sulfuric acid 60%	◎	◎	△		Lime milk	◎	◎	◎		Ethylene chloride	×	×	×
	Sulfuric acid 98%	×	×	×	Salts	Most metal chlorides, nitrates, sulfates	◎	◎	○		Formalin	◎	○	○
	Nitric acid 70%	○	△	×		Potassium bichromate 10%	◎	○	△		Carbon bisulfide	×	×	×
	Nitric acid 95%	×	×	×		Potassium perchlorate 1%	○	△	×		Acetaldehyde	×	×	×
	Mixed acid H_2SO_4 + HNO_3 50-10%:20-40%	◎	○	○		Potassium permanganate 15%	◎	○	△		Gasoline	△		
						Sodium hypochlorite	△*	△*	×		Petroleum	×	×	×
	50%:50%	△	×	×	Organic chemicals	Methylene chloride	×	×	×		Aromatic hydrocarbon	×	×	×
	Mixed acid: CrO_3 : H_2SO_4 25%:25%	×	×	×		Triol (toluene)	×	×	×		Glycerin	◎	◎	◎
						Trichloroethylene	×	×	×		Oil, fat	◎	◎	◎
	Hydrogen fluoride 10%	◎	◎	△		Acetone	×	×	×		Cresol solution 5%	×	×	×
	Phosphoric acid	◎	◎	△		Ketones	×	×	×		Lacquer, thinner	×	×	×
	Acetic acid 95%>	○	△	△		Methyl alcohol	◎	△	×	Gas	Dry chlorine gas 100%	△	×	×
	Acetic acid ≧95%	△	×	×		Ethyl ether	×	×	×		Wet chlorine gas 5%	△	×	×
	Aminoformic acid 50%	◎	○	×		Ethyl alcohol	◎	○	△		Ammonia, many other gaseous wastes	◎	○	○
	Oxalic acid	◎	◎	◎		Butyl alcohol	◎	○	△	Other	Seawater, brine	◎	◎	◎
	Lactic acid	○	△	△		Aniline	×	×	×		Ant repellent	×	×	×
	Hydrogen peroxide 30%	◎	○	△		Benzene	×	×	×		Wood preservative (creosote)	×	×	×
Alkali	Caustic soda 40%≧	◎	◎	○		Carbon tetrachloride	×	×	×					
	Caustic potash 40%≧	◎	◎	○		Chloroform	×	×	×					

Notes: ◎: not eroded at all ○: not apparently eroded △: slightly eroded ×: unusable
For chemical marked with *, VP and HI-VP products may not be used depending on the service conditions. Please consult us.

7. Chemical Resistance of HT-VP Products

The chemical resistance in the table is only for reference. Please consult us when using HT-VP products for chemicals.

	Chemical name	Temperature (ºC) 20	40	60	80		Chemical name	Temperature (ºC) 20	40	60	80		Chemical name	Temperature (ºC) 20	40	60	80
Acids	35% hydrochloric acid	◎	◎	◎	○	Alkalis	50% caustic soda	○	○	△	×	Organic chemicals	Oil, fat	◎	◎	◎	○
	Nitric acid 70%≧	○	×	×	×		60% caustic potash	◎	○	○	○		Ethyl ether	X	—	—	—
	Sulfuric acid 90%≧	◎	◎	○	△		Saturated ammonia water	◎	◎	◎	○		Hexane	◎	—	—	—
	Hypochlorous acid	△	×	×	×	Gas	Chlorine, sulfurous acid	○	—	—	—		Creosote	×	×	×	×
	50% chromium acid	△	×	×	×		Ammonia	◎	◎	○	△		Benzol	×	×	×	×
	Acetic acid 95%≧	○	△	×	×	Salts	Most metal chlorides	◎	◎	◎	○		Formalin	◎	◎	○	—
	Chloroacetic acid	◎	○	○	×		Potassium perchlorate	◎	◎	◎	○		Benzin	×	—	—	—
	Oxalic acid	◎	◎	◎	◎	Organic chemicals	Ethanol	◎	○	○	△		Ketones	×	—	—	—
	Lactic acid	◎	◎	○	○		Butanol	◎	◎	◎	○		Plating solutions	◎	◎	○	○
	Fatty acid	○	○	○	△		Carbon tetrachloride	×	×	×	×	Other	Petroleum	×	×	×	×
	Maleic acid	◎	◎	◎	◎		Glycerin	◎	◎	◎	◎						

Note: ◎: not eroded at all ○: not apparently eroded △: slightly eroded (usable with restrictions on length of period and pressure) ×: unusable

Ⅲ Bonding Techniques

1. Bonding HI-TS and TS Products

Cutting the pipe

1 Draw a cut line.

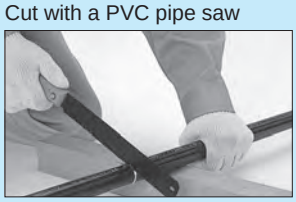
Draw a cut line around the pipe, using a wide piece of thick paper or tape.

2 Cut the pipe.

Cut with a power disc saw

Cut with a disc sander

Cut with a PVC pipe saw



Cut the pipe along the cut line at right angles to its longitudinal axis.

Chamfering

Chamfer with a disc sander

Chamfer with a rasp

Chamfer with a Chamfering tool (commercially available)

Chamfer with a reamer (commercially available)

The edge should be chamfered as the table below.

Drawing a marker line for inserting the pipe

After chamfering the pipe edge, draw a marker line around the inserting end of the pipe with a marker pen to show the insertion length.
Draw the line all around the pipe as possible.

●Zero point and bonding length
(for nominal diameters 50 and more)

(The position where the pipe stops after lightly pushing the inserting end into the socket)

The position of the marker line is obtained by adding the zero point length to the bonding length in the table on the right, and should be marked with a marker pen.

⚠ For nominal diameters 40 and less, insert the pipe up to the stopper located in the socket.

Bending lengths for nominal diameters 50 and more

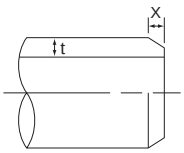
Units: mm

Nominal Dia.	Bonding length	Nominal Dia.	Bonding length
50	20	300	100
75	25	350	120
100	30	400	135
125	35	450	150
150	45	500	170
200	70	600	200
250	85		

Typical insertion lengths for nominal diameters 40 and less

Units: mm

Nominal Dia.	13	16	20	25	30	40
Fitting insertion length	26	30	35	40	44	55



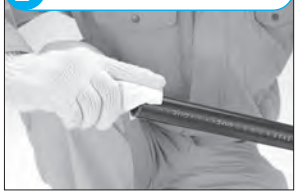
Chamfer dimension Units: mm

Nominal Dia.	30 and more	40-65	75-150	200 and less
Chamfer dimension	1	2	5	10

⚠ If a pipe and a joint are bonded together without the edges chamfered, a film is formed back in the inserted end and the pipe line may become clogged.

Bonding (for nominal diameters 40 and less)

1 Clean the surface.



Clean the inner surface of the fitting and the outer surface of the inserting end of the pipe with a dry cloth.

2 Apply the adhesive.

Apply the adhesive evenly and thinly in the circumferential direction around the inner surface of the fitting first and then the outer surface of the inserting end of the pipe.

3 Insert the pipe.

Insert the pipe straight into the fitting up to the marker line without a pause immediately after applying the adhesive. Hold the fitting and the pipe together for at least 30 seconds.

4 Bonding completion.

After bonding the pipe to the fitting, remove any adhesive coming out of the joint surface immediately. Do not apply unreasonable force to the joint.

Bonding (for nominal diameters 50 and more)

1 Clean the surface.

Clean the inner surface of the fitting and the outer surface of the inserting end of the pipe with a dry cloth. Position the wire and fastener in advance.

⚠ Sand, water or oil on the surface to be bonded may cause faulty bonding.

2 Apply the adhesive.

Apply the adhesive evenly and thinly in the circumferential direction around the inner surface of the fitting first and then the outer surface of the inserting end of the pipe.

⚠ In the summer two persons should work together as much as possible to work quickly and prevent the adhesive from drying during this process.

3 Insert the pipe.

Insert the pipe straight into the fitting up to the marker line without a pause, immediately after applying the adhesive. Hold the fitting and the pipe together.

⚠ Do not hammer the pipe into the fitting. This may damage the pipe.

4 Bonding completion.

After bonding the pipe to the fitting, remove any adhesive coming out of the joint surface immediately. Do not apply unreasonable force to the joint.

⚠ After the bonding work, ventilate the work area to remove any solvent gas.

Typical holding time required to bond TS products

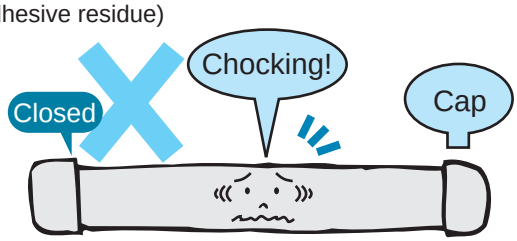
Nominal Dia.	50 and less	65 to 150	200 and more
Typical holding time	At least 30 sec.	At least 60 sec.	At least 1 min. in summer At least 3 min. in winter

Reference

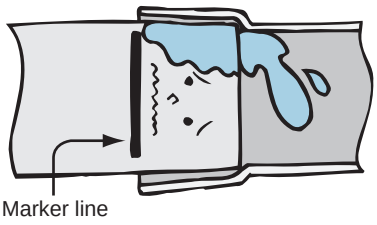
Ⅳ Preventing Solvent Cracking

Solvent cracking is a phenomenon which hairline cracks occurs when a solvent is added to objects.
The hairline cracks would grow larger after starting the service and increase the possibility of leakage. For PVC-U or PVC-C pipes, the possibility of leakage increases particularly when the following factors occur.
When all these factors are combined, the possibility increases furtherer.

Pipe clogging after bonding
(adhesive residue)

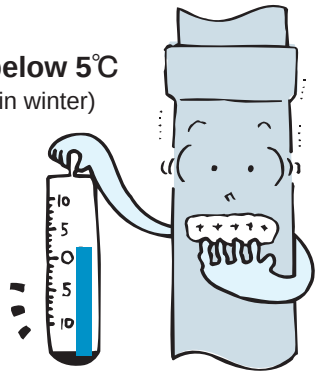


Presence of solvent
Adhesive coming out of the inner surface of the pipe due to excessive adhesive applied or the presence of chemicals that have adverse effects (such as preservatives) on the surface



Unreasonable stress being applied
(Thermal stress, pipe flattening, pipe bending)

Low temperature below 5℃
(Particularly piping work in winter)

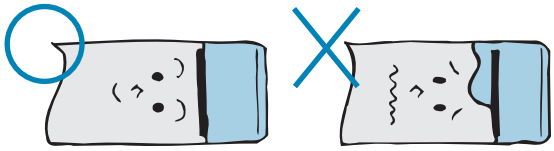


Preventing solvent cracking

During bonding work

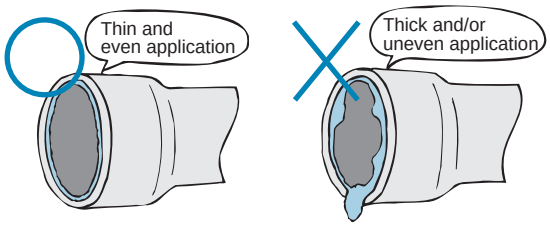
Position to apply the adhesive on the outer surface of the pipe

⚠ Do not apply the adhesive beyond the marker line.



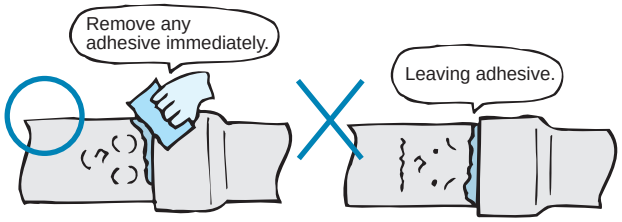
Adhesive coming out to the pipe inner surface

⚠ **Apply the adhesive thinly and evenly to the inner surface of the TS fittings.**



Removing excessive adhesive

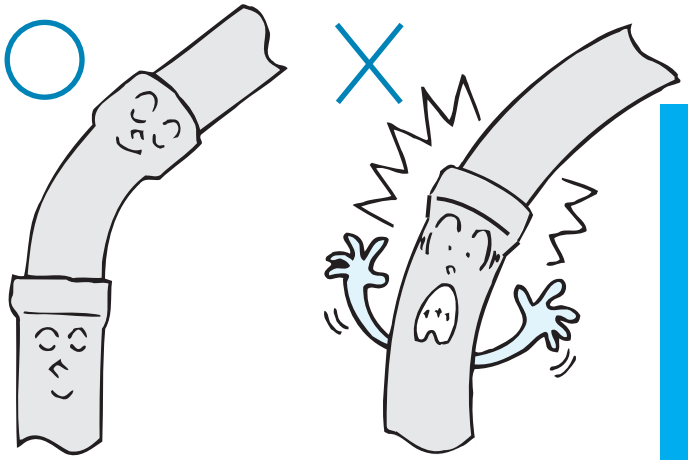
⚠ After inserting the pipe into the fitting, remove adhesive coming out of the joint surface with a cloth.



During piping work

Use bends

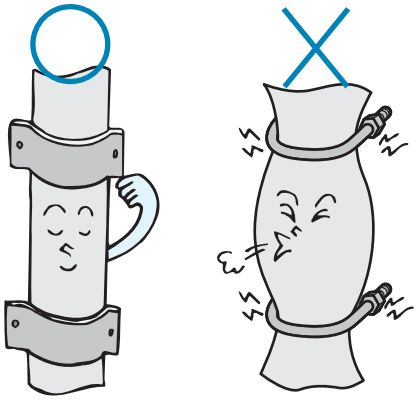
⚠ Use bends at pipe corners. Do not bend the pipe.



Reference

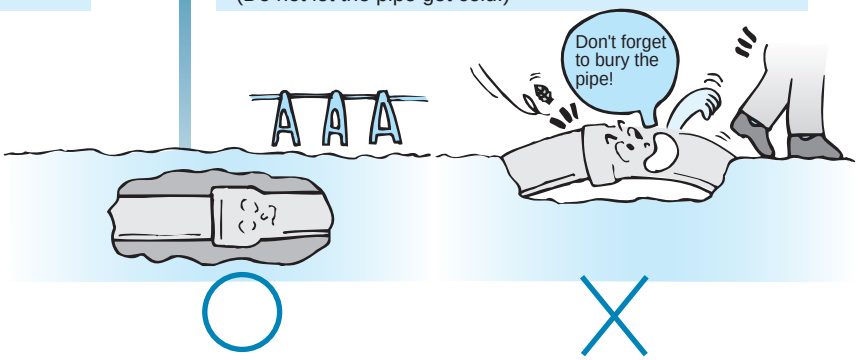
Pipe supports

⚠ When supporting the pipe with saddle bands, use wide fastener bands. Do not use U-bolts. Be careful not to tighten the bands excessively.



Backfilling

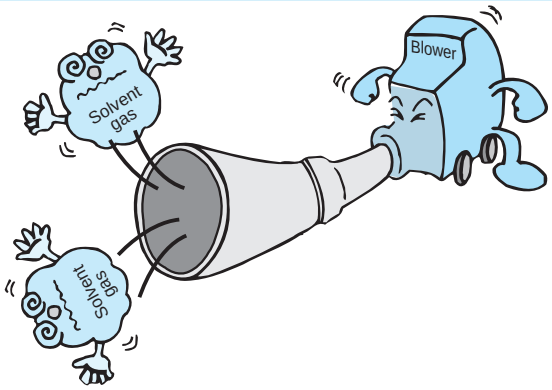
⚠ Backfill the pipe as quickly as possible to prevent thermal stress due to temperature differences or external impact. (Do not let the pipe get cold.)



Removing the solvent gas after bonding work

Ventilation

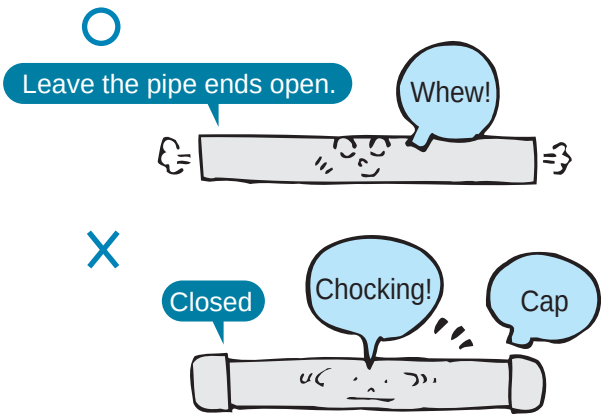
⚠ After bonding work, remove the solvent gas using a blower (low pressure type) or other means.



Washing with water avoiding water pressure in the pipe

⚠ Pour water into the pipe 30 minutes after the bonding work for nominal diameter 50 and less and one hour after the bonding work for nominal diameters 65 and more. Do not make any water pressure in the pipe.

Opening the pipe ends

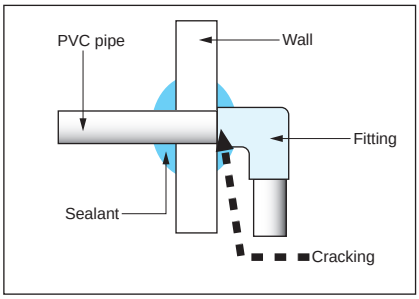


⚠ Do not close the pipe ends. Leave them open to remove the adhesive vapor.

Other important information

There is a recently developed technique which installs a PVC-U or PVC-C pipe through an interior wall and then the gap between the pipe and the wall is filled with a sealant. Some sealants contain a plasticizer, such as DOP and phthalate ester, or a solvent such as xylene and toluene, which may cause solvent cracking to PVC pipes. Usually, these plasticizers and solvents are contained in polyurethane sealants but not in silicon sealants.

However, plasticizers and solvent may be added to silicon sealants to improve their performance in the future. It is advisable to contact the sealant manufacturer for details.



V User Instructions

This section is about do's and don'ts in order to make the most of the performance of Kubota ChemiX PVC-U or PVC-C pipes and fittings. Please read carefully and use the instructions in the safety manual where appropriately.

●Please observe the following instructions.
Classes of actions are represented by the following graphic symbols.

- ⚠ indicates that the action needs to be taken carefully.
- ⊘ indicates that the action is prohibited.
- ❗ indicates that the action must be taken.

1. Instructions for the treatment of left-over material and scraps

⊘ No on-site burning

Do not burn PVC pipes and fittings on site. Toxic chlorine gas will be released into the air, by burning.

⊘ Laws and regulations

Left-over and scrapped PVC pipes and fittings should be treated according to local laws and regulations. Do not crush leftovers and scraps with a hammer. Crushed pieces may fly away.

2. Carrying instructions

❗ Wear gloves

Wear rubber-coated gloves with a firm grip to prevent injury.

⚠ Careless handling is dangerous

Large PVC pipes are heavy. Also, PVC pipes which are bundled together can be heavier than expected. Handle them with care to prevent injury. Careless handling is dangerous.

⊘ Do not step on pipes

Do not step on pipes. The surface of PVC pipes is slippery, which may lead to an accident.

❗ Use a cushion

Place cushions between pipes and the truck bed and on the parts of a pipe that are secured with a rope to prevent scratches and deformation.

⊘ Careful handling

When loading and unloading the PVC pipes from truck, do not throw or drag PVC pipes into the truck. Handle with care to prevent scratches and damage to the pipes and injury.

⚠ Prevent collasping during transport

Take measures to stop ropes from becoming loose or coming off to prevent pipes from falling off the truck.

⚠ Carefully lift and lower pipes

If a truck with a hoist is used, balance the load when lifting to prevent injury.

3. Storage instructions

❗ When storing pipes horizontally indoors

When storing PVC-U or PVC-C pipes, pile them in a crisscross pattern or in a staggered pattern to prevent them from warping or deforming. Put stoppers at the pipe ends to prevent the pile from collapsing.

❗ When storing pipes outdoors

When storing pipes outdoors, put a simple roof over the storage area or an opaque sheet on the pipes to block direct sunlight. When a sheet is used, provide a good air flow.

❗ Storing pipes vertically

When there is no choice but to store pipes vertically, take measures to prevent them from falling over, such as securing them with ropes.

❗ Storing fittings

Fittings should be stored indoors with the pipes. When there is no choice but to store them outdoors, put a sheet over them to protect from sunlight. Always put a cover on fittings with a rubber ring to protect from direct sunlight which will degrade the performance quality of rubber rings.

4. Installation instructions

Pipes and fittings should be installed using the standard installation techniques recommended by Kubota ChemiX, in order to ensure work safety and the performance of pipe lines. If installation conditions do not allow this, please contact us.

Using the proper tools

Select tools with the proper specifications for tasks such as cutting, drilling and joining. Read and ensure that you fully understand the instruction manuals of the tools before using.

Ventilation after bonding work

After bonding work, ventilate the bonded pipe well. Do not close the bonded pipe. Otherwise, solvent cracking or a bad odor may result. Solvent cracking is a phenomenon which hairline cracks occur in a PVC-U or PVC-C pipe due to residual solvent vapor in the adhesive. Residue of bad odor in drinking-water pipes affects the smell and taste of the water. It should be noted that, particularly in the winter, solvents do not easily evaporate and tend to remain in the pipe.

Caution against the use of organic chemicals

PVC-U or PVC-C pipes and fittings can be eroded by organic chemicals, and should not be allowed to come into contact with creosote (wood preservative), termite and other pesticides or paint. If soil contaminated by these chemicals is expected along the pipe line route, take measures to protect against contamination by avoiding contaminated areas when installing the pipe line.

Treatment for thermal expansion and contraction

For pipes bonded to fittings, expansion fittings should be used to prevent pipes from becoming disconnected from their fittings or damaged due to thermal expansion and contraction.

Do not bend pipes

Do not bend pipes. Otherwise, the strain will remain, causing potential pipe rupture. If curved pipes are required, always use bends.

About thrust protection

For buried pipes subject to hydrostatic pressure, thrust protection should be provided to prevent the pipes from becoming disconnected from their fittings at corners and branches. The standard installation technique recommended by the Japan PVC Pipe and Fittings Association and Kubota ChemiX should be used.

Do not heat pipes on site

Do not heat pipes on site. Pipes may become scorched or burnt, resulting in reduced strength.

About protective insulation cover

Avoid installing pipes near steam and hot-water pipes in order to prevent deformation and damage due to high temperatures. If this is not possible, put a protective insulation cover around the pipe.

Public space used for pipes

When pipes are buried under public roads, follow the burying standards or instructions provided by the road administrator. For siphon pipes across a river and pipes buried under railways, follow the instructions provided by the respective administrators.

Squeeze-off tools

Squeeze-off tools for polyethylene pipes should not be used to repair small water pipes. The ductility of PVC-U or PVC-C pipes is smaller than that of polyethylene pipes. If water sealing work is carried out with squeeze-off tools, whitening due to plastic deformation may occur to the pipe which lead to damage in the future.

Freeze protection

In cold regions, pipes should be buried 20 cm deeper than the maximum freeze depth. Thermal insulation should be wrapped around the exposed part of a vertical water pipe to protect against freezing.

Cutting small pipes

Do not use a pipe cutter to cue small pipes. The cutter may cause chippings or deformation to the cut section of the pipe.

Joining a hydrant

Since a hydrant has parallel pipe threads, water cannot be sealed by inserting the threads into the female threads of a water fitting with sealing tape. When joining a hydrant to a water fitting, place a gasket between the hydrant flange (the face with the gasket on) and the water fitting.

Do not thread PVC pipes and fittings

Do not thread PVC-U or PVC-C pipes and fittings directly. These pipes have a large notch effect, and their strength decreases if cracks or notches are made.

Use of lubricant specifically designed for joining fittings with a rubber ring

A lubricant specifically designed for rubber rings should be used to joint fittings with a rubber ring to a pipe. Do not use adhesive or oil. It may damage the rubber ring.

Insertion force joining pipes to TS fittings

When joining a pipe to a TS fitting, unreasonable stress may be applied to the fitting depending on the dimensional combination of the pipe and the fitting if the pipe is inserted up to the stopper in the fitting. In terms of the relation between the bonding length and the pressure resistance, it has been confirmed that a practically sufficient hydrostatic resistance can be achieved by inserting the pipe up to one-third of the insertion length of the fitting from the insertion length position without any adhesive applied (zero point position).
In order to prevent the bonded pipe from becoming disconnected from the fitting due to the elasticity of the pipe, the insertion force should be applied for over 30 seconds for nominal diameters 50 and less and for over 60 seconds for nominal diameters 65 and more.

Joining steel pipes to fittings with a tapered female thread

Do not insert the tapered male threads of a metal pipe into a hydrant fitting. The joint may be damaged. Normally, a metal socket should be joined to the tapered male thread of the metal pipe. Then, a valve socket should be joined to the metal socket. When strength is required for the inserted section, a valve socket with a metal male thread should be joined to the metal socket.

5. Instructions for handling PVC adhesive

Do not use adhesives for other applications

PVC and plastic adhesives were developed to bond PVC pipes to PVC fittings, and should not be used for other applications.

Use of appropriate adhesives

There are three types of adhesive: one for HI products, one for HT products and one for other products. The adhesives are designed to provide appropriate joint strength to pipes and fittings. Therefore, it is necessary to use the adhesive appropriate for the type of pipe.

If adhesive enters the eye

If adhesive enters the eye, do not rub the eye. Seek medical attention immediately

Storage according to laws and regulations

Adhesives are hazardous substances under the Fire Defense Law. Follow applicable laws, regulations and municipal ordinances when storing adhesives.

Ventilation and fire prevention

When using an adhesive, ventilation should be provided to prevent intoxication. Also fire sources should be kept away from organic solvents.

Use of gloves

Wear gloves to protect against skin irritation and sores. Do not touch the adhesive directly. If the adhesive touches the skin, wash it off with soap and water immediately.

Washing hands and gargling

After using the adhesive, wash your hands and gargle well.

Store in a cool and dark place away from fire sources

Adhesives contain organic solvents. After using the adhesive close the lid of the can securely and store it in a cool and dark place indoors. Be sure to keep away from fire sources.

Do not use old and expired adhesives

Do not use an old and expired adhesive that has jelled or that has no pungent solvent odor. Do not thin the adhesive with thinner. This will decrease the adhesion, leading to the pipe disconnection from the fitting and causing leakage.