

# ***Fuji polypropylene pipes***

**for pressure applications** Polypropylene single-layer pipe

# ***Fuji GRP pipe***

**for pressure applications** Glass reinforced polypropylene double-layer pipe



**FUJIKAKO Co., Ltd.**

<http://www.fujikako.co.jp>

# To support the future of the earth

## FUJIKAKO's high-functionality products

### New sleeve welding method

A single worker can perform welding at a range from 16 A to 100 A.

Both stable quality and operability are achieved!



### Flexible and quake-resistant

As the pipe and joint are integrated, there is no risk of disconnection of joined parts or leakage.



Pipe tensile test

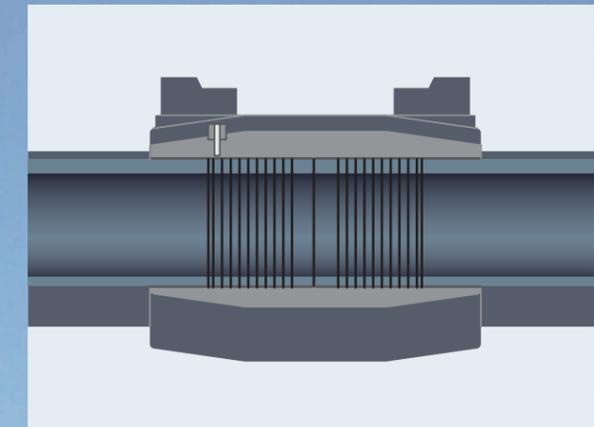


Bending pipes

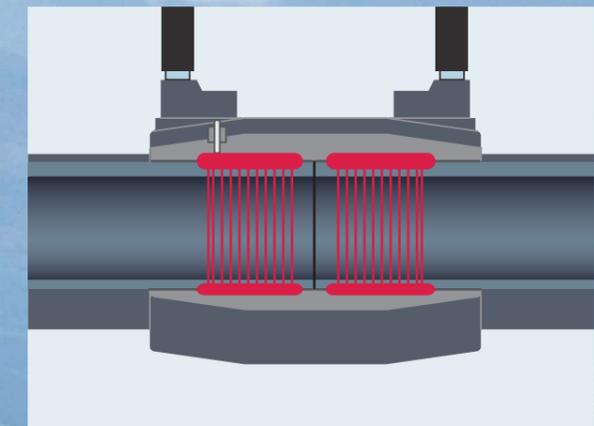
### Electrofusion method

Easy and secured joining system usable at a range from 40 A to 200 A.

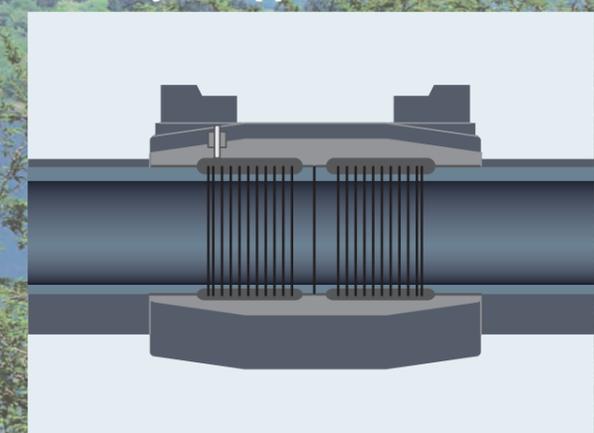
A pipe and joint are integrated without requiring any mastery skills.



•Pipes are inserted into a joint.



•Wires are heated and the interface of the joint and pipes fuses.



•Joining is completed after natural cooling.



## Notes

- The numerical values indicating the usable range of chemical resistance, liquid pressure, and temperature of our products listed in this catalog are given as a rough guide to help customers select our products. These values do not guarantee performance, durability, or useful life.
- Please refrain from using our products in conditions that deviate from the usable range described in this catalog, as this may place an unexpected load on the product.
- If you are thinking about using our products in an environment where there is a risk of personal injury or property damage, please make sure to consult with our sales office first.
- The useful life of products depends on a variety of factors. Therefore, please understand that even if you use products within the usable range described in this catalog, the useful life of products may change depending on the balance between multiple use conditions, environment, etc.
- Equipment that uses our products must be subject to regular inspections according to conditions of use, in order to prevent damage to the products and accidents caused by or related to the product. Consult with us regarding the period and methods of inspections.
- Please understand that this catalog may be revised without prior notice due to reasons such as product improvement, design changes, or discontinuation of production. For this reason, please check with us that the catalog is the latest version when selecting a product.

### Scope of warranty

The warranty period for our products is one (1) year from the date of delivery. If the product is damaged during the warranty period, we will repair or replace the product at our expense. Repairs and replacements more than one year after delivery will be made at the customer's expense. However, the following cases are not covered by our warranty, and we will not pay compensation for damages caused by damage to the product or accidents caused by or related to the product.

- [1] If the use conditions deviate from the usable range of the product described in this catalog  
 [2] If our products are applied, handled, or installed by inappropriate methods not described in this catalog  
 [3] If the installation method or installation environment of the product is not considered as normal  
 [4] If the issue is caused by fire, flood, earthquake, lightning, or some other natural disaster

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## Features of Fuji polypropylene pipes

Fuji polypropylene pipes (PP pipes hereinafter) are pipes made of polypropylene that we successfully commercialized for the first time in Japan. Among many types of thermoplastic pipes, they are highly heat and corrosion resistant and have exceptional physical properties.

Polypropylene has a stereoregular molecular structure generated by the advancement of petrochemistry and is a thermoplastic resin that has many excellent characteristics. Its excellency has been proven in films, molded parts, and sheets. It is re-evaluated as a clean, environmentally-friendly material that does not emit toxic gases when disposed of or incinerated.

### 1. Excellent chemical resistance

Polypropylene provides high chemical resistance across a wide range including acids, alkalis, and bases so it can be used in high temperatures and for high concentrations.

### 2. Excellent high and low temperature resistance

Having excellent high/low temperature resistance, it can be used in temperatures from **-10°C to 100°C**.

### 3. Light weight and easy to handle

Polypropylene pipes are light weight with a specific gravity of 0.9 to 0.91, which is about 1/8 of that of steel pipes, so it is easy to transport and install them.

#### ■Specific gravity of pipe materials

Pipe material	PP pipe	GRP pipe	Rigid PE pipe	Rigid PVC pipe	FRP pipe	Steel pipe
Specific gravity	0.9 to 0.91	1.03	0.94 to 0.96	1.40	1.55	7.85

### 4. Excellent mechanical strength

They are durable and have a higher mechanical strength for tensile, inner pressure, impact, etc. when used at high-temperature parts as compared to other synthetic resin pipes. A material with excellent creep property is also used.

### 5. High electrical insulation properties

Because the products have high electrical insulation properties, you do not need to worry about electric corrosion when transporting any fluids.

### 6. Excellent weather resistance

Stabilizer has been contained so that the products can withstand long-term outdoor use.

### 7. Low thermal conductivity

Their thermal conductivity is very low, being about 1/270 that of steel pipes. Therefore, they are hard to conduct heat.

### 8. No emission of toxic gas during incineration

Polypropylene and additives used in raw materials do not contain toxic gas products such as halide. So the products are environmentally-friendly with little incineration residue.

## Features of Fuji GRP pipes (glass reinforced polypropylene double-layer pipes)

Fuji GRP pipes (GRP pipes hereinafter) are integrally-molded double-layer pipes whose inner layer is polypropylene resin and outer layer is Fiberglass Reinforced Thermo Plastics (FRTP) in which polypropylene resin is reinforced with glass fibers.

Therefore, in addition to the features of PP pipes, GRP pipes are very strong and their thermal expansion coefficients are low.

### 1. Excellent mechanical strength

The strength reduction rate of high-temperature areas is lower than that of other thermoplastic synthetic resin pipes because the resin is reinforced by glass fibers.

### 2. Low thermal expansion coefficient

The thermal expansion coefficient is much smaller than that of other plastic pipes and the serpentine shape of the pipe is small. So the products are most suitable for rack piping and open piping.

#### Thermal expansion coefficient of pipe materials (x10<sup>-6</sup>/°C)

Pipe material	GRP pipe	PP pipe	Rigid PVC pipe	Stainless steel pipe	Steel pipe
Thermal expansion coefficient	24	110	70	17	12

## Physical properties

Item	Unit	PP pipe	GRP pipe
Specific gravity	—	0.9 to 0.91	1.03
Tensile strength	N/mm <sup>2</sup>	24.5	39.2
Bending strength	N/mm <sup>2</sup>	31.3	63.7
Tensile elastic modulus	N/mm <sup>2</sup>	784.5	1225.8
Bending elastic modulus	N/mm <sup>2</sup>	902.2	1961.3
Shear strength	N/mm <sup>2</sup>	29.4	24.5
Compression strength	N/mm <sup>2</sup>	34.3	39.2
Expansion	%	400 to 600	>3
Poisson's ratio	—	0.42	0.40
Vicat softening point	°C	>145	130.3
Thermal expansion coefficient	/°C	110 × 10 <sup>-6</sup>	24 × 10 <sup>-6</sup>
Voltage resistance	kV/mm	30 to 32	30 to 32
Volume resistivity	Ω cm	>10 <sup>16</sup>	>10 <sup>16</sup>
Thermal conductivity	W/m·K	0.17 to 0.23	0.17 to 0.23

\*The above physical property values assume ordinary temperature.

## Working pressure and destruction pressure

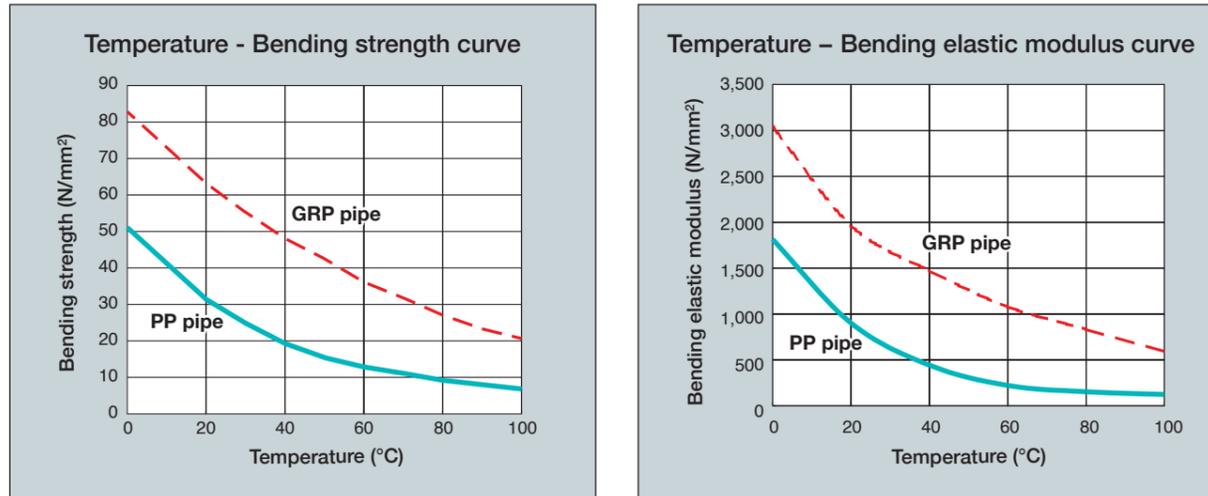
		Pipe type	DN	0°C	20°C	40°C	60°C	80°C	100°C
PP pipe	Working pressure (MPa)	H-pipe	16	1.65	1.29	1.00	0.72	0.43	0.27
			20	1.31	1.02	0.79	0.57	0.34	0.22
			25	1.20	0.94	0.72	0.53	0.32	0.20
			40	0.95	0.74	0.57	0.42	0.25	0.16
			50	0.95	0.74	0.57	0.42	0.25	0.16
			75	0.96	0.75	0.58	0.42	0.25	0.16
		M-pipe	100	0.95	0.74	0.57	0.42	0.25	0.16
			125	0.62	0.48	0.37	0.27	0.16	0.10
			150	0.60	0.47	0.36	0.26	0.16	0.10
			200	0.62	0.48	0.37	0.27	0.16	0.10
			250	0.62	0.49	0.38	0.27	0.16	0.10
			300	0.63	0.49	0.38	0.27	0.16	0.10
	L-pipe	125	0.47	0.37	0.28	0.20	0.12	0.08	
		150	0.46	0.36	0.28	0.20	0.12	0.08	
		200	0.40	0.31	0.24	0.18	0.11	0.07	
		250	0.41	0.32	0.25	0.18	0.11	0.07	
		300	0.41	0.32	0.25	0.18	0.11	0.07	
		Destruction pressure (MPa)	H-pipe	16	9.91	7.74	5.98	4.34	3.25
20	7.85			6.13	4.73	3.43	2.57	2.16	
25	7.20			5.63	4.34	3.15	2.36	1.98	
40	5.71			4.46	3.44	2.50	1.87	1.57	
50	5.71			4.46	3.44	2.50	1.87	1.57	
75	5.78			4.51	3.48	2.53	1.90	1.59	
M-pipe	100			5.71	4.46	3.44	2.50	1.87	1.57
	125			3.70	2.89	2.23	1.62	1.22	1.02
	150			3.62	2.83	2.18	1.58	1.19	1.00
	200			3.69	2.88	2.23	1.62	1.21	1.02
	250			3.74	2.92	2.25	1.63	1.23	1.03
	300			3.77	2.94	2.27	1.65	1.24	1.03
L-pipe	125		2.81	2.20	1.69	1.23	0.92	0.77	
	150		2.78	2.17	1.68	1.22	0.91	0.76	
	200		2.41	1.89	1.46	1.06	0.79	0.66	
	250		2.44	1.91	1.47	1.07	0.80	0.67	
	300		2.45	1.92	1.48	1.07	0.81	0.67	
	GRP pipe		Working pressure (MPa)	H-pipe	40	0.95	0.74	0.57	0.42
50		0.95			0.74	0.57	0.42	0.25	0.16
75		0.96			0.75	0.58	0.42	0.25	0.16
L-pipe		100		0.95	0.74	0.57	0.42	0.25	0.16
		125		0.47	0.37	0.28	0.20	0.12	0.08
		200		0.40	0.31	0.24	0.18	0.11	0.07
Destruction pressure (MPa)		H-pipe	40	5.71	4.46	3.44	2.50	1.87	1.57
			50	5.71	4.46	3.44	2.50	1.87	1.57
			75	5.78	4.51	3.48	2.53	1.90	1.59
		L-pipe	100	5.71	4.46	3.44	2.50	1.87	1.57
			125	2.81	2.20	1.69	1.23	0.92	0.77
			200	2.78	2.17	1.68	1.22	0.91	0.76

(Note)1. This table only shows calculated values and the destruction pressure is not guaranteed. Regarding the pressure for constant use, please be sure to use a pressure within the working pressure.

2. Regarding pipe types, H-pipes are for high pressure, M-pipes are for medium pressure, and L-pipes are for low pressure.

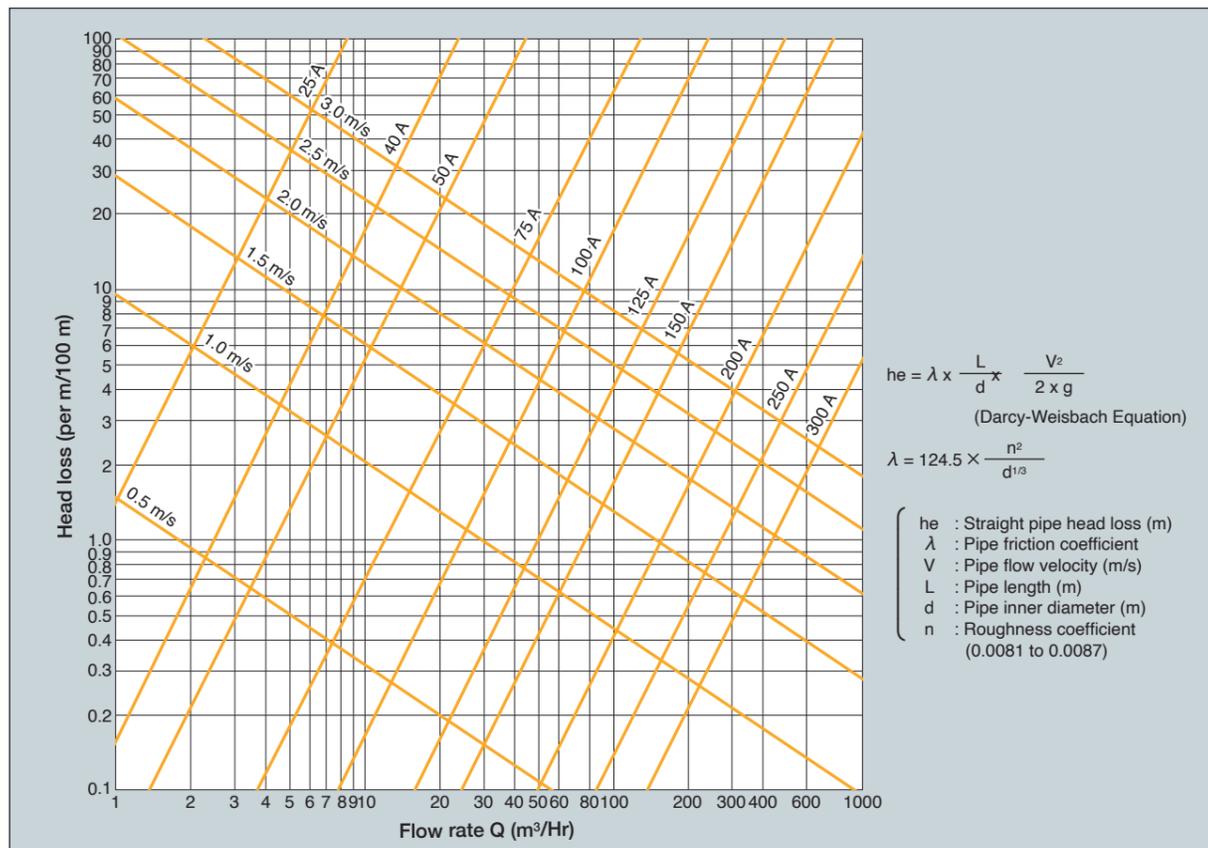
## Temperature dependence

Because PP pipes and GRP pipes are made of thermoplastic resin, they are easily affected by temperature changes. Special attention should be paid when designing piping or using pipes.



## Head loss

PP pipes and GRP pipes have extremely low fluid friction and smooth inner surface. Thus, substances such as scale hardly adhere to them, which prevents them from aging.



## Thermal expansion/contraction and thermal stress

The thermal expansion coefficient of the GRP pipes is about 1/3 that of vinyl chloride pipes. However, it is important to prevent applying excessive thermal stress on the pipes and joints by absorbing the expansion with the expansion joints and piping configuration, same as polyethylene pipes and vinyl chloride pipes including PP pipes.

### 1. Thermal expansion/contraction

$$\Delta L = L \times \alpha \times \Delta T$$

- ΔL : Amount of expansion (mm)
- L : Piping length (mm)
- α : Thermal expansion coefficient (PP pipes 110 × 10<sup>-6</sup>/°C)  
(GRP pipes 24 × 10<sup>-6</sup>/°C)
- ΔT : Difference between outside temperature and working (design) temperature during piping installation (°C)

### 2. Thermal stress

If the temperature changes when both ends of the pipe are fixed, thermal stress will be applied to the pipe material.

$$\sigma T = E \times \alpha \times \Delta T$$

- σT : Thermal stress (N/mm<sup>2</sup>)
- E : Elastic modulus at working (design) temperature (N/mm<sup>2</sup>)
- α : Thermal expansion coefficient (PP pipes 110 × 10<sup>-6</sup>/°C)  
(GRP pipes 24 × 10<sup>-6</sup>/°C)
- ΔT : Difference between outside temperature and working (design) temperature during piping installation (°C)

$$W = \frac{\sigma T \times \pi \times (D^2 - d^2)}{4}$$

- W : Thermal load (N)
- σT : Thermal stress (N/mm<sup>2</sup>)
- D : Pipe outer diameter (mm)
- d : Pipe inner diameter (mm)

### 3. Measures for expansion/contraction

As the joints are made of polypropylene which is flexible, the elbows in the piping can distribute bending stresses.

**Equations:**

$$\sigma = \frac{2 \times \Delta L \times E \times D}{\ell^2}$$

$$\sigma_s = \frac{\sigma_b}{F}$$

**Legend:**

- σ : Bending stress (N/mm<sup>2</sup>)
- ΔL : Amount of expansion (mm)
- E : Elastic modulus at working (design) temperature (N/mm<sup>2</sup>)
- D : Pipe outer diameter (mm)
- ℓ : Piping length (mm)
- σs : Allowable stress (N/mm<sup>2</sup>)
- σb : Bending strength at working (design) temperature (N/mm<sup>2</sup>)
- F : Safety rate

**Check:** σ ≤ σs ... OK

# Chemical resistance

Name of chemical	Concentration %	Temperature (°C)					Name of chemical	Concentration %	Temperature (°C)					Name of chemical	Concentration %	Temperature (°C)				
		20	40	60	80	100			20	40	60	80	100			20	40	60	80	100
<b>[Acids]</b>						<b>[Alkalis]</b>						<b>[Gases]</b>								
Sulfuric acid	5	[Hardly affected]					Sodium hydroxide	10	[Hardly affected]					Potassium bromide		[Hardly affected]				
	10	[Hardly affected]						30	[Hardly affected]					Sodium bromide	Saturation	[Hardly affected]				
	30	[Hardly affected]					50	[Hardly affected]					Copper sulfate	Saturation	[Hardly affected]					
	50	[Hardly affected]					Potassiumhydroxide	20	[Hardly affected]					Iron(I), (II) sulfate	Saturation	[Hardly affected]				
	70	[Hardly affected]					Ammonia water	10	[Hardly affected]					<b>[Organic chemicals]</b>						
	90	[Hardly affected]					30	[Hardly affected]					Hydrogen chloride	100	[Partially affected]					
98 (Not applicable)						Barium hydroxide	Saturation	[Hardly affected]					Sulfurous acid gas	100	[Hardly affected]					
Hydrochloric acid	10	[Hardly affected]					Calcium hydroxide	Saturation	[Hardly affected]					Ammonia	100	[Hardly affected]				
	20	[Hardly affected]					Magnesium hydroxide	Saturation	[Hardly affected]					Hydrogen fluoride	100	[Partially affected]				
	30	[Hardly affected]					<b>[Bases]</b>						Chlorine (wet and dry)	100	(Not applicable)					
Nitric acid	10	[Hardly affected]					Sodium carbonate	Saturation	[Hardly affected]					<b>[Organic chemicals]</b>						
	15	[Partially affected]					Potassiumcarbonate	Saturation	[Hardly affected]					Benzene	100	(Not applicable)				
	20	[Partially affected]					Ammoniumcarbonate	Saturation	[Hardly affected]					Toluene	100	(Not applicable)				
Acetic acid	10	[Hardly affected]					Sodium chlorite	10	[Partially affected]					Styrene	100	(Not applicable)				
	40	[Partially affected]					30	[Partially affected]					Methyl alcohol	100	[Hardly affected]					
	50	[Partially affected]					Sodium benzoate	35	[Hardly affected]					Ethyl alcohol	100	[Partially affected]				
Phosphoric acid	25	[Hardly affected]					Aluminum chloride	Saturation	[Hardly affected]					Glycerin	100	[Hardly affected]				
	50	[Hardly affected]					Calcium chloride	Saturation	[Hardly affected]					Ethyl ether	100	(Not applicable)				
	85	[Partially affected]					Calcium chlorate	Saturation	[Hardly affected]					Ethylene glycol	100	[Hardly affected]				
Oxalic acid	30	[Hardly affected]					Copper(I) chloride	Saturation	[Hardly affected]					Ethyl acetate	100	[Partially affected]				
	50	[Partially affected]					Copper(II) chloride	Saturation	[Hardly affected]					Butyl acetate	100	[Partially affected]				
	95	[Partially affected]					Iron(II) chloride	Saturation	[Hardly affected]					Amyl acetate	100	[Partially affected]				
Chromic acid	5	[Hardly affected]					Iron(III) chloride	Saturation	[Hardly affected]					Vinyl acetate	100	[Partially affected]				
	10	[Hardly affected]					Potassium chloride	Saturation	[Hardly affected]					Trichloroethylene	100	(Not applicable)				
	20 (Not applicable)						Tin (I), (II) chloride	Saturation	[Hardly affected]					Chloroform	100	(Not applicable)				
Hydrofluoric acid	10	[Hardly affected]					Sodium chlorate	Saturation	[Hardly affected]					Carbon tetrachloride	100	(Not applicable)				
	20	[Hardly affected]					Hydrogen peroxide water	1	[Partially affected]					Methylene chloride	40	[Partially affected]				
	55	[Partially affected]					3	[Partially affected]					Ethylene chloride	40	[Partially affected]					
Fluorosilicic acid	20	[Partially affected]					10	[Partially affected]					Nitrobenzene	100	[Partially affected]					
		[Partially affected]					Potassium perchlorate	10	[Partially affected]					Aniline	100	[Hardly affected]				
		[Partially affected]					Potassium permanganate	10	[Partially affected]					Pyridine	100	[Partially affected]				
Boric acid	Saturation	[Hardly affected]					Lead acetate	Saturation	[Partially affected]					Acetaldehyde	100	[Partially affected]				
		[Hardly affected]					Copper cyanide		[Partially affected]					Formalin	35	[Partially affected]				
		[Hardly affected]					Sodium cyanide		[Partially affected]					Acetone	100	[Partially affected]				
Butyric acid	100	[Hardly affected]					Silver nitrate		[Partially affected]					Cyclohexanone	100	[Partially affected]				
		[Hardly affected]					Sodium nitrate		[Partially affected]					Methyl ethyl ketone	100	[Partially affected]				
		[Hardly affected]					Ammonium nitrate		[Partially affected]					<b>[Others]</b>						
Carbonic acid	100	[Hardly affected]					Potassium bromate		[Partially affected]					Vaseline		[Partially affected]				
		[Hardly affected]					Calcium hypochlorite	Saturation	[Partially affected]					Olive oil		[Partially affected]				
		[Hardly affected]					Sodium hypochlorite	Saturation	[Partially affected]					Castor oil		[Partially affected]				
Formic acid	100	[Hardly affected]					Potassium bichromate	Saturation	[Partially affected]					Cottonseed oil		[Partially affected]				
		[Hardly affected]					Alum (various types)	Saturation	[Partially affected]					Linseed oil		[Partially affected]				
		[Hardly affected]					Sodium dichromate	Saturation	[Partially affected]					Beer		[Partially affected]				
Oleic acid	100	[Hardly affected]					Salt water	Saturation	[Partially affected]					Whisky		[Partially affected]				
		[Hardly affected]					Sodium fluoride	Saturation	[Partially affected]					Wine		[Partially affected]				
		[Hardly affected]					Potassium fluoride	Saturation	[Partially affected]					Seawater		[Partially affected]				
Citric acid	100	[Hardly affected]					Aluminum fluoride	Saturation	[Partially affected]					Water		[Partially affected]				
		[Hardly affected]							[Partially affected]					Syrup		[Partially affected]				
		[Hardly affected]							[Partially affected]					Milk		[Partially affected]				
Glycolic acid	100	[Hardly affected]							[Partially affected]					Fructose	Saturation	[Partially affected]				
		[Hardly affected]							[Partially affected]							[Partially affected]				
		[Hardly affected]							[Partially affected]							[Partially affected]				
Succinic acid	100	[Hardly affected]							[Partially affected]							[Partially affected]				
		[Hardly affected]							[Partially affected]							[Partially affected]				
		[Hardly affected]							[Partially affected]							[Partially affected]				
Tartaric acid	100	[Hardly affected]							[Partially affected]							[Partially affected]				
		[Hardly affected]							[Partially affected]							[Partially affected]				
		[Hardly affected]							[Partially affected]							[Partially affected]				
Sulfamic acid	100	[Hardly affected]							[Partially affected]							[Partially affected]				
		[Hardly affected]							[Partially affected]							[Partially affected]				
		[Hardly affected]							[Partially affected]							[Partially affected]				
Tannic acid	10	[Hardly affected]							[Partially affected]							[Partially affected]				
		[Hardly affected]							[Partially affected]							[Partially affected]				
		[Hardly affected]							[Partially affected]							[Partially affected]				
Trichloroacetic acid	10	[Hardly affected]							[Partially affected]							[Partially affected]				
		[Hardly affected]							[Partially affected]							[Partially affected]				
		[Hardly affected]							[Partially affected]							[Partially affected]				
Monochloroacetic acid	100	[Hardly affected]							[Partially affected]							[Partially affected]				
		[Hardly affected]							[Partially affected]							[Partially affected]				
		[Hardly affected]							[Partially affected]							[Partially affected]				
Phenol	100	[Hardly affected]							[Partially affected]							[Partially affected]				
		[Hardly affected]							[Partially affected]							[Partially affected]				
		[Hardly affected]							[Partially affected]							[Partially affected]				
Chlorosulfonic acid	100	(Not applicable)							[Partially affected]							[Partially affected]				
		[Partially affected]							[Partially affected]							[Partially affected]				
		[Partially affected]							[Partially affected]							[Partially affected]				

■: Hardly affected    ■: Partially affected (can be used conditionally)

(Note) 1. The chemical resistance summary is based on the results of immersion tests on test pieces as well as our delivery records and it does not guarantee the performance of the products. If you have any questions, please contact our sales office.

(Note) 2. Please do not use the products for steam piping.

(Note) 3. Fuji GRP pipes include glass fibers. Please use Fuji polypropylene pipes for chemicals that affect glass such as hydrofluoric acid.

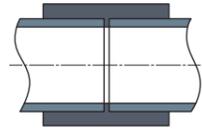
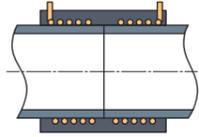
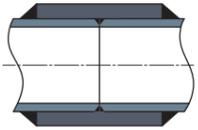
(Note) 4. Welding water faucet sockets and elbows are different from the above table.

(Note) 5. If you use the products near a boiler, please contact us.

# Joint joining method

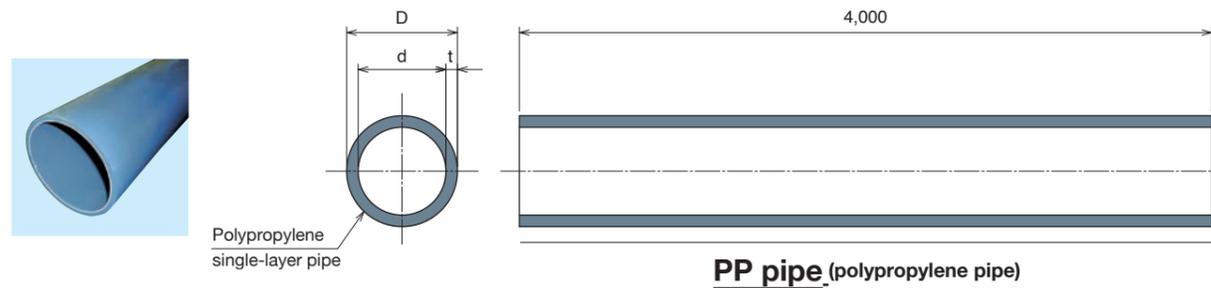
There are three ways to join pipes and joints: sleeve welding, electrofusion, and welding. Use a suitable method in accordance with the usage and circumstances.

## Joining method

Usage classification	For pressure applications			
	Sleeve welding	Electrofusion	Welding	
Page	pp. 12 to 15	pp. 16 to 19	pp. 20 to 22	
How parts are joined				
Main tools	Sleeve welding machine or handy welder Surface temperature indicator	Electrofusion machine	Welding gun Surface temperature indicator	
DN	16	○	—	—
	20	○	—	—
	25	○	—	—
	40	○	○	—
	50	○	○	—
	75	○	○	—
	100	○	○	—
	125	—	○	—
	150	—	○	—
	200	—	○	—
250	—	—	○	
300	—	—	○	

(Note) Flange joining and screw joining can also be used.

## [Produce list] Pipes for pressure applications (P)



**PP pipe** (polypropylene pipe)

DN	Outer diameter (D)	PP pipe				Code
		Pipe type	Thickness (t)	Approximate inner diameter (d)	Reference weight (kg/m)	
16	22	H	3.0	16.0	0.17	7140005
20	27	H	3.0	21.0	0.21	7140013
25	34	H	3.5	27.0	0.31	7140021
40	48	H	4.0	40.0	0.51	7140039
50	60	H	5.0	50.0	0.79	7140047
75	89	H	7.5	74.0	1.75	7140063
100	114	H	9.5	95.0	2.84	7140071
125	140	M	7.8	124.4	2.95	7140120
150	165	M	9.0	147.0	4.02	7140138
200	216	M	12.0	192.0	7.00	7140146
250	267	M	15.0	237.0	10.81	7140154
300	318	M	18.0	282.0	15.44	7140162
125	140	L	6.0	128.0	2.30	7140196
150	165	L	7.0	151.0	3.17	7140203
200	216	L	8.0	200.0	4.76	7140211
250	267	L	10.0	247.0	7.35	7140229
300	318	L	12.0	294.0	10.50	7140237

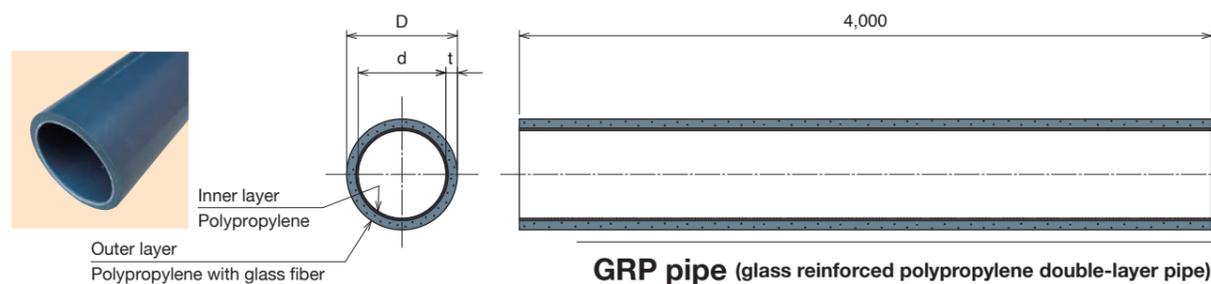
\*Built-to-order product

\*Built-to-order product

\*Built-to-order product

\*Built-to-order product

- (Note) 1. The specified length is 4 m.  
 2. A 120 m roll can be provided for 25 A or less (PP pipe).  
 3. Regarding pipe types, H-pipes are for high pressure, M-pipes are for medium pressure, and L-pipes are for low pressure.



**GRP pipe** (glass reinforced polypropylene double-layer pipe)

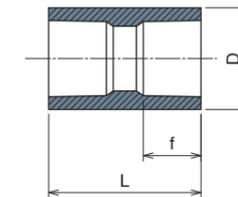
DN	Outer diameter (D)	Pipe type	Thickness (t)	Details of thickness		Approximate inner diameter (d)	Reference weight (kg/m)	Code
				GRP pipe				
				Inner layer (PP)	Outer layer (GRP)			
40	48	H	4.0	1.5	2.5	40.0	0.55	7553016
50	60	H	5.0	1.5	3.5	50.0	0.87	7553024
75	89	H	7.5	2.5	5.0	74.0	1.91	7553040
100	114	H	9.5	3.2	6.3	95.0	3.10	7553058
125	140	L	6.0	2.0	4.0	128.0	2.51	7553081
150	165	L	7.0	2.3	4.7	151.0	3.45	7553083
200	216	L	8.0	2.7	5.3	200.0	5.18	7553085

- (Note) 1. The specified length is 4 m.  
 2. Regarding pipe types, H-pipes are for high pressure and L-pipes are for low pressure.

## [Product list] Joints for pressure applications

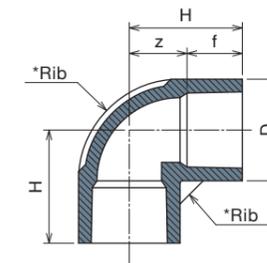
### Sleeve welding joints

#### Sleeve welding socket (WS)



DN	D	L	f	Code
16	30	55	22	7140302
20	36	60	23	7140310
25	44	66	25	7140328
40	59	75	28	7140336
50	72	85	28	7140344
75	105	120	35	7140360
100	133	130	45	7140378

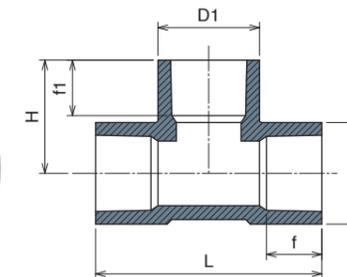
#### Sleeve welding elbow (ELB)



DN	D	H	f	z	Code
16	30	33	21	12	7144205
20	36	39	21	18	7144213
25	44	49	24	25	7144221
40	61	62	28	34	7144239
50	74	70	28	42	7144247
75	104	85	35	50	7144263
100	127	110	45	65	7144271

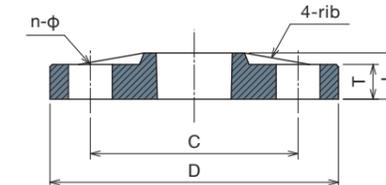
\* Marked parts are ribbed.

#### Sleeve welding tee (TEE)



DN	D	L	H	D1	f	f1	Code
16 × 16	30	66	33	30	21	21	7142803
20 × 16	36	78	36	30	21	21	7143009
× 20	36	78	39	36	21	21	7142811
25 × 16	44	90	42	32	24	21	7143017
× 20	44	96	44	38	24	21	7143025
× 25	44	98	49	44	24	24	7142829
40 × 40	61	124	62	61	28	28	7142837
50 × 50	74	140	70	74	28	28	7142845

#### Sleeve welding flange (SPF)

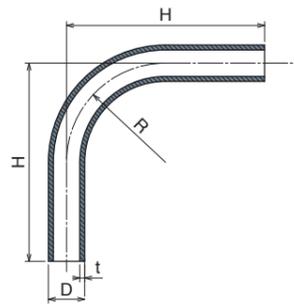


DN	D	L	C	T	n	φ	Bolt diameter	Code
16	95	20	70	13	4	15	M12	7141102
20	100	20	75	15	4	15	M12	7141110
25	125	20	90	15	4	19	M16	7141128
40	140	25	105	17	4	19	M16	7141136
50	155	25	120	17	4	19	M16	7141144
75	185	30	150	19	8	19	M16	7141160
100	210	40	175	19	8	19	M16	7141178

- (Note) 1. The size of the outer diameter, pitch circle diameter, and bolt hole diameter conform to JIS-10k.  
 2. The maximum pressure for constant use is 0.2 MPa at 60°C or lower, 0.15 MPa at 80°C or lower, and 0.1 MPa at 100°C or lower. Use a short pipe with drain core (CRP) for conditions exceeding the description above.  
 3. The torque value of the nominal-diameter 16 to 20 is 9.8 N·m (1.0 kgf·m), torque value of the nominal-diameter 25 to 40 is 14.7 N·m (1.5 kgf·m), and torque value of the nominal-diameter 50 or larger is 19.6 N·m (2.0 kgf·m).  
 4. The gasket thickness should be 3 t and the material should be soft rubber. Use of gaskets with seal rings is recommended. Use a short pipe with drain core (CRP) for conditions exceeding the description above.

## Sleeve welding joints

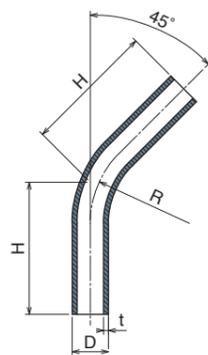
### 90° elbow (90° smooth)



DN	D	H	t	R	Code
16	22	120	3	60	7142001
20	27	130	3	70	7142019
25	34	160	3.5	100	7142027
40	48	210	4	140	7142035
50	60	260	5	180	7142043
75	89	390	7.5	290	7142069
100	114	520	9.5	400	7142077

(Note) As the pipe is bent by softening the material with heat, the degree may change when the ambient temperature rises. Store the products in a well-ventilated area while avoiding direct sunlight.

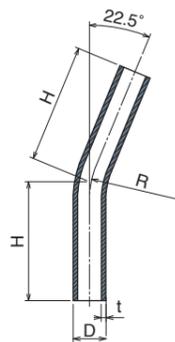
### 45° elbow (45° smooth)



DN	D	H	t	R	Code
16	22	80	3	60	7141805
20	27	80	3	70	7141813
25	34	110	3.5	100	7141821
40	48	130	4	140	7141839
50	60	170	5	180	7141847
75	89	250	7.5	290	7141863
100	114	300	9.5	400	7141871

(Note) As the pipe is bent by softening the material with heat, the degree may change when the ambient temperature rises. Store the products in a well-ventilated area while avoiding direct sunlight.

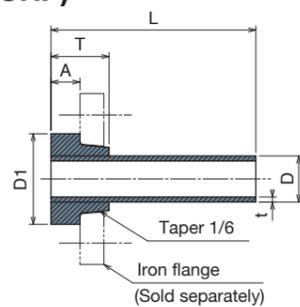
### 22.5° elbow (22.5° smooth)



DN	D	H	t	R	Code
16	22	80	3	60	7141607
20	27	80	3	70	7141615
25	34	85	3.5	100	7141623
40	48	110	4	140	7141631
50	60	140	5	180	7141649
75	89	170	7.5	290	7141665
100	114	220	9.5	400	7141673

(Note) As the pipe is bent by softening the material with heat, the degree may change when the ambient temperature rises. Store the products in a well-ventilated area while avoiding direct sunlight.

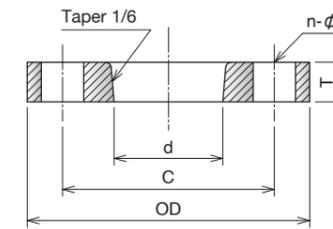
### Short pipe with drain core (CRP)



DN	D1	D	L	T	A	t	Code
16	48	22	150	28	13	3	7140873
20	53	27	150	34	17	3	7140881
25	63	34	150	37	20	3.5	7140899
40	80	48	150	39	20	4	7140906
50	90	60	150	39	20	5	7140914
75	126	89	200	46	25	7.5	7140930
100	146	114	200	46	25	9.5	7140948

## Sleeve welding joints

### CRP iron flange (IF)



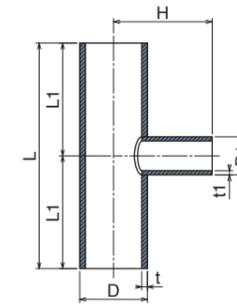
<Material>

- SS+Zn (plating)
- SUS304.....Built-to-order product

DN	OD	C	T	d	n	φ	Bolt diameter	Code
16	95	70	12	33.5	4	15	M12	1170163
20	100	75	14	38.5	4	15	M12	1170165
25	125	90	14	47.7	4	19	M16	1170167
40	140	105	16	61.5	4	19	M16	1170169
50	155	120	16	73.5	4	19	M16	1170171
75	185	150	18	102.5	8	19	M16	1170175
100	210	175	18	127.5	8	19	M16	1170177

(Note) The size of the outer diameter, pitch circle diameter, and bolt hole diameter conform to JIS-10k.

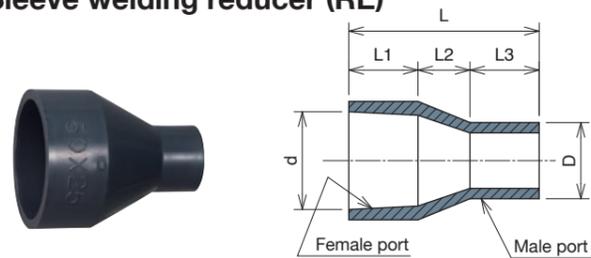
### Tee (T)



DN	D	L	H	D1	L1	t	t1	Code
40 × 16	48	180	80	22	90	4	3	7143033
× 20	48	180	80	27	90	4	3	7143041
× 25	48	180	80	34	90	4	3.5	7143059
× 40	48	200	100	48	100	4	4	7143031
50 × 16	60	180	80	22	90	5	3	7143067
× 20	60	180	80	27	90	5	3	7143075
× 25	60	180	80	34	90	5	3.5	7143083
× 40	60	200	90	48	100	5	4	7143091
× 50	60	200	100	60	100	5	5	7143065
75 × 16	89	200	90	22	100	7.5	3	7143158
× 20	89	200	90	27	100	7.5	3	7143166
× 25	89	200	90	34	100	7.5	3.5	7143174
× 40	89	220	100	48	110	7.5	4	7143182
× 50	89	240	110	60	120	7.5	5	7143190
× 75	89	260	130	89	130	7.5	7.5	7142861
100 × 16	114	240	110	22	120	9.5	3	7143215
× 20	114	240	110	27	120	9.5	3	7143223
× 25	114	240	110	34	120	9.5	3.5	7143231
× 40	114	260	120	48	130	9.5	4	7143249
× 50	114	270	130	60	135	9.5	5	7143257
× 75	114	300	150	89	150	9.5	7.5	7143273
× 100	114	320	160	114	160	9.5	9.5	7142879

## Sleeve welding joints

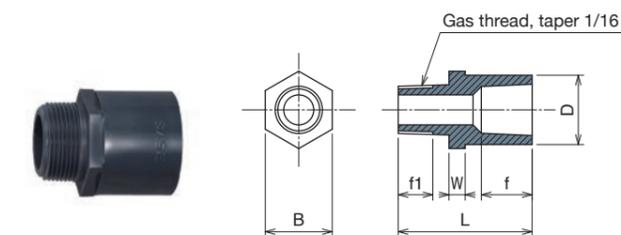
### Sleeve welding reducer (RE)



DN	D	d	L	L1	L2	L3	Code
20 × 16	22	26.2	55	20	15	20	7143489
25 × 16	22	33	70	25	20	25	7143497
× 20	27	33	60	25	15	20	7143504
40 × 20	27	47	80	25	30	25	7143520
× 25	34	47	75	30	25	20	7143538
50 × 25	34	59	85	30	35	20	7143554
× 40	48	59	80	30	25	25	7143562
* 75 × 40	48	88	135	35	70	30	7143611
× 50	60	88	108	35	43	30	7143629
100 × 50	60	113	150	45	75	30	7143661
× 75	89	113	125	45	45	35	7143687

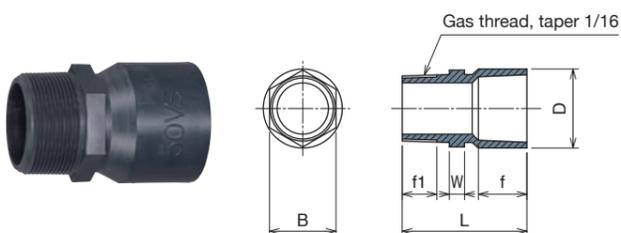
(Note) 1. As a drawing process has been performed on the product of the size marked with an asterisk (\*) by softening the material with heat, the diameter may change when the ambient temperature rises. Store the products in a well-ventilated area while avoiding direct sunlight.  
2. It cannot be used for electrofusion joining.

### Sleeve welding valve socket (VS)



DN	D	L	f	f1	W	B	Code
16	30	58	22	15	7	29	7144700
20	36	64	23	17	8	35	7144718
25	44	74	27	19	8	40	7144726

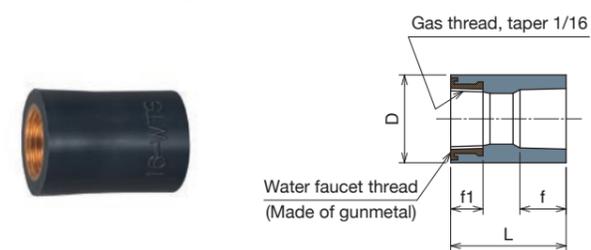
(Note) 1. The maximum pressure for constant use is **0.2 MPa** at 40°C or lower and **0.1 MPa** at 60°C or lower.  
2. For driving torque, see p. 33.



DN	D	L	f	f1	W	B	Code
40	57	90	35	25	10	48	7144734
50	71	106	43	28	12	60	7144742

(Note) 1. The maximum pressure for constant use is **0.2 MPa** at 40°C or lower and **0.1 MPa** at 60°C or lower.  
2. For driving torque, see p. 33.

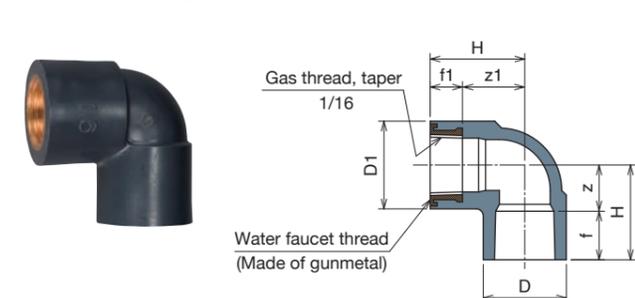
### Sleeve welding water faucet socket (WTS)



DN	D	L	f	f1	Code
16	32	45	20	12	7144601
20	38	50	20	14	7144619
25	46	60	20	16	7144627
40	63	70	25	19	7144635
50	76	80	25	21	7144643

(Note) 1. The maximum pressure for constant use is **0.2 MPa** at 40°C or lower and **0.1 MPa** at 60°C or lower.  
2. Chemical resistance is different from the description on p. 9 as gunmetal comes into contact with liquids.

### Sleeve welding water faucet elbow (WE)

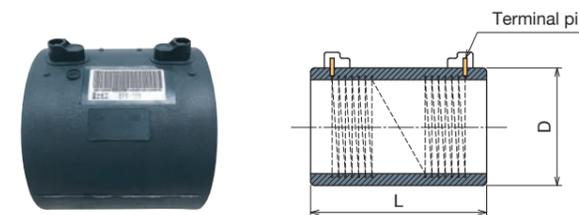


DN	D	H	D1	f	z	f1	z1	Code
16	30	35	32	21	14	12	23	7144403
20	36	41	38	21	20	14	27	7144411

(Note) 1. The maximum pressure for constant use is **0.2 MPa** at 40°C or lower and **0.1 MPa** at 60°C or lower.  
2. Chemical resistance is different from the description on p. 9 as gunmetal comes into contact with liquids.

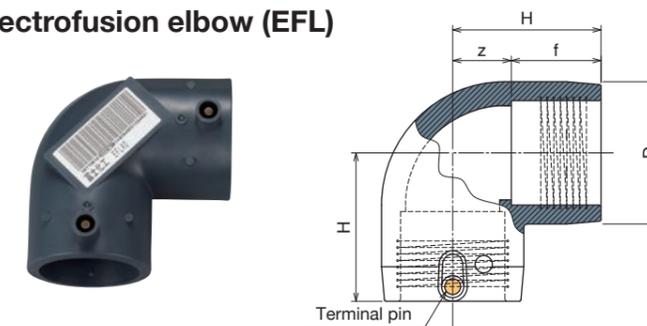
## Electrofusion joints

### Electrofusion socket (EFS)



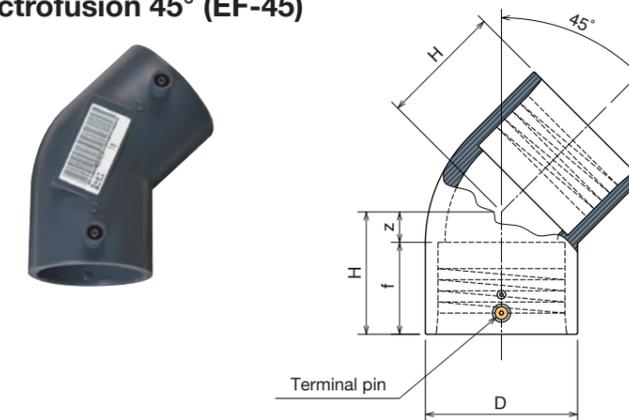
DN	D	L	Code
40	59	80	7149202
50	73	96	7149207
75	108	121	7149217
100	135	126	7149221
125	165	163	7149226
150	194	171	7149231
200	253	215	7149236

### Electrofusion elbow (EFL)



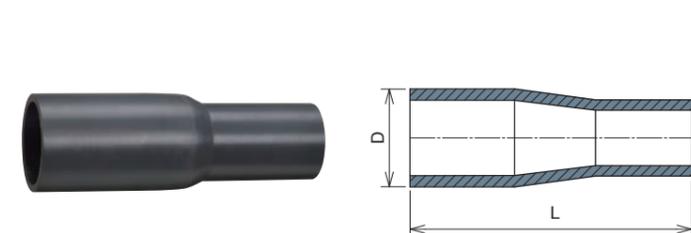
DN	H	f	z	D	Code
40	70	44	26	61	7149301
50	86	52	34	83	7149306
75	114	65	49	114	7149318
100	132	68	64	139	7149325

### Electrofusion 45° (EF-45)



DN	H	f	z	D	Code
40	56	44	12	61	7150009
50	68.5	52	17	75	7150011
75	86.5	65	22	108	7150013
100	97.5	70	28	135	7150015

### Pressure reducer (REP)

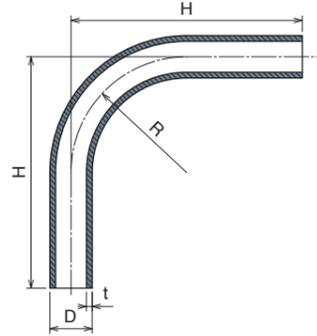


DN	D	D1	L	Code
50 × 40	60	48	179	7150451
75 × 50	89	60	237	7150461
100 × 50	114	60	267	7150471
× 75	114	89	241	7150476
125 × 75	140	89	300	7150481
× 100	140	114	274	7150486
150 × 75	165	89	340	7150491
× 100	165	114	314	7150496
× 125	165	140	298	7150501
200 × 100	216	114	413	7150506
× 125	216	140	395	7150511
× 150	216	165	371	7150516

(Note) For joining, EFS, EFL, and EF-45 are needed.

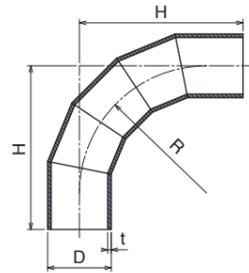
## Electrofusion joints

### 90° elbow (90° smooth / 90° miter)



DN	D	H	t	R	Code
40	48	210	4	140	7142035
50	60	260	5	180	7142043
75	89	390	7.5	290	7142069
100	114	520	9.5	400	7142077

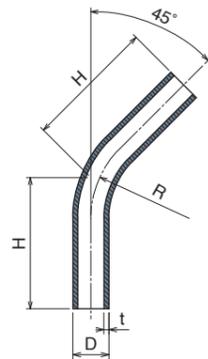
(Note) As the pipe is bent by softening the material with heat, the degree may change when the ambient temperature rises.  
Store the products in a well-ventilated area while avoiding direct sunlight.  
For fusion, 2 pieces of EFS, EFL, or EF-45 are needed.



DN	D	H	t	R	Code
125	140	360	7.8	280	7142605
150	165	420	9	330	7142613
200	216	520	12	432	7142621

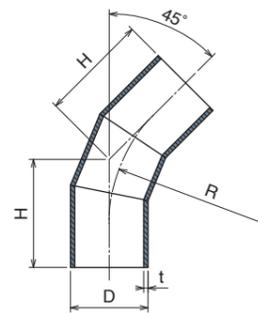
(Note) For fusion, 2 pieces of EFS are needed.

### 45° elbow (45° smooth / 45° miter)



DN	D	H	t	R	Code
40	48	130	4	140	7141839
50	60	170	5	180	7141847
75	89	250	7.5	290	7141863
100	114	300	9.5	400	7141871

(Note) As the pipe is bent by softening the material with heat, the degree may change when the ambient temperature rises.  
Store the products in a well-ventilated area while avoiding direct sunlight.  
For fusion, 2 pieces of EFS, EFL, or EF-45 are needed.

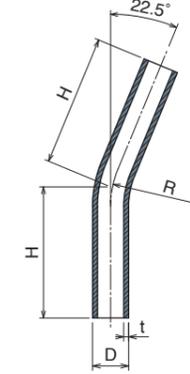


DN	D	H	t	R	Code
125	140	195	7.8	280	7142481
150	165	225	9	330	7142499
200	216	265	12	432	7142506

(Note) For fusion, 2 pieces of EFS are needed.

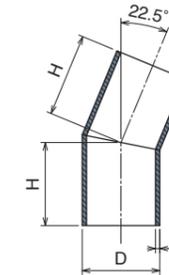
## Electrofusion joints

### 22.5° elbow (22.5° smooth / 22.5° miter)



DN	D	H	t	R	Code
40	48	110	4	140	7141631
50	60	140	5	180	7141649
75	89	170	7.5	290	7141665
100	114	220	9.5	400	7141673

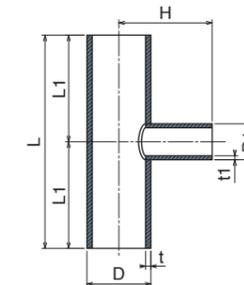
(Note) As the pipe is bent by softening the material with heat, the degree may change when the ambient temperature rises.  
Store the products in a well-ventilated area while avoiding direct sunlight.  
For fusion, 2 pieces of EFS, EFL, or EF-45 are needed.



DN	D	H	t	R	Code
125	140	150	7.8	-	7142283
150	165	160	9	-	7142291
200	216	180	12	-	7142308

(Note) For fusion, 2 pieces of EFS are needed.

### Tee (T)



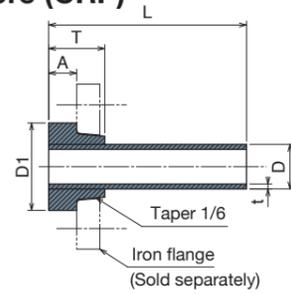
DN	D	L	H	D1	L1	t	t1	Code
40 × 16	48	180	80	22	90	4	3	7143033
× 20	48	180	80	27	90	4	3	7143041
× 25	48	180	80	34	90	4	3.5	7143059
× 40	48	200	100	48	100	4	4	7143031
50 × 16	60	180	80	22	90	5	3	7143067
× 20	60	180	80	27	90	5	3	7143075
× 25	60	180	80	34	90	5	3.5	7143083
× 40	60	200	90	48	100	5	4	7143091
× 50	60	200	100	60	100	5	5	7143065

DN	D	L	H	D1	L1	t	t1	Code
75 × 16	89	200	90	22	100	7.5	3	7143158
× 20	89	200	90	27	100	7.5	3	7143166
× 25	89	200	90	34	100	7.5	3.5	7143174
× 40	89	220	100	48	110	7.5	4	7143182
× 50	89	240	110	60	120	7.5	5	7143190
× 75	89	260	130	89	130	7.5	7.5	7142861
100 × 16	114	240	110	22	120	9.5	3	7143215
× 20	114	240	110	27	120	9.5	3	7143223
× 25	114	240	110	34	120	9.5	3.5	7143231
× 40	114	260	120	48	130	9.5	4	7143249
× 50	114	270	130	60	135	9.5	5	7143257
× 75	114	300	150	89	150	9.5	7.5	7143273
× 100	114	320	160	114	160	9.5	9.5	7142879
125 × 75	140	320	160	89	160	7.8	7.5	7143281
× 100	140	340	170	114	170	7.8	9.5	7143299
× 125	140	360	180	140	180	7.8	7.8	7142887
150 × 100	165	380	180	114	190	9	9.5	7143306
× 125	165	400	200	140	200	9	7.8	7143314
× 150	165	480	240	165	240	9	9	7142895
200 × 125	216	540	250	140	270	12	7.8	7143322
× 150	216	560	260	165	280	12	9	7143330
× 200	216	600	300	216	300	12	12	7142902

(Note) For fusion, 3 pieces of EFS, EFL, and EF-45 are needed.  
Sleeve welding joint for 25 or less

## Electrofusion joints

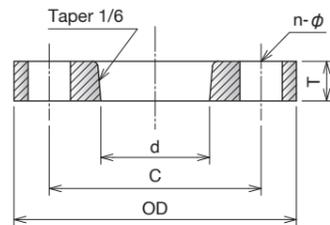
### Short pipe with drain core (CRP)



DN	D1	D	L	T	A	t	Code
40	80	48	150	39	20	4	7140906
50	90	60	150	39	20	5	7140914
75	126	89	200	46	25	7.5	7140930
100	146	114	200	46	25	9.5	7140948
125	181	140	200	48	25	7.8	7140956
150	211	165	200	50	25	9	7140964
200	258	216	200	50	25	12	7140972

(Note) For fusion, 1 piece of EFS, EFL, and EF-45 are needed.

### CRP iron flange (IF)



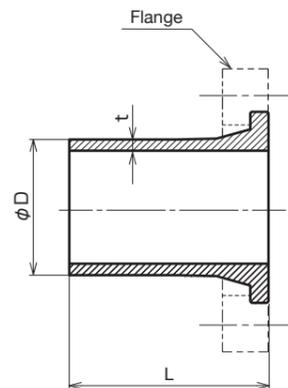
DN	OD	C	T	d	n	φ	Bolt diameter	Code
40	140	105	16	61.5	4	19	M16	1170169
50	155	120	16	73.5	4	19	M16	1170171
75	185	150	18	102.5	8	19	M16	1170175
100	210	175	18	127.5	8	19	M16	1170177
125	250	210	20	153.5	8	23	M20	1170179
150	280	240	22	178.5	8	23	M20	1170181
200	330	290	22	229.5	12	23	M20	1170183

(Note) The size of the outer diameter, pitch circle diameter, and bolt hole diameter conform to JIS-10k.

<Material>

- SS+Zn (plating)
- SUS304·····Built-to-order product

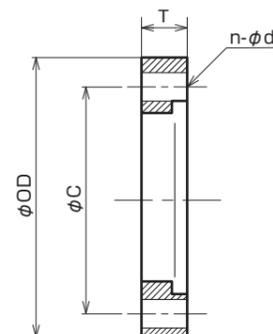
### GRP flange adapter (GR-FA)



DN	φD	L	t	Code
40	48	100	4	7151051
50	60	110	5	7151053
75	89	130	7.5	7151059
100	114	140	9.5	7151063

(Note) For joining, 1 piece of EFS, EFL, EF-45, and EF-TY are needed.

### GRP flange (GR-F)



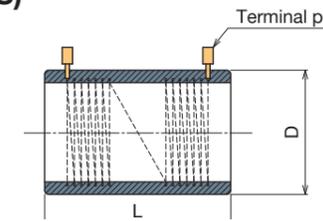
DN	φOD	C	T	n	φd	Code
40	140	105	21	4	19	7151001
50	155	120	21	4	19	7151003
75	185	150	30	8	19	7151007
100	210	175	34	8	19	7151009

(Note) 1. Torque value is 20 N·m or higher.  
 2. For the O-ring, use gaskets with double seal rings. (PTEF coated type is recommended depending on chemical conditions.)  
 3. The companion flange should be flat face (FF). When using a raised flange (RF), use a short pipe with drain core (CRP) and iron flange (IF).  
 4. The combination of the GRP flange adapter (GR-FA) and CRP iron flange (IF) as well as the combination of a short pipe with drain core (CRP) and GRP flange (GR-F) cannot be used.

## DN 65 Switch joints

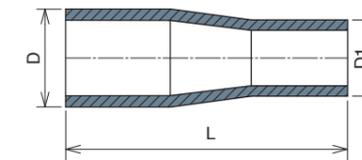
Production of the product with nominal diameter 65 ended at the end of September 2019. Please use the following joints for renewal work of the existing piping or the connection of nominal-diameter-65 piping.

### Electrofusion socket (EFS)



DN	D	L	Code
65	93	72	7149211

### Pressure reducer (REP)



DN	D	D1	L	Code
65 × 50	76	60	202	7150456
75 × 65	89	76	230	7150466

(Note) For joining, EFS, EFL, and EF-45 are needed.

### Short pipe with drain core (CRP)

See the figure to the left.

DN	D1	D	L	T	A	t
65	115	76	200	46	25	6.2

### CRP iron flange (IF)

See the figure to the left.

<Material>

- SS+Zn (plating)
- SUS304·····Built-to-order product

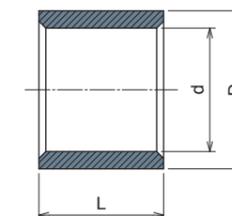
DN	OD	C	T	d	n	φ	Bolt diameter
65	175	140	18	89.5	4	19	M16

(Note) The size of the outer diameter, pitch circle diameter, and bolt hole diameter conform to JIS-10k.

## Welding joints

\*Built-to-order product

### Welding socket (DWS)



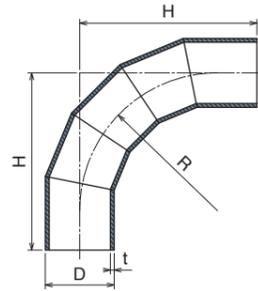
DN	D	L	d	Code
250	297	250	268	7140542
300	354	300	319	7140550

\*Built-to-order product

## Welding joints

\*Built-to-order product

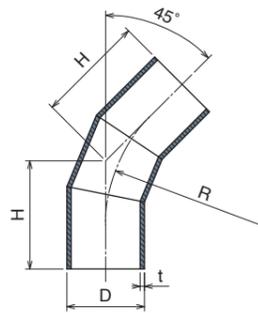
### 90° elbow (90° miter)



DN	D	H	t	R	Code
250	267	630	15	534	7142639
300	318	740	18	636	7142647

\*Built-to-order product

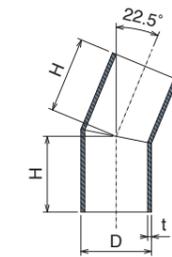
### 45° elbow (45° miter)



DN	D	H	t	R	Code
250	267	315	15	534	7142514
300	318	365	18	636	7142522

\*Built-to-order product

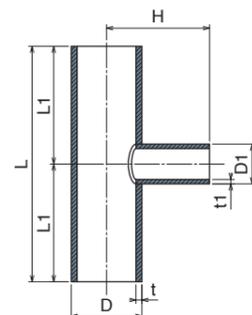
### 22.5° elbow (22.5° miter)



DN	D	H	t	Code
250	267	200	15	7142316
300	318	230	18	7142324

\*Built-to-order product

### Tee (T)



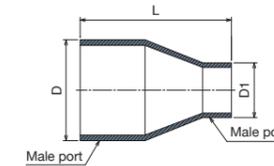
DN	D	L	H	D1	L1	t	t1	Code
250 × 125	267	620	320	140	310	15	7.8	7143348
× 150	267	640	330	165	320	15	9	7143356
× 200	267	680	340	216	340	15	12	7143364
× 250	267	740	370	267	370	15	15	7142910
300 × 150	318	700	360	165	350	18	9	7143372
× 200	318	740	370	216	370	18	12	7143380
× 250	318	800	400	267	400	18	15	7143398
× 300	318	860	430	318	430	18	18	7142928

\*Built-to-order product

## Welding joints

\*Built-to-order product

### Reducer (RE)

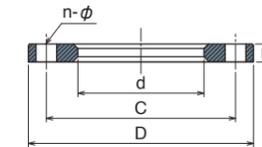


DN	D	D1	L	Code
250 × 150	267	165	400	7143869
× 200	267	216	375	7143877
300 × 250	318	267	420	7143900

\*Built-to-order product

- (Note) 1. As a drawing process has been performed on the product by softening the material with heat, the diameter may change when the ambient temperature rises. Store the products in a well-ventilated area while avoiding direct sunlight.  
2. For joining 150 A or 200 A, use EFS.

### Welding flange (PF)

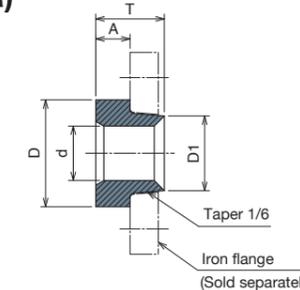


DN	D	L	T	C	d	n	φ	Bolt diameter	Code
250	400	-	20	355	268.3	12	25	M22	7141061
300	445	-	20	400	319.3	16	25	M22	7141079

\*Built-to-order product

- (Note) 1. The size of the outer diameter, pitch circle diameter, and bolt hole diameter conform to JIS-10k.  
2. Use at least a 9 mm thick backup flange as well.  
3. The maximum pressure for constant use is 0.2 MPa at 60°C or lower, 0.15 MPa at 80°C or lower, and 0.1 MPa at 100°C or lower. Use a core ring (CR) for conditions exceeding the description above.  
4. The torque value is 19.6 N·m (2.0 kgf·m).  
5. The gasket thickness should be 3 t for nominal diameter 250 and 5 t for nominal diameter 300, and the material should be soft rubber. Use of gaskets with seal rings is recommended. Use a core ring (CR) for conditions exceeding the description above.

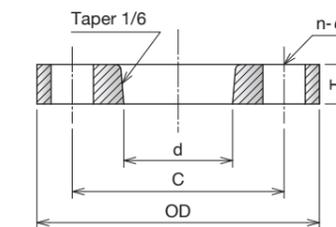
### Welding core ring (CR)



DN	D	D1	d	T	A	Code
250	323	279	268	57	30	7140716
300	367	330	319	57	30	7140724

\*Built-to-order product

### CR iron flange (IF)



DN	OD	C	T	d	n	φ	Bolt diameter	Diameter	Code
250	400	355	24	280.5	12	25	M22	250	1170185
300	445	400	24	331.5	16	25	M22	300	1170187

\*Built-to-order product

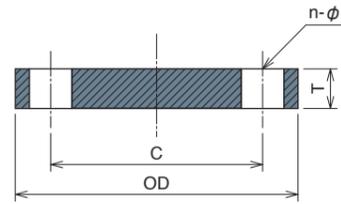
(Note) The size of the outer diameter, pitch circle diameter, and bolt hole diameter conform to JIS-10k.

<Material>

- SS+Zn (plating)
- SUS304

## Other parts

### Blind flange (BF)



<Material>  
· Polypropylene

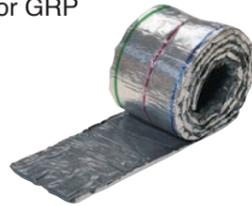
\*Built-to-order product  
\*Built-to-order product

DN	OD	C	T	n	φ	Bolt diameter	Code
16	95	70	12	4	15	M12	7141335
20	100	75	14	4	15	M12	7141337
25	125	90	14	4	19	M16	7141339
40	140	105	16	4	19	M16	7141341
50	155	120	16	4	19	M16	7141343
75	185	150	18	8	19	M16	7141347
100	210	175	18	8	19	M16	7141349
125	250	210	20	8	23	M20	7141351
150	280	240	20	8	23	M20	7141353
200	330	290	20	12	23	M20	7141355
250	400	355	20	12	25	M22	7141357
300	445	400	20	16	25	M22	7141359

(Note) 1. The size of the outer diameter, pitch circle diameter, and bolt hole diameter conform to JIS-10k.  
2. It cannot be used for CRP.

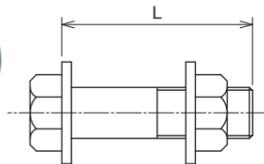
### Fire resistant sheet

Specifically for GRP



DN	Length	Width	Thickness	Code
40 to 200	1.6 m/roll	110	8.5	1574701

### Bolt/nut

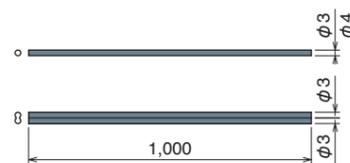


<Material>  
· SS+Zn (plating)  
· SUS304

DN	No. of bolts (piece)	Nominal dimensions	Examples of length depending on the combination (mm)					
			SPF+SPF PF+PF	CRP+CRP CR+CR	SPF+IF PF+IF	CRP+IF CR+IF	GR-F+GR-FA	
16	4	M12	50	70	45	55	-	
20	4	M12	55	80	50	65	-	
25	4	M16	60	90	55	70	-	
40	4	M16	65	95	60	75	70	
50	4	M16	65	95	60	75	70	
75	8	M16	70	110	65	85	80	
100	8	M16	70	110	65	85	85	
125	8	M20	-	120	-	85	-	
150	8	M20	-	120	-	95	-	
200	12	M20	-	120	-	95	-	
250	12	M22	85	140	80	110	-	
300	16	M22	85	140	80	110	-	

(Note) Use 2 washers for each bolt.

### Welding rod (WB)



Thickness (mm)	Welding rod length (mm)	Rough quantity/1kg (piece)	Code
φ3	1,000	160	7144809
φ4	1,000	100	7144817
φ3W	1,000	70	7144825

(Note) Welding rods marked with "W" are double-type.

<Material>  
· Polypropylene

## Fire compartment penetration (fire resistant sheet)

### For GRP Introduction of fire compartment penetration Fuji GRP fire resistant sheet

Certified by Japan's Minister of Land, Infrastructure, Transport and Tourism (MLIT)

[Wall] PS060WL-0952

[Single wall] PS060WL-1055

[Floor] PS060FL-0978

Applicable piping size **Wall/floor 40 to 200 A**



### Certified by Japan's Minister of the MLIT

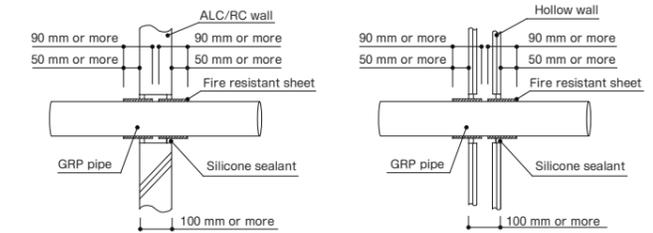
Certified by Japan's Minister of the MLIT	Structure	Thickness	Opening diameter	Space factor	Filler	GRP pipe dimensions
PS060WL-0952 (Wall)	Iron-reinforced concrete (RC) Autoclaved lightweight concrete (ALC) Hollow wall	100 mm or more	φ260 mm or less	86.7% or less	Silicone sealant (JIS A5758)	Outer diameter φ216 mm or less Thickness 12.0 mm or less
PS060WL-1055 (Single wall)	Two-ply application of one-side-reinforced plasterboard / Partition wall with light-gauge steel	42 mm or more	φ270 mm or less	85.3% or less	Silicone sealant (JIS A5758)	Outer diameter φ216 mm or less Thickness 8.0 mm or less
PS060FL-0978 (Floor)	Iron-reinforced concrete (RC) Autoclaved lightweight concrete (ALC)	100 mm or more	φ400 mm or less	51.9% or less	Cement mortar	Outer diameter φ216 mm or less Thickness 8.0 mm or less

### Installation conditions / Cross section

#### RC/ALC/hollow wall

**Number of wrapping of the sheet**  
Wrapping once or more on the circumference of the pipe for both sides of the wall.

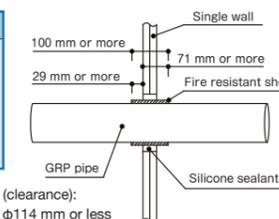
Dimension of the gap between the piping and wall (clearance): 8 to 22 mm



#### Two-ply application of one-side-reinforced plasterboard

**Number of wrapping of the sheet**

When the outer diameter of the pipe is φ114 mm or less, wrap the circumference of the pipe once or more.  
When the outer diameter of the pipe is over φ114 mm, wrap the circumference of the pipe twice or more.

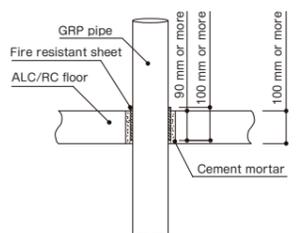


Dimension of the gap between the piping and wall (clearance):  
9 to 28 mm when the outer diameter of the pipe is φ114 mm or less  
18 to 27 mm when the outer diameter of the pipe is over φ114 mm

#### RC/ALC floor

**Number of wrapping of the sheet**

When the outer diameter of the pipe is φ114 mm or less, wrap the circumference of the pipe once or more.  
When the outer diameter of the pipe is over φ114 mm, wrap the circumference of the pipe twice or more.



### Number of sites in which the work can be performed with 1 roll of the sheet

GRP pipe		Number of sites in which the work can be performed (site)		
DN	Outer diameter	PS060WL-0952 (Wall)	OWL-1055 (Single wall)	PS060FL-0978 (Floor)
40	48	3	7	7
50	60	3	6	6
65	76	2	5	5
75	89	2	4	4
100	114	1	3	3
125	140	1	1	1
150	165	1	1	1
200	216	1	1	1

## Fire compartment penetration (fire resistant sheet)

### RC/ALC/hollow wall - Installation method

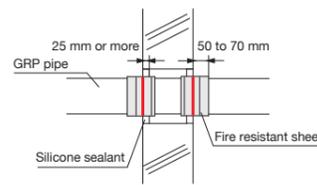
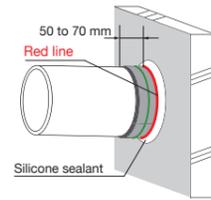
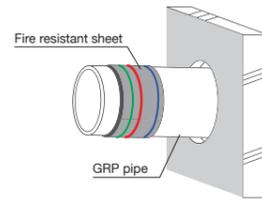
#### 1. Installation at the opening

- Confirm that the size of the opening is suitable for the pipe size. Refer to the table below.

GRP pipe		Applicable opening diameter
DN	Outer diameter	PS060WL-0952 (Wall)
40	48	70 to 90
50	60	80 to 100
65	76	100 to 120
75	89	110 to 130
100	114	135 to 155
125	140	160 to 180
150	165	185 to 205
200	216	240 to 260

#### 2. Wrapping of fire resistant sheet

- Wrap the sheet on the circumference of the pipe once or more. (It is acceptable for the sheet to be overlapped.)
- Align the **red line** with the wall surface. Install the pipe so that the fire resistant sheet protrudes by 50 to 70 mm from the wall surface. (Install the pipe so that the **blue line** is inside the wall.)



#### 3. Backfilling / Work completion

- Fill openings on both sides of the wall by 25 mm or more from the wall surface using silicone sealant. Use construction sealant (JIS A 5758).
- Perform the same work on the other side of the wall. This completes the work.

### Single wall - Work procedures

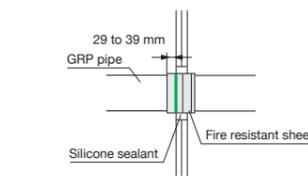
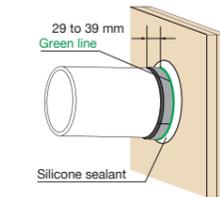
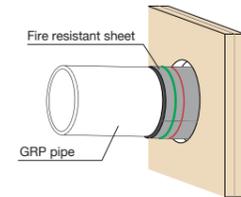
#### 1. Installation at the opening

- Confirm that the size of the opening is suitable for the pipe size. Refer to the table below.

GRP pipe		Applicable opening diameter
DN	Outer diameter	PS060WL-1055 (Single wall)
40	48	70 to 100
50	60	80 to 115
65	76	100 to 130
75	89	110 to 145
100	114	135 to 170
125	140	180 to 190
150	165	205 to 215
200	216	255 to 270

#### 2. Wrapping of fire resistant sheet

- Wrap the circumference of the pipe once when the outer diameter of the pipe is  $\phi 114$  mm or less and twice or more when the outer diameter is over  $\phi 114$  mm. (It is acceptable for the sheet to be overlapped.)
- Align the **green line** with the wall surface. Install the pipe so that the fire resistant sheet protrudes by 29 to 39 mm from the wall surface. (Install the pipe so that the **red line** is inside the wall.)



#### 3. Backfilling / Work completion

- Completely fill openings on the wall using silicone sealant. Use construction sealant (JIS A 5758).

### RC/ALC floor - Work procedures

#### 1. Installation at the opening

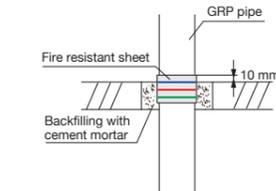
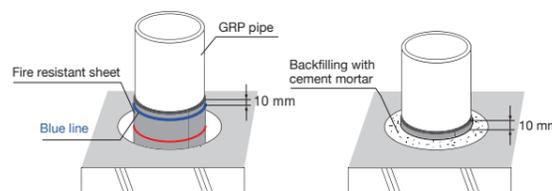
- Confirm that the size of the opening is suitable for the pipe size. Refer to the table below.

GRP pipe		Applicable opening diameter
DN	Outer diameter	PS060FL-0978 (Floor)
40	48	70 or more
50	60	85 or more
65	76	110 or more
75	89	125 or more
100	114	160 or more
125	140	195 or more
150	165	230 or more
200	216	300 or more

\*The opening diameter is  $\phi 400$  mm or less.

#### 2. Wrapping of fire resistant sheet

- Wrap the circumference of the pipe once when the outer diameter of the pipe is  $\phi 114$  mm or less and twice or more when the outer diameter is over  $\phi 114$  mm. (It is acceptable for the sheet to be overlapped.)
- Align the **blue line** with the floor surface. Install the pipe so that the fire resistant sheet protrudes by 10 mm from the floor surface. (Install the pipe so that the **red line** is inside the floor.)



#### 3. Backfilling / Work completion

- Backfill the openings with cement mortar.

## Joining tools

### Sleeve welding

#### Handy welder

<Product for sale>



Handy welder (electric heating type)

<Product for sale>



Heater face attachment

DN
16
20
25
40
50
75
100

- (Note)1. Handy welders for 16 to 100 A (FK-100) and 16 to 50 (FK-050) are available.  
2. The heater face is separately sold and one size can be ordered.  
3. We do not lease the product.

#### Sleeve welding machine

<Product for lease>



Sleeve welding machine

<Accessories>



Heater face attachment

DN
16
20
25
40
50
75
100

- (Note)1. Leased sleeve welding machine includes a set of attachments for pipe sizes 16 to 100 A.  
2. The total weight is approx. 100 kg.

### Electrofusion

#### Electrofusion machine(For EFS, EFL, and EF-45)

<Product for lease> \*Bar code type, 100 V power supply



FKBC-01



FKBC-02



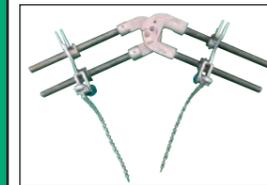
NTEF100-FK

DN	Code
40	9210250
50	
75	
100	
125	
150	
200	

- (Note)1. DN 40 to 200 are supported.  
2. Power outlet to be used: 2 kVA or more

#### Fixture

<Product for lease>



DN	Code
40	9210255
50	
75	
100	

### Welding

#### Welding gun (hot jet)

<Commercially available product>



(Note) We do not lease the product.

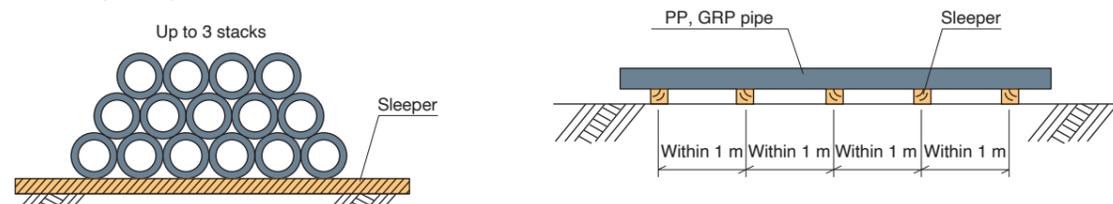
## Installation method

### Handling

- When transferring the product, do not throw, drop, roll, or drag it, and prevent any action that may damage the product.
- When securing the product, use a fiber belt such as a nylon sling.  
When using steel wires or something similar, be sure to insert cushioning materials where they come into contact with the product.

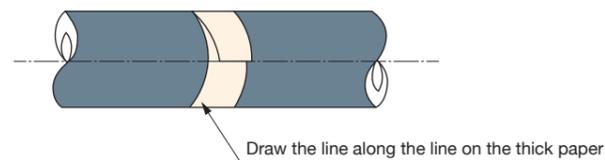
### Storage

- Store the products in an indoor, well-ventilated place.  
When the products are stored outdoors, cover them with sheets to avoid UV rays, wind, rain, and adhesion of earth/sand or oil.
- When temporarily placing straight pipes, place sleepers in 1 m or less intervals.  
When storing the products stacked, pile them up to 3 stacks at most.
- When joining work is performed on site, any foreign matters attached may cause defective joining.  
If any foreign matter adheres, wipe it off using acetone, alcohol, or something similar.
- Be sure to keep away from fire.



### Processing

- When cutting pipes  
The PP and GRP pipes can be cut easily with a pipe cutter or saw.  
Draw a cutting line to prevent the displacement of the axis by using thick paper or something similar.
- When chamfering the pipe ends  
Chamfer the pipe ends by using a reamer or cutter.  
Remove chips and burr after chamfering.



## Joining method

### Sleeve welding joining

[This document provides an overview of the installation process. Refer to the installation manual for details.]

In this method, pipes and joints are joined by fusing them using an electric heating type handy welder. Electricity is used to heat the handy welder.

#### [Joining procedure]

- ① Prepare jigs and tools (e.g. handy welder, surface temperature indicator, stopwatch) necessary for joining.
- ② Remove any dirt and liquid from the parts to be welded. If any oily material has got on, wipe it off with acetone, alcohol, or something similar.
- ③ Mark the welding margin on the pipe to be welded.

DN	16	20	25	40	50	75	100
Welding margin t (mm)	20	20	20	25	25	30	40

- ④ Check the temperature of the welder. (The suitable temperature is between 270 and 300°C.)
- ⑤ Insert the pipe and joint into the welder and fuse the surface of parts to be joined.  
The joint should be inserted to the guideline marked on the welder.

- ⑥ Keep the parts inserted until a weld bead is seen at the end of the welder on the entire circumference as the parts melt. (See the period to keep the parts inserted.)

DN	16	20	25	40	50	75	100
Period to keep the parts inserted (second)	8	9	10	15	25	35	40

- ⑦ After the melting process is completed, remove the pipe and joint from the welder and immediately insert the pipe into the joint. Insert it while twisting it so that melted resin mixes while preventing the adhesion of foreign matters such as water and oil.

- ⑧ After insertion, keep holding the pipe and joint during the period to hold the parts to prevent displacement of the melted surfaces.

(Joining is completed.)

DN	16	20	25	40	50	75	100
Period to hold the parts (second)	20	20	20	30	30	40	50

- Note.**
1. Be sure to check the temperature of the welder for each joining process.
  2. Small amounts of resin remain in the welder each time the melting process is performed. When welding continuously, remove the remaining resin adhered to the welder completely before starting work.
  3. NEVER directly heat and join pipes and joints using a burner or anything similar instead of using a welder.



Step ①



Step ②



Step ③



Step ④



Step ⑤



Step ⑥



Step ⑦-1



Step ⑦-2



Step ⑧

## Sleeve welding machine joining

This document provides an overview of the installation process. Refer to the installation manual for details.

[Joining procedure]

- ① Prepare the sleeve welding machine.
- ② Prepare jigs and tools (e.g. surface temperature indicator, stopwatch) necessary for joining.
- ③ Attach the heater face suitable for the nominal diameter to join to the heater.
- ④ Place the pipe and joint on the clamp then install and fix it at the specified position.
- ⑤ Set the selector scale in accordance with the nominal diameter to join.

DN	16	20	25	40	50	75	100
Selector scale	32		50		63		110

- ⑥ Confirm that the temperature of the heater face is in a range of  $280^{\circ}\text{C}\pm 10^{\circ}\text{C}$ .
- ⑦ Clean the areas to be welded with acetone or alcohol to remove dirt and water.
- ⑧ Turn the handle on the clamp table to insert the pipe and joint into the heater face. Insert them properly until the clamp table comes into contact with the stopper.
- ⑨ After inserting the pipe and joint into the heater face, keep heating them for the prescribed period.

DN	16	20	25	40	50	75	100
Heating time (second)	8	9	10	15	25	35	40

- ⑩ After the heating time has elapsed, pull out the pipe and joint from the heater face, remove the heater face, and promptly insert the pipe into the joint. Insert them properly until the clamp table comes into contact with the stopper.
- ⑪ After insertion, maintain the pressure bonding state for the prescribed period. After the cooling time has elapsed, remove the parts from the clamp. (Joining is completed)

DN	16	20	25	40	50	75	100
pressure bonding time (second)	20		30		40		50
Cooling time (second)	3		4		6		

- ⑫ Small amounts of resin remain on the heater face each time the melting process is performed. When welding continuously, remove the remaining resin adhered to the heater face completely before starting work.

Note. Be sure to check the temperature of the heater face at each joining process.



## Electrofusion joining

Check the QR code for the installation procedure video.



### Electrofusion joint

[Joining procedure]

- ① Prepare jigs and tools (e.g. electrofusion machine) necessary for electrofusion.
- ② Remove dirt and liquid from the part to be fused. Dirt on the fused part causes electrofusion failure. Clean the part with acetone or alcohol (e.g. anhydrous ethanol).
- ③ Mark a point of the length of the joint insertion on the pipe. Then, insert the joint.
- ④ Check whether the joint is correctly inserted into the pipe.
- ⑤ Prepare the electrofusion machine. Insert the connector at the end of the output cable into the terminal pin of the joint to the end.
- ⑥ Read the bar code on the joint with the bar code reader.
- ⑦ After checking the contents displayed on the liquid crystal panel (LCP), recheck the status of the pipe insertion and safety, then press the start button. The power-supply time displayed on the LCP decreases while power is supplied normally.
- ⑧ After the power supply is completed, confirm that the indicator of the joint has been raised. Cool it down for 10 minutes or more.

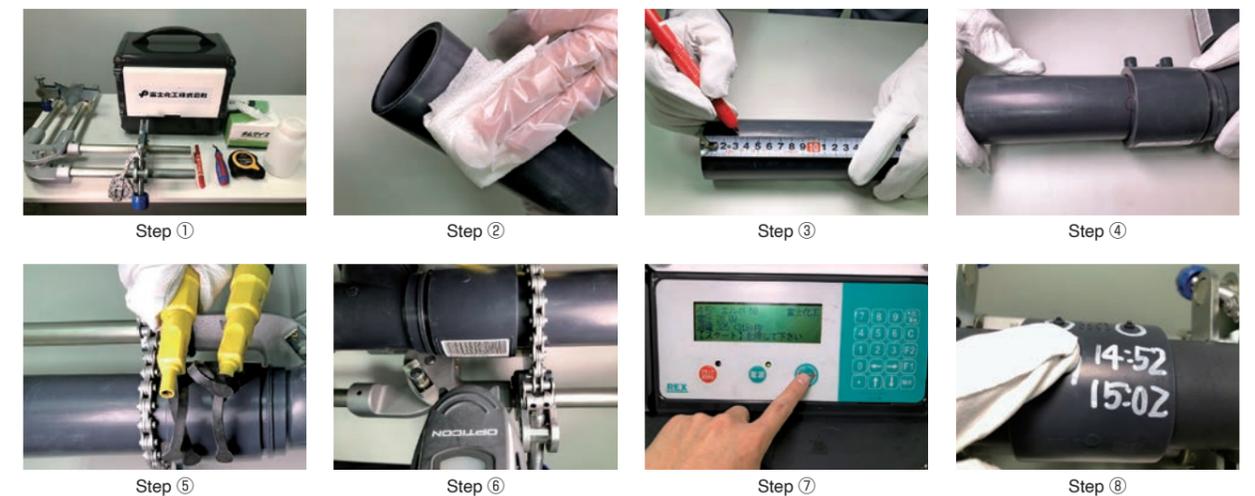
\*For the handling of the electrofusion machine, please refer to the instruction manual provided with the machine.  
\*Our clamp can be used for electrofusion joints.

### Insertion length of the pipe into the joint (mm)

DN	40	50	75	100	125	150	200
EFS (Socket)	40	48	60	63	81	85	107
EFL (Elbow)	44	52	65	68	-	-	-
EF-45 (45° elbow)	44	52	65	70	-	-	-

### Power-supply time of electrofusion (second)

DN	Power-supply time				Cool-down time	
	-5°C	20°C	23°C	40°C		
EFS (Socket)	40	204	170	167	150	600
	50	300	250	244	210	600
	65	492	410	401	353	600
	75	382	318	313	286	600
	100	378	315	307	265	600
	125	631	515	506	453	600
EFL (Elbow)	150	619	550	548	539	600
	200	891	810	788	664	600
	40	200	170	166	146	600
	50	425	354	347	304	600
EF-45 (45° elbow)	75	392	320	314	282	600
	100	324	270	265	238	600
	40	234	195	193	183	600
	50	398	325	321	299	600
EF-45 (45° elbow)	75	354	295	291	266	600
	100	342	285	279	245	600

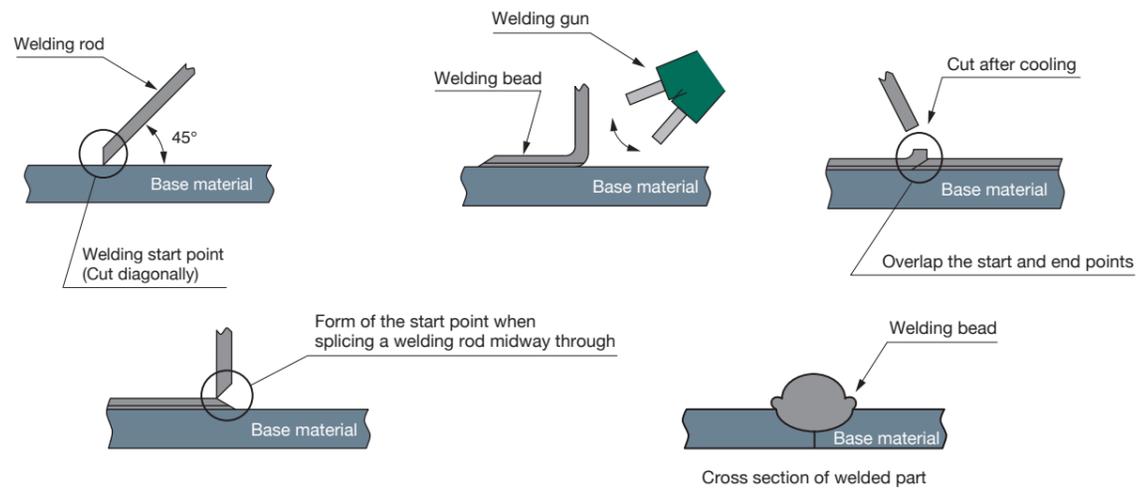


## Welding joining

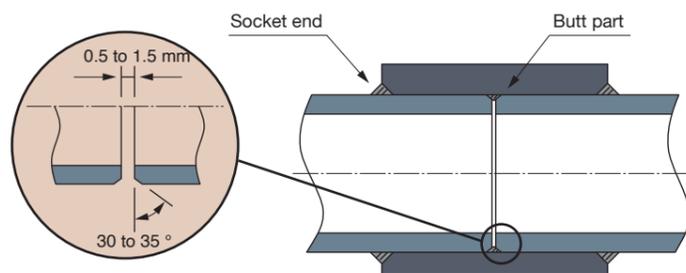
This document provides an overview of the installation process. Refer to the installation manual for details.

### [Joining procedure]

- ① Prepare jigs and tools (e.g. welding gun, polypropylene welding rod, surface temperature indicator) necessary for welding.
- ② Start the welding gun (hot jet), and adjust the voltage and air flow so that the hot air temperature at a position 5 to 10 mm from the nozzle at the gun's tip is 220 to 270°C. Then, perform the warmup operation for 5 to 10 minutes so that there will be no temperature variation. Perform test-welding on a different material to grasp how to operate without causing thermal degradation. (Thermal degradation generates water-like paraffin.)
- ③ Peel off the surface layer on the welding rod and welded part then start welding. Dirt on the welded part causes welding failure. Clean the part with acetone or alcohol.
- ④ Have the welding gun 5 to 10 mm away. While heating the base material and welding rod alternately (the heating ratio between the base material and welding rod should be 6:4 for the first welding operation and 5:5 for the second operation and after), press the welding rod against the base material at a load of approximately 500 g and perform welding so that the welding bead runs over by approximately 0.5 to 1 mm. The welding rod should be vertical to the base material during the operation.
- ⑤ Keep pressing while the end point of the welding overlaps with the start point and move the welding gun away. After cooling for approximately 15 seconds, cut the welding rod using a cutter knife or something similar.
- ⑥ Place the welding rod for the next process at a position shifted from the previous end point (start point).



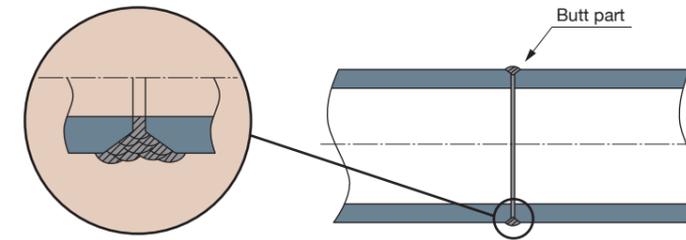
## Welding socket (DWS)



No. of welds for welding socket (DWS) (weld)

DN	Butt part	Socket end
250	6	6
300	6	10

## Butt joining of pipes

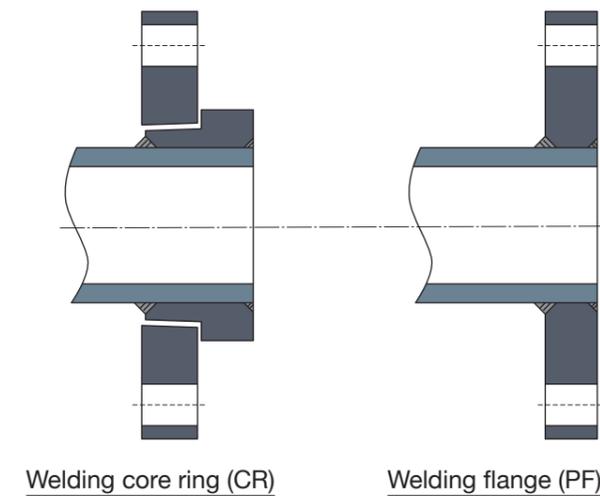


No. of welds on pipe butt part (weld)

DN	Butt part
250	15
300	15

\*The operation of only butt joining of pipes is not performed in principle. This construction method is performed only when it is necessary.

## Welding core ring (CR), welding flange (PF)



No. of welds on welding core ring (CR) and welding flange (PF) (weld)

DN	Outer face side	Inner face side
250	6	6
300	6	6

(Note) 1. The number of welds on the inner face side is a guide.  
2. Fill gaps using the welding rod so that there will be no gap when chamfering is performed after welding.

## Screw joining

### Valve socket and water faucet joint

[Joining procedure]

- ① Wrap the threaded part of the joint with sealing tape (Teflon tape) approximately twice.
- ② Tighten only two threads manually then screw in using a tool.

Driving torque at joint thread  
(N·m)

DN	Driving torque
16	19.6
20	19.6
25	29.4
40	29.4
50	39.2

## Pipe support interval

The support interval for PP pipes and GRP pipes is shorter than metal pipes just like rigid vinyl chloride pipes.

### Pipe support interval (Fuji polypropylene pipes)

DN		Liquid piping								Gas piping			
		Liquid specific gravity = 1.0				Liquid specific gravity = 1.2				(Only pipe's own weight)			
		30°C	60°C	80°C	100°C	30°C	60°C	80°C	100°C	30°C	60°C	80°C	100°C
16	H-pipe	1.0	0.7	0.7	0.6	0.9	0.7	0.7	0.6	1.2	0.9	0.8	0.8
20		1.0	0.8	0.7	0.7	1.0	0.8	0.7	0.7	1.3	1.0	0.9	0.9
25		1.2	0.9	0.8	0.8	1.1	0.9	0.8	0.7	1.5	1.2	1.1	1.0
40		1.3	1.0	0.9	0.9	1.3	1.0	0.9	0.8	1.8	1.4	1.3	1.2
50		1.5	1.1	1.0	1.0	1.4	1.1	1.0	0.9	2.1	1.6	1.4	1.4
75		1.8	1.4	1.3	1.2	1.8	1.4	1.2	1.2	2.5	1.9	1.8	1.7
100	2.1	1.6	1.4	1.4	2.0	1.5	1.4	1.3	2.8	2.2	2.0	1.9	
125	M-pipe	2.1	1.6	1.5	1.4	2.0	1.6	1.4	1.3	3.2	2.5	2.3	2.1
150		2.3	1.8	1.6	1.5	2.2	1.7	1.5	1.5	3.5	2.7	2.5	2.3
200		2.6	2.0	1.9	1.8	2.5	2.0	1.8	1.7	4.0	3.1	2.8	2.7
250		3.0	2.3	2.1	2.0	2.8	2.2	2.0	1.9	4.5	3.4	3.1	3.0
300		3.2	2.5	2.3	2.1	3.1	2.4	2.2	2.1	4.9	3.8	3.4	3.2
125		L-pipe	2.0	1.5	1.4	1.3	1.9	1.5	1.3	1.3	3.2	2.5	2.3
150	2.2		1.7	1.5	1.4	2.1	1.6	1.5	1.4	3.5	2.7	2.5	2.3
200	2.4		1.9	1.7	1.6	2.3	1.8	1.6	1.5	4.0	3.1	2.8	2.7
250	2.7		2.1	1.9	1.8	2.6	2.0	1.8	1.7	4.5	3.4	3.1	3.0
300	2.9		2.3	2.1	1.9	2.8	2.2	2.0	1.9	4.9	3.8	3.4	3.2

- (Note) 1. Support the pipes at the interval given in the above values or less.  
 2. The values have been set so that the deflection amount is 10 mm or smaller under the condition of both-end simple support and uniformly distributed load.  
 3. The support interval should be slightly shorter than the above values when there is vibration.

### Pipe support interval (Fuji GRP)

DN		Liquid piping								Gas piping			
		Liquid specific gravity = 1.0				Liquid specific gravity = 1.2				(Only pipe's own weight)			
		30°C	60°C	80°C	100°C	30°C	60°C	80°C	100°C	30°C	60°C	80°C	100°C
40	H-pipe	1.7	1.5	1.4	1.3	1.7	1.5	1.4	1.3	2.3	2.1	1.9	1.8
50		1.9	1.7	1.6	1.5	1.9	1.7	1.6	1.4	2.6	2.3	2.2	2.0
75		2.3	2.1	2.0	1.8	2.3	2.0	1.9	1.7	3.2	2.8	2.6	2.4
100		2.7	2.4	2.2	2.0	2.6	2.3	2.2	2.0	3.6	3.2	3.0	2.7
125	L-pipe	2.6	2.3	2.2	2.0	2.5	2.2	2.1	1.9	4.0	3.6	3.4	3.1
150		2.8	2.5	2.3	2.1	2.7	2.4	2.2	2.1	4.4	3.9	3.7	3.4
200		3.1	2.8	2.6	2.4	3.0	2.7	2.5	2.3	5.1	4.5	4.2	3.9

- (Note) 1. Support the pipes at the interval given in the above values or less.  
 2. The values have been set so that the deflection amount is 10 mm or smaller under the condition of both-end simple support and uniformly distributed load.  
 3. The support interval should be slightly shorter than the above values when there is vibration.

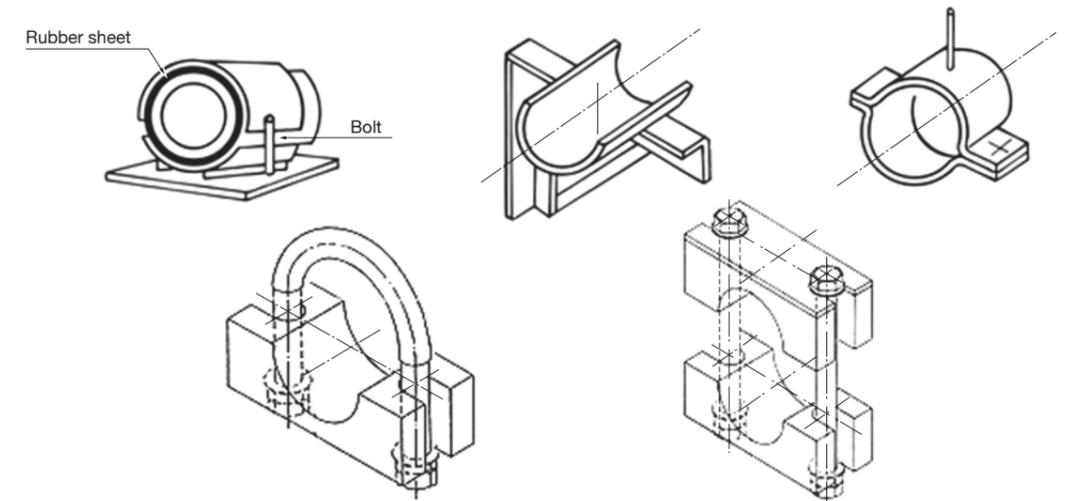
## Pipe support position

Dynamic loads such as pulses, vibrations, and impact tend to be concentrated on bent and branching parts in a line in all types of piping. For this reason, in addition to such parts, important straight parts need to be firmly fixed.

Consideration is also needed to prevent pipes from being directly exposed to the weight of heavy objects such as valves as well as external force during operation.

## Pipe support form

A long holding band should be used for supporting pipes. Cushioning materials also need to be used to prevent damage to pipes.



- The content of this catalog was prepared for providing information on products. Some of the values described are not guaranteed values for quality purposes. Please check the content before ordering products.



# FUJIKAKO Co., Ltd.

<http://www.fujikako.co.jp>

<b>Head office factory</b>	<b>90 Maeda, Fuji-shi, Shizuoka 416-8655, Japan</b>	<b>TEL.+81-(0)5-4561-1370</b>	<b>FAX.+81-(0)5-4561-6862</b>
<b>Fuji sales office</b>	90 Maeda, Fuji-shi, Shizuoka 416-8655, Japan	TEL.+81-(0)5-4587-0415	FAX.+81-(0)5-4560-5259
<b>Hokuriku sales office</b>	90 Maeda, Fuji-shi, Shizuoka 416-8655, Japan	TEL.+81-(0)5-4587-2773	FAX.+81-(0)5-4560-5259
<b>ONSEN facility department</b>	90 Maeda, Fuji-shi, Shizuoka 416-8655, Japan	TEL.+81-(0)5-4587-2773	FAX.+81-(0)5-4560-5259
<b>Osaka sales office</b>	Shin-Osaka Hankyu Building 5F, 1-1-1 Miyahara, Yodogawa-ku, Osaka-shi, Osaka 532-0003, Japan	TEL.+81-(0)6-6398-6031	FAX.+81-(0)6-6398-6033
<b>Yokohama sales office</b>	2-1 Suehiro-cho, Tsurumi-ku, Yokohama-shi, Kanagawa 230-8611, Japan	TEL.+81-(0)4-5500-6421	FAX.+81-(0)4-5500-6422

## Distribution outlet



**FUJIKAKO Co., Ltd.**  
2024.03

\*Please note that standards/specifications in this catalog are subject to change without notice in the interest of product improvement.