

L-SERIES

RUBBER EXPANSION/FLEXIBLE JOINT



※ The contents of this literature are subject to change without notice.

AGENT

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L-SERIES

RUBBER EXPANSION/FLEXIBLE JOINT

“TOZEN” rubber expansion/flexible joint L-series connectors are being used widely in various fields like absorption of stress when ground subsidence and earthquake, absorption of movement in weak reclaimed land, absorption of thermal elongation and compression of resin pipes and vibration absorption of pump.

Furthermore, large movement can be absorbed with small overall length.

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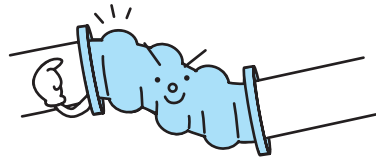
Various LS Connectors

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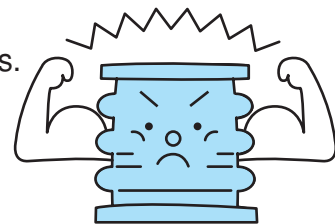
1. Absorption of Movement

Proper arch of L-series connector and elasticity of rubber itself absorb large movement with small overall length.



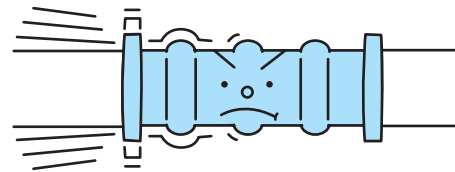
2. High Pressure Resistance

L-series connector provides max. working pressure 2.94 MPa (30 kgf/cm²) with our proper construction and special compound synthetic rubber reinforced by strong synthetic fibre. This pressure rating varies against sizes, please consult us.



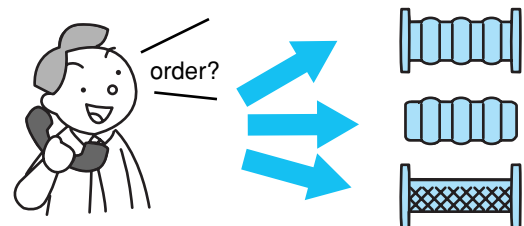
3. Vibration and Sound Absorption

Spring constant is made small with elasticity of rubber and proper design of arch and waist to result good vibration and sound isolation.



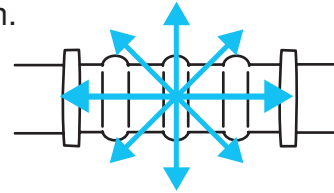
4. Custom Made

L-series connectors are custom made connectors. It is possible to make connectors to meet site requirements like fluid, pressure, temperature, overall length, connection, movement, etc.



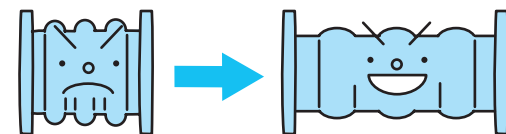
5. Large Displacement

L-series connectors have large movement of axial compression, elongation, lateral and angular movement independently or simultaneously, while metal connectors provide movement in one direction.

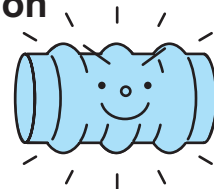


6. Great Recovery from Movement

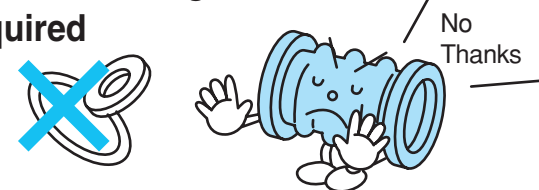
When a metal connector is fully compressed, it assumes a permanent set, a rubber expansion joint continues to return to its original position.



7. Excellent Corrosion Resistance

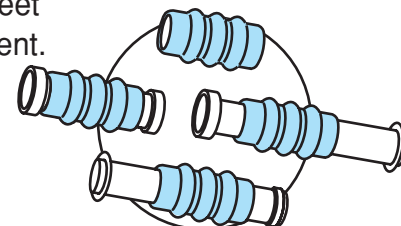


8. Neither Packing nor Gasket required

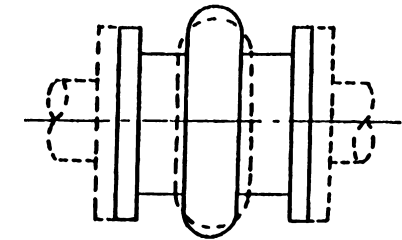


9. Variation

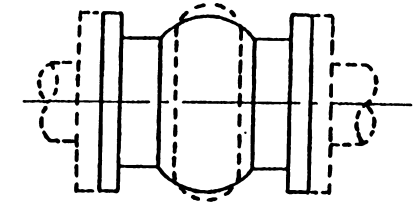
Various connections are provided by materials like polyvinyl chloride pipes (VP, VU), steel pipes, hume pipes, etc. and also by connection like flange, socket, welding, etc., which meet site requirement.



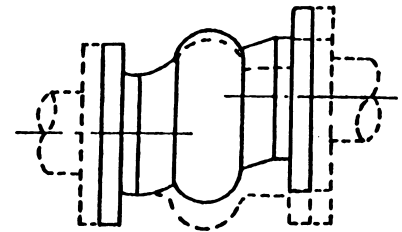
Absorption of: Axial Compression



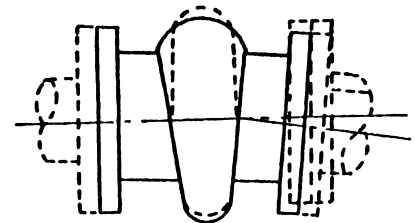
Absorption of: Axial Elongation



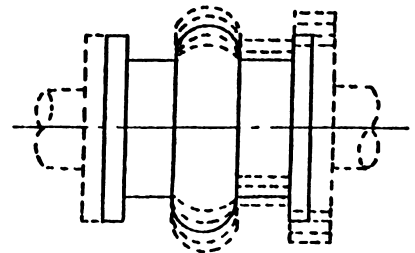
Absorption of: Lateral Movement



Absorption of: Angular Movement



Absorption of: Vibration



The above movements can be absorbed independently or simultaneously.

GUIDELINE FOR EXPANSION JOINT IN JAPAN

JWWA (Japan Water Works Association), Japan Sewerage System Business Group and Japan Sewerage System Association indicate the followings as a one word of design of water works facility, a guide for earthquake proof construction method for water works facility, a design criteria and a guide for countermeasure to earthquake for sewerage system facility.

Water Conduit Facility (by JWWA) 4.2.5 Expansion Joint

The expansion joints for water conduit pit shall conform to the following clauses.

1. In the open and closed pit, the expansion joint shall be installed in the distance approx. 10 to 20 m as both expansion and executing joints.
2. As uneven ground subsidence happens easily at the place of soil quality change, before and behind of jointing well, bridge, weir, manhole, gate, etc., an expansion joint with large flexibility shall be installed.
3. The material of expansion joint shall have enough strength and water tightness, and it shall function well against elongation and compression.

7. Water Distribution Facility 7.4.14 Expansion Joint

The expansion joint shall conform to the following clauses.

1. The expansion joint shall be installed in interval 20 to 30 m at the exposure of pipe used non-free expansion joint.
2. In case that coated steel pipe for water works is installed, an expansion joint shall be installed if required.
3. In case that unplasticized polyvinyl chloride pipe used TS joint is installed, the expansion joint shall be installed if required.
4. An expansion joint with large flexibility shall be installed at aqueduct bridge and place of uneven subsidence in weak ground.

7.4.15 Foundation of Pipe

In case that the pipe is laid to weak ground, the place of a stratum sudden change and a sharp slope, etc., the piping shall be done as follows.

- ② In case that rigid and weak ground are in dislocation and one end of the pipe of structure, etc. is anchored, a flexible expansin joint shall be used to meet uneven ground subsidence.

A Volume of Design Criteria • Machine Design by Japan Sewerage System Business Group

4.2 Joint for Main Pipe

1. The flange joint shall be standard in joint style of the main pipe.
2. In case uneven ground subsidence is anticipated between the pump station and discharge tank or distribution tank, etc., an expansion joint shall be installed to make safety against elongation/compression and flexibility.

APPLICABLE FLUIDS

Water, Chilled Water, Cooling and Heating Water, Condensing Water, Hot Water, Sea Water

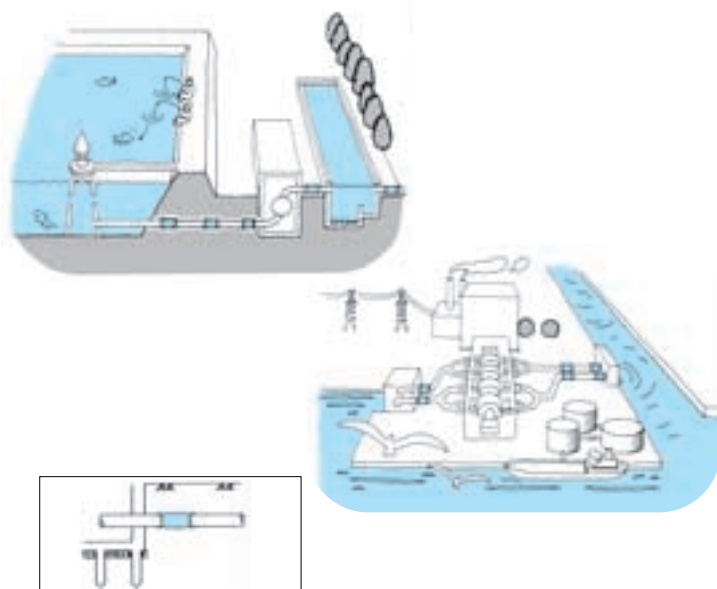
- Potable Water (with special compound rubber)
- Hot Spring Water (available depends on the conditions)
- Alkali (available depends on the conditions)
- Acid (available depends on the conditions)
- Oil (available depends on the conditions)

APPLICATION

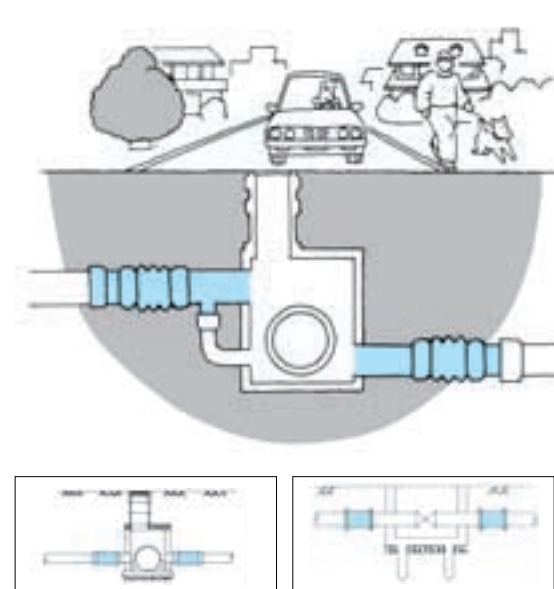
L-series connectors provide absorption of pipe movements in piping system with short overall length.
L-series connectors are being used in :

- Water Supply Service ●Water Treatment Plant ●HVAC Systems
- Chemical Processing Plant ●Power Stations ●Marine Service
- Sewerage Treatment Plant ●Drainage Systems

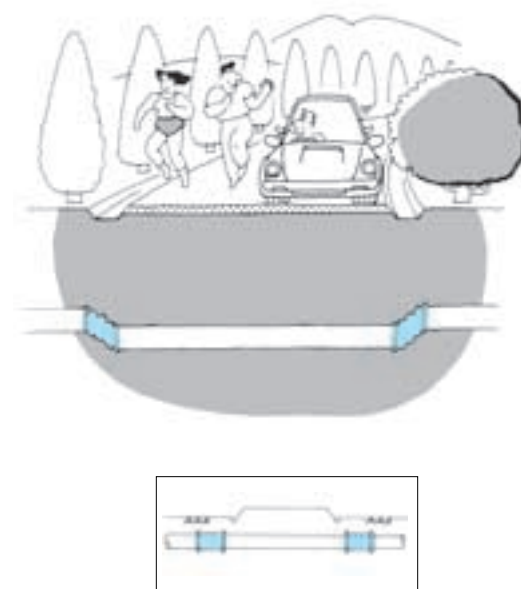
1. Beside a structure



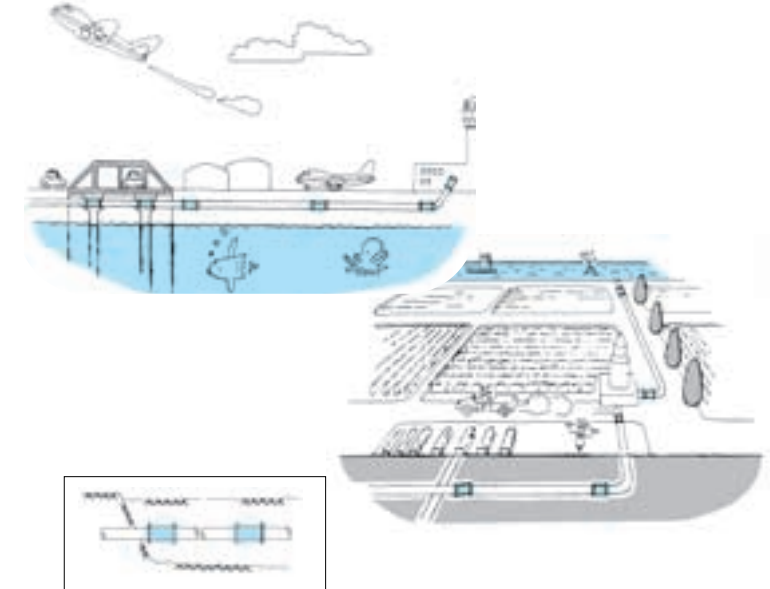
2. Beside valve & manhole



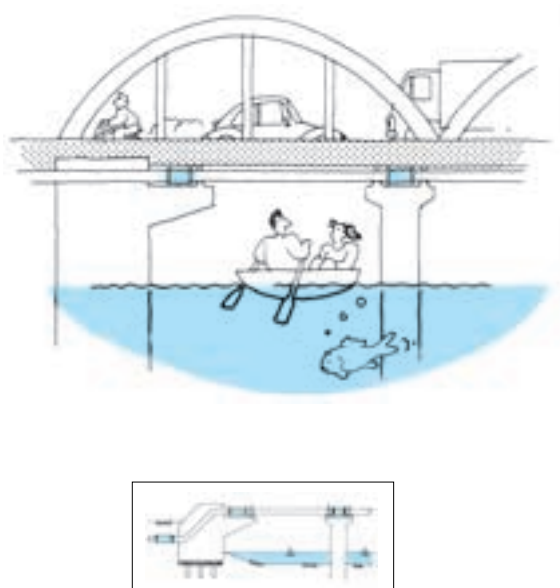
5. Under road and railway



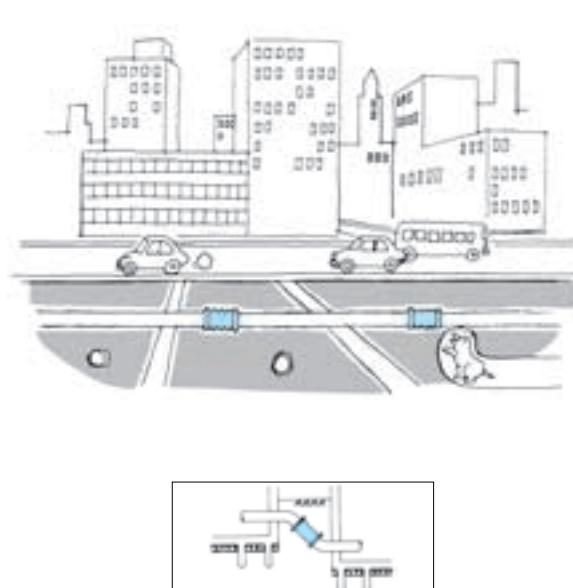
6. In reclamation area and rural area



3. On or under an aqueduct bridge



4. Between two structures



7. In pump house



APPLICATION

●When ground subsidence is anticipated

It is installed in weak land, crossing area of the road and river, etc. to absorb lateral movement and angular movement.

●When thermal expansion and contraction is anticipated

It is installed in the pipe line, where thermal elongation and compression are anticipated, to absorb axial and angular movement

●When vibration and noise generate

It is installed besides a pump and turbine to absorb vibration and noise transmitted to the pipe.

●When several factors for vibration and noise are anticipated

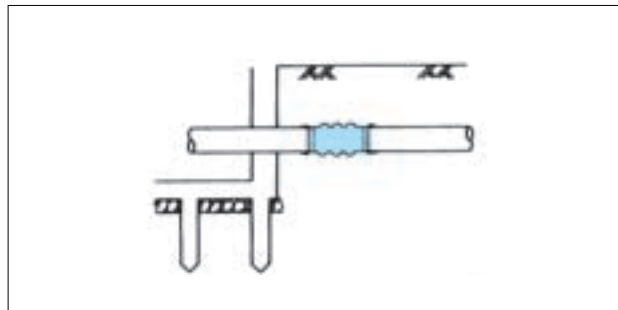
Even though the above mentioned factors are generated in complex, L-series connectors are applicable.

●When our other products are not applicable

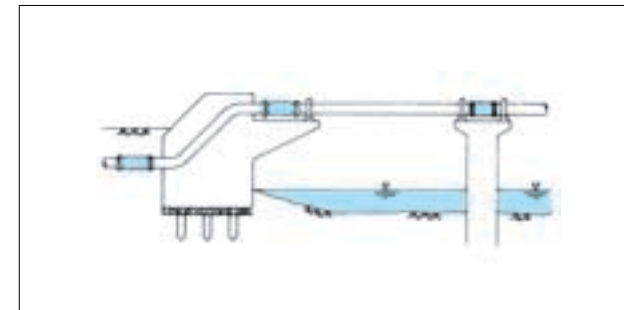
In case our other standard products like TWINFLEX, TOZENFLEX, TUFFLEX HS, etc. do not satisfy site requirements, L-series connectors are applicable.

■Application Examples Relates to Civil Engineering

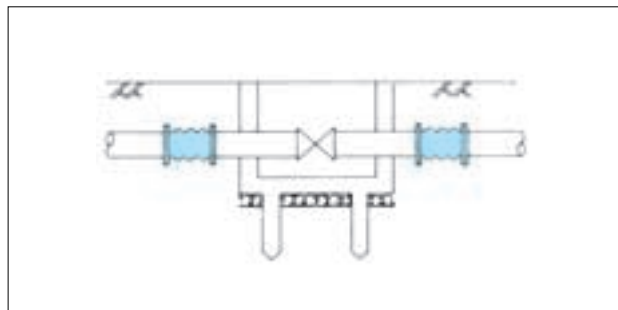
1. Beside a structure



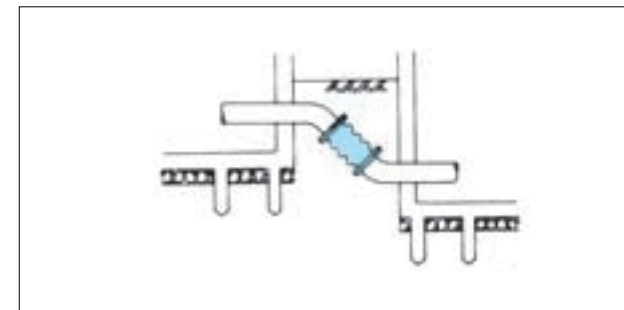
2. Beside a manhole



3. Aqueduct bridge



4. Between two structures



Beside a manhole



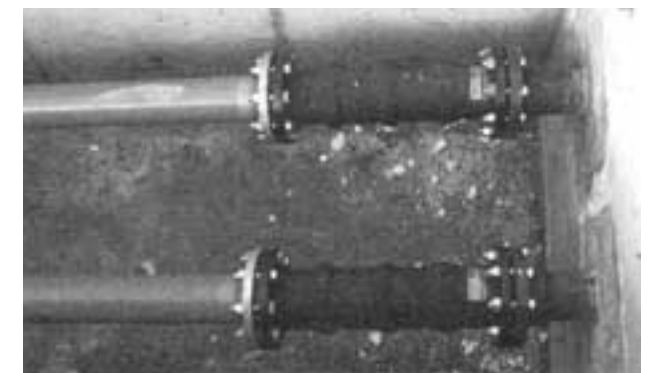
Drain pipe unit



LS Connector



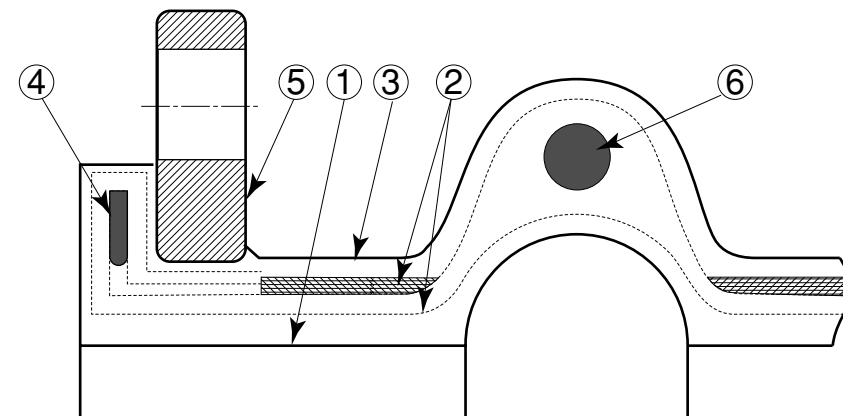
Socket and spigot of huge pipe



Pipe penetration through structure



LS Connector



1. Inner Rubber

The inner rubber core protects the reinforcing fabric from penetration of the fluid and aging. This smooth, leakproof core is made of neoprene, EPDM, chloro-butyl, hypalon, nitrile or other compound as desired for various service. Please consult us.

2. Reinforcing Fabric

The reinforcing fabric is the flexible and supporting part between the inner core and outercover. High strength synthetic fibre is used depending on pressure and temperature requirements. All fabric piles are penetrated with synthetic rubber to give max. adhesion under the conditions of pressure, vacuum and stress.

3. Outer Rubber

This is the exterior surface of the expansion joint, generally made of neoprene, giving good resistance to weather, ozone, aging, cracking, heat and corrosion.

4. End Reinforcing Ring

This end reinforcing ring provides max. strength and tightness between flanges.

5. Flanges

Our standard flange is made of mild steel and coated with epoxy. It may be altered upon request.

6. Arch Reinforcing Ring

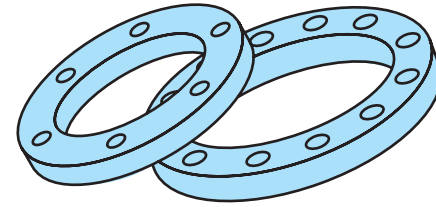
This arch reinforcing ring is incorporated for the buried or vacuum services. General structure design of this ring is based on a load of 3 m underground plus 25 tons of vehicle load.

Rubber Materials		C R	EPDM
Test Items			
Spring Hardness	Hs (JIS A)	63	60
Tolerances of Spring Hardness		±5	±5
Tensile Strength	Tensile Strength kgf/cm ² (more than)	100	100
	Elongation % (more than)	400	400
Tear Test	Tear Strength kgf/cm ² (more than)	25	20
Aging Test (100°C 96 hours)	Change Ratio In Tensile Strength % (more than)	-20	-25
	Change Ratio In Tensile Elongation % (more than)	-60	-30
	Change in Spring Hardness Hs	+25 ~ -0	+10 ~ -0

Free sulphur analyzing and melting test for EPDM of rubber materials are according to JIS K6353.

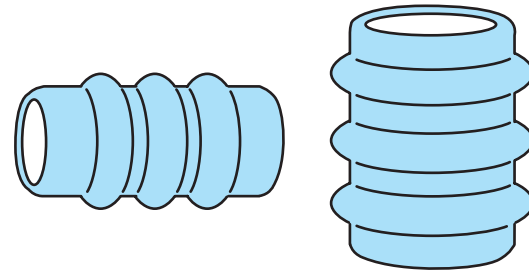
■ Flange

It is possible to specify materials, standard and finish or painting.



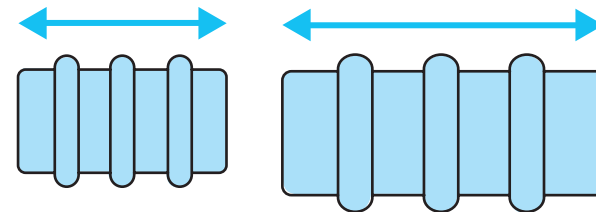
■ Rubber

The rubber body material is changeable to meet site requirements. Please consult us.



■ Overall Length

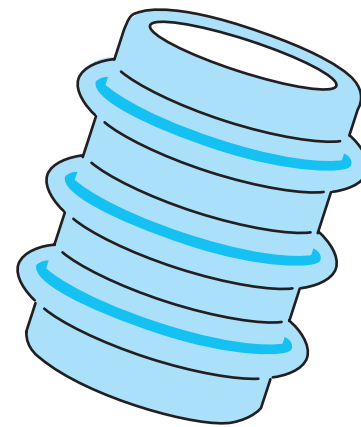
Please refer to a table of standard overall length for each product herein. It is changeable if specified.



■ Underground Application

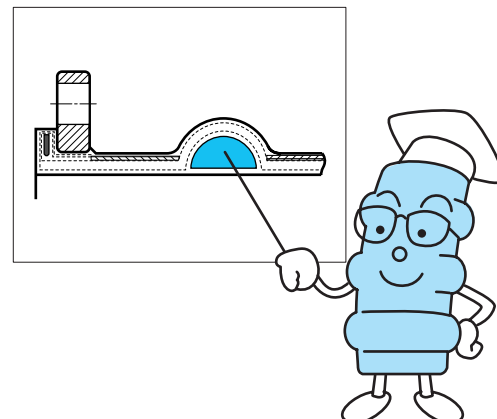
The reinforcing ring is used against outer pressure of the buried service. It is designed in the base of a load of 3m underground plus 25 tons vehicle load. When a load of outer pressure more than that is anticipated, please specify it. For application of suction like vacuum, etc., please use this underground type connector.

The standard finish of flanges for underground type will be hot dip galvanized +Tar epoxy coating.



■ Filled Arch

When inner rubber is required to be flat for prevention of sludge sedimentation, dead air space, fluid turbulent flow, etc., please specify this filled arch type.



Angular movement of our L-series connectors are shown in the following table.

Lateral Movement(mm)	No.of Bellows	Nominal Diameter(A)	Angular Movement(°)
20	1	20~600	7
		700~1500	5
50	2	20~600	15
		700~1500	10
100	3	20~600	20
		700~1500	15
200	4	20~600	30
		700~1500	20
300	5~6	200~600	30
400	6~7	200~600	30

LS-C

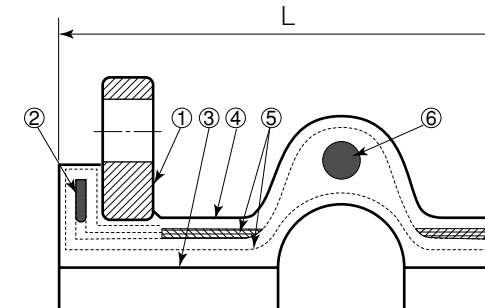
Flange Type LS Connector

6 types of LS connectors are available, which 20 mm, 50 mm, 100 mm, 200 mm, 300 mm and 400 mm of eccentricity.

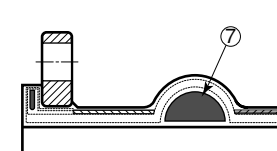


Construction

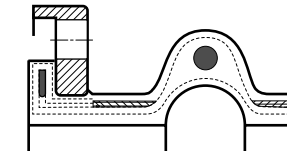
32A~900A



20~25A



1000A~1500A



No.	Parts	Materials
①	Flange	Mild Steel(SS400)
②	Reinforcing Ring	Mild Steel(SS400)
③	Inner Rubber	Synthetic Rubber
④	Outer Rubber	Synthetic Rubber
⑤	Reinforcing Cord	Synthetic Fiber
⑥	Reinforcing Ring	Mild Steel(SS400)
⑦	Filler	Special High Polymer Rubber

- Aboveground and underground types are available.
- The above figures show the underground type.
- The size 20A and 25A are filled arch type.
- The filled arch type is also producible more than 32A.

Features

●Absorption of Movement

All parts other than flanges are flexible. Large movement can be absorbed with small overall length.

●Classification of Eccentricity

LS connector is classified in 6 types of lateral movement, which are 20mm, 50mm, 100mm, 200mm, 300mm and 400mm.

Applications

- Absorption of pipe movements in weak ground
- Insulation between structure and pipe
- Crossing river, road and railway
- Before and behind of aqueduct bridge
- Run out from manhole
- Absorption of pipe thermal elongation and compression
- Vibration absorption of pump, etc.

Classification of Max. Working Pressure and Temperature

Classification of Lateral Movement	Classification of Pressure	Max. Working Pressure MPa (kgf/cm ²)	Max. Working Temp. (°C)
For 20 mm, 50 mm 100 mm, 200 mm	Low Pressure Middle Pressure High Pressure	Less than 0.20 (2) Less than 0.49 (5) Less than 0.98 (10)	70°C 80°C (EPDM)
for 300 mm, 400 mm	—	Less than 0.49 (5)	

* For higher pressure application, please consult us.

Dimensions and Allowable Movements

Nominal Dia. (mm)	20 mm Lateral Movement 1 – Bellow (mm)				50 mm Lateral Movement 2 – Bellow (mm)				100 mm Lateral Movement 3 – Bellow(mm)				200 mm Lateral Movement 4 – Bellow (mm)			
	L	Elon.	Comp.	Mass(kg)	L	Elon.	Comp.	Mass(kg)	L	Elon.	Comp.	Mass(kg)	L	Elon.	Comp.	Mass(kg)
20	150	15	20	2.3	250	30	45	2.6	350	40	60	3.2	450	40	60	3.8
25	150	15	20	2.6	250	30	45	2.9	350	40	60	3.6	450	40	60	4.3
32	150	15	20	3.0	250	30	45	3.4	350	40	60	4.4	450	40	60	5.3
40	150	15	20	3.6	250	30	45	4.0	350	40	60	5.2	450	40	60	6.3
50	150	15	20	4.4	250	30	45	4.9	350	40	60	6.2	450	40	60	7.4
65	150	15	20	5.2	250	30	45	5.9	350	40	60	8.0	450	40	60	9.5
80	150	20	20	6.0	300	30	45	6.7	350	40	60	9.1	450	40	60	11
100	150	20	20	7.2	300	30	45	8.4	350	40	60	11	450	40	60	13
125	150	20	20	10	300	30	45	12	350	40	60	15	450	40	60	17
150	200	20	20	13	300	30	45	16	500	40	60	20	600	40	60	22
200	200	20	20	18	300	30	45	21	500	40	60	26	600	40	60	28
250	200	20	20	26	300	30	45	31	500	40	60	37	600	40	60	43
300	200	20	20	33	300	30	45	39	550	40	60	46	650	40	60	55
350	200	25	30	42	350	40	50	50	550	50	70	59	650	50	70	68
400	200	25	30	50	350	40	50	60	550	50	70	74	650	50	70	85
450	200	25	30	61	350	40	50	74	550	50	70	95	650	50	70	105
500	250	25	30	71	350	40	50	87	550	50	70	110	650	50	70	125
600	250	25	30	99	400	40	50	121	550	50	70	145	650	50	70	168
700	250	25	30	116	400	40	50	137	650	50	70	170	750	50	70	197
800	300	25	30	133	400	40	50	156	650	50	70	190	750	50	70	225
900	300	25	30	150	400	40	50	178	650	50	70	220	750	50	70	254
1000	300	25	30	170	450	40	50	197	700	50	70	250	800	50	70	287
1100	300	25	30	190	450	40	50	225	700	50	70	280	800	50	70	324
1200	300	25	30	217	450	40	50	254	700	50	70	310	800	50	70	357
1350	300	25	30	260	450	40	50	300	700	50	70	370	800	50	70	420
1500	350	25	30	405	450	40	50	460	750	50	70	590	950	50	70	680

L : Overall Length Elon. : Elongation Comp.: Compression

- Mass indicates the weight for underground type.
- Please use each movement within allowable movements.
- Information in the above table is for single movement only. In case of complex movements, correction is required. Please refer to the expression in page 26.

LS-G

LS Connector G-Type 300mm and 400mm Lateral Movement



Features

●Absorption of Movements

All parts except flanges are flexible.
Large movements can be absorbed with small overall length.

Applications

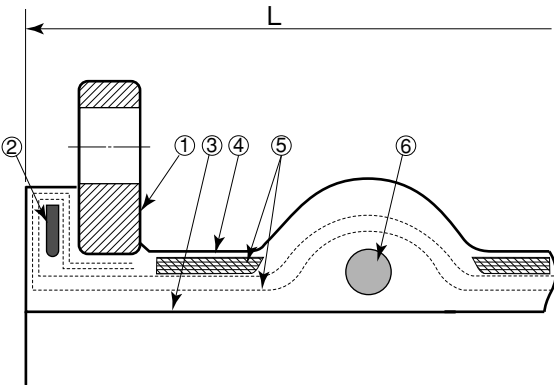
- Absorption of pipe movement in weak ground.
- Insulation between structure and pipe.
- Crossing river, road and railway.
- Before and behind of aqueduct bridge.
- Run out from manhole.
- Absorption of pipe thermal elongation and compression.

Classification

Lateral Movement(mm)	Aboveground/Underground Applications	Nominal Diameter(A)	Max. Working Temp. (°)
For 300 mm and 400 mm	Combined use of above-ground and underground Negative Pressure: MPa (kgf/cm ²)	Less than 0.49 (5)	70°C 80°C (EPDM)

For higher pressure application, please consult us.

Construction



No.	Parts	Materials
①	Flange	Mild Steel(SS400)
②	Reinforcing Ring	Mild Steel(SS400)
③	Inner Rubber	Synthetic Rubber
④	Outer Rubber	Synthetic Rubber
⑤	Reinforcing Cord	Synthetic Fiber
⑥	Reinforcing Ring	Mild Steel(SS400)

- The products is for combined use for aboveground and underground applications.
- Please note of flat inner rubber.
- For 150 A to 600 A, the shape of reinforcing ring of part No.2 will be different.

Dimensions and Allowable Movements

300 mm Lateral Movement

Nominal Dia. (mm)	No. of Bellows	Overall Length (mm)	Allowable Movement				Allowable Torsion Limit(°C)	Mass (kg)
			L.M. (mm)	Elon. (mm)	Comp. (mm)	A.M. (°C)		
20	5	550	300	60	50	30	15	4.2
25	5	550	300	60	50	30	15	5.3
32	5	550	300	60	50	30	15	7.3
40	5	550	300	60	50	30	15	8.1
50	5	550	300	60	50	30	15	10
65	5	650	300	60	50	30	15	15
80	5	650	300	60	50	30	15	16
100	5	650	300	60	50	30	15	21
125	5	650	300	60	50	30	15	28
150	5	650	300	60	60	30	15	34
200	5	700	300	80	60	30	15	45
250	5	700	300	80	60	30	15	65
300	5	800	300	80	60	30	15	83
350	5	900	300	80	60	30	15	105
400	5	900	300	80	70	30	15	127
450	5	900	300	80	70	30	15	159
500	5	900	300	80	70	30	15	177
600	6	1000	300	80	70	30	15	260

L.M. = Lateral Movement Elon. = Elongation
Comp. = Compression

400 mm Lateral Movement

Nominal Dia. (mm)	No. of Bellows	Overall Length (mm)	Allowable Movement				Allowable Torsion Limit(°C)	Mass (kg)
			L.M. (mm)	Elon. (mm)	Comp. (mm)	A.M. (°C)		
20	7	750	400	80	50	30	15	5.3
25	7	750	400	80	50	30	15	6.5
30	7	750	400	80	50	30	15	9
40	7	750	400	80	50	30	15	10
50	7	750	400	80	50	30	15	12
65	6	750	400	80	50	30	15	17
80	6	750	400	80	50	30	15	18
100	6	750	400	80	50	30	15	23
125	6	750	400	80	50	30	15	28
150	6	750	400	100	60	30	15	38
200	7	850	400	100	60	30	15	51
250	7	850	400	100	60	30	15	74
300	7	950	400	100	60	30	15	94
350	7	1100	400	100	60	30	15	121
400	7	1100	400	100	70	30	15	145
450	7	1100	400	100	70	30	15	183
500	7	1100	400	100	70	30	15	203
800	7	1250	400	100	70	30	15	289

L.M. : Lateral Movement
Elon. : Elongation
Comp.: Compression
A.M. : Angular Movement
Please apply each movement within a allowable movements.
Information in the above table is single movement only.
In case of complex movements, correction is required.
Please refer to the expression in page 26.

LC-F

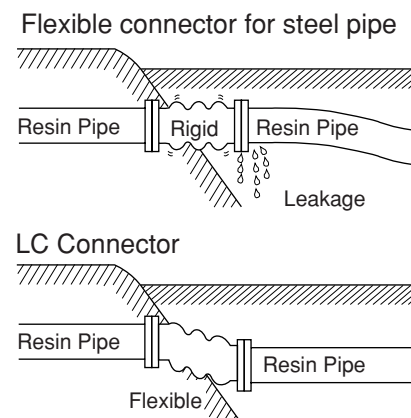
LC Connector Flange Type for Resin Pipe

Soft connector for resin
pipe of PVC (VP, VU).

Features

●Soft

As LC connector is more flexible than PVC pipes, it can absorb stress caused by uneven ground subsidence, etc. and can protect the pipes.



Construction

Lateral Movement	Aboveground/Underground Applications	Classification Of Pressure	Max. Working Pressure MPa (kgf/cm ²)	Max. Working Temp.
100 mm and 200 mm	Aboveground application (not applicable to Negative Pressure)	Low Pressure	Less than 0.20 (2)	70°C 80°C (EPDM)
		Middle Pressure	Less than 0.49 (5)	
		High Pressure	Less than 0.98 (10)	
	Underground application Negative Pressure: -0.1 MPa (-760 mmHg)	Low Pressure	Less than 0.20 (2)	
		Middle Pressure	Less than 0.49 (5)	
		High Pressure	Less than 0.98 (10)	

For higher pressure applications, please consult us.

Applications

- Absorption of pipe movement in weak ground.
- Insulation between structure and pipe.
- Crossing river, road and railway.
- Before and behind of aqueduct bridge.
- Run out from manhole.
- Absorption of pipe thermal elongation and compression.
- Vibration absorption of pump, etc.

Construction

No.	Parts	Materials
①	Flange	Mild Steel(SS400)
②	Reinforcing Ring	Mild Steel(SS400)
③	Inner Rubber	Synthetic Rubber
④	Outer Rubber	Synthetic Rubber
⑤	Reinforcing Cord	Synthetic Fiber
⑥	Reinforcing Ring	Mild Steel(SS400)
⑦	Filler	Special High Polymer

●Both aboveground and underground types are available.
The above figure shows underground type.

●20A and 25A are filled arch type.
The filled arch type is also producible for more than 32A.

Dimensions and Allowable Movements

Nominal Dia. (mm)	100 mm Lateral Movement 3 – Bellow (mm)				200 mm Lateral Movement 4 – Bellow(mm)			
	L	Elon.	Comp.	Mass(kg)	L	Elon.	Comp.	Mass(kg)
20	350	40	60	3.2	450	40	60	3.8
25	350	40	60	3.6	450	40	60	4.3
32	350	40	60	4.4	450	40	60	5.3
40	350	40	60	5.2	450	40	60	6.3
50	350	40	60	6.2	450	40	60	7.4
65	350	40	60	8.0	450	40	60	9.5
80	350	40	60	9.1	450	40	60	11
100	350	40	60	11	450	40	60	13
125	350	40	60	15	450	40	60	17
150	500	40	60	20	600	40	60	22
200	500	40	60	26	600	40	60	28
250	500	40	60	37	600	40	60	43
300	550	40	60	46	650	40	60	55
350	550	50	70	59	650	50	70	68
400	550	50	70	74	650	50	70	85
450	550	50	70	95	650	50	70	105
500	550	50	70	110	650	50	70	125
600	550	50	70	145	650	50	70	168
700	650	50	70	170	750	50	70	197
800	650	50	70	190	750	50	70	225
900	650	50	70	220	750	50	70	254
1000	700	50	70	250	800	50	70	287
1100	700	50	70	280	800	50	70	324
1200	700	50	70	310	800	50	70	357
1350	700	50	70	370	800	50	70	420
1500	750	50	70	590	950	50	70	680

L. = Overall Length, Elon. = Elongation, Comp. = Compression

- Mass indicates for underground type.
- Please use each movement within allowable movements.
- Information in the above table is for single movement only.
In case of complex movements, correction is required. Please refer to the expression in page 26.

LV-C

LV Connector Socket Joint Type for Resin Pipe

Simple installation with only socket joint of LV connector for resin pipes of PVC (VP, VU), etc.



Construction

No.	Parts	Materials
①	Socket	PVC
②	Reinforcing Ring	Mild Steel(SS400)
③	Inner Rubber	Synthetic Rubber
④	Outer Rubber	Synthetic Rubber
⑤	Reinforcing Cord	Synthetic Fiber

●The material is combined use for aboveground and underground.
 ●The product is filled arch type of inner rubber.

Dimensions and Allowable Movements

Nominal Dia. (mm)	H (mm)	100 mm Lateral Movement 4 – Below (mm)				200 mm Lateral Movement 6 – Below(mm)			
		L	Elon.	Comp.	Mass(kg)	L	Elon.	Comp.	Mass(kg)
50	64	500	40	50	5	650	60	70	7
65	64	500	40	50	7	650	60	70	8
80	64	500	40	50	8	650	60	70	9
100	74	500	40	50	10	650	60	70	12
125	75	600	40	50	12	700	60	70	14
150	90	600	40	50	15	750	60	70	18
200	145	600	40	50	20	750	60	70	24
250	164	700	40	50	24	850	60	70	28
300	180	700	40	50	33	850	60	70	38

L = Overall Length, Elon. = Elongation, Comp. = Compression

●Mass indicates for underground type.
 ●Information in the above table is for single movement only. In case of complex movements, correction is required. Please refer to page 26.

Features

●Simple Installation

Simple installation with only socket jointing. Please refer to the below figures for installation.

●Filled Arch

No fear of sludge sediment due to straight inner rubber.

Applications

- Absorption of pipe movements in weak ground.
- Insulation between structure and pipe.
- Crossing river, road and railway.
- Before and behind aqueduct bridge.
- Run out from manhole
- Absorption of pipe thermal elongation and compression.

Installation

	Measure H dimension from the edge of socket and make a marked line.
	Apply adhesive to a collet of socket inside and to outside of inserting part (up to a marked line).
	Insert the inserting part up to a marked line. Adhesion will be completed after drying.

Construction

Lateral Movement(mm)	Aboveground / Underground Applications	Max working Pressure MPa (kgf/cm ²)	Max. Working Temp.
100 mm and 200 mm	Combined use of aboveground and underground. Negative Pressure: -0.1 MPa (-760 mmHg)	Less than 0.49 (5)	70°C 80°C (EPDM)

For higher pressure application, please consult us.

LB-C

LB Connector Bevel End Type



Construction

No.	Parts	Materials
①	Side Pipe	Mild Steel(SS400)
②	Stopper Ring	Mild Steel(SS400)
③	Inner Rubber	Synthetic Rubber
④	Outer Rubber	Synthetic Rubber
⑤	Reinforcing Cord	Synthetic Fiber
⑥	Filler	Special High Polymer
⑦	Reinforcing Ring	Mild Steel(SS400)

32~40A		
50A~1500A		●The product is combined use of aboveground and underground. ●32A and 40A are filled arch type of inner rubber. ●The filled arch type for more than 50A is also producible.

Dimensions and Allowable Movement

Nominal Dia. (mm)	H (mm)	100 mm Lateral Movement 3 – Bellow (mm)				200 mm Lateral Movement 4 – Bellow (mm)			
		L	Elon.	Comp.	Mass(kg)	L	Elon.	Comp.	Mass (kg)
32	150	700	40	60	4	800	40	60	6
40	150	700	40	60	5	800	40	60	7
50	150	700	40	60	6	800	40	60	8
65	150	700	40	60	9	800	40	60	11
80	150	700	40	60	12	800	40	60	14
100	150	700	40	60	14	800	40	60	16
125	150	700	40	60	16	800	40	60	18
150	150	800	40	60	26	900	40	60	29
200	150	800	40	60	39	900	40	60	44
250	150	800	40	60	49	1000	40	60	56
300	150	800	40	60	64	1000	40	60	72
350	150	1000	50	70	73	1150	50	70	92
400	160	1000	50	70	96	1150	50	70	104
450	160	1000	50	70	130	1150	50	70	148
500	160	1050	50	70	143	1200	50	70	174
600	160	1050	50	70	180	1200	50	70	220
700	160	1050	50	70	214	1200	50	70	280
80	160	1050	50	70	244	1200	50	70	360
900	160	1100	50	70	310	1250	50	70	420
1000	160	1100	50	70	340	1250	50	70	480
1100	170	1000	50	70	380	1150	50	70	660
1200	170	1000	50	70	510	1150	50	70	680
1350	170	1000	50	70	620	1150	50	70	740
1500	170	1050	75	80	840	1200	75	85	1000

- Please use each movement within allowable movements.
- Information including lateral movement in the above table is for single movement only. In case of complex movements, correction is required. Please refer to the expression in page 26.

Applications

- Absorption of pipe movements in weak ground.
- Crossing pipe for river, road and railway.
- Insulation between structure and pipe.
- Absorption of pipe thermal elongation and compression.

Classification

Lateral Movement	Aboveground• Underground Applications	Classification of Pressure	Max. Working Pressure Mpa (kgf/cm ²)	Max. Working Temp.
100 mm and 200 mm	Combined use of aboveground and underground. Negative Pressure: -0.1 Mpa (-760 mmHg)	Low Pressure	Less than 0.20 (2)	70℃ 80℃ (EPDM)
		Middle Pressure	Less than 0.49 (5)	
		High Pressure	Less than 0.98 (10)	

For higher pressure applications, please consult us.

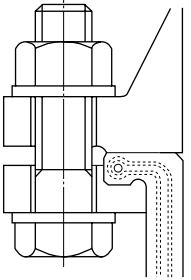
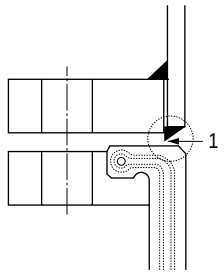
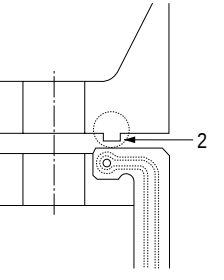
Example of Various Connection

For Hume Pipe	For Cast Iron Pipe
Upstream for FRPM Pipe (Socket)	Downstream for FRPM (Spigot)

For dimensions and working pressure of the above products by the end connections, please consult us.

NOTES FOR CONNECTION

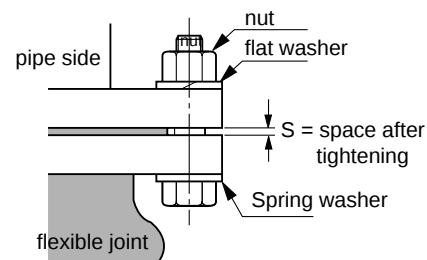
1. In rubber expansion joints, the packing face of the products might be damaged depends on the counter-pipe flange type.
Please check the shape of the counter-pipe flange as follows.

	Butt Welding type Flange	Slip-On Welding Type Flange	Male-Female Flange
Shape			
Result	No problem. It is an ideal one because the inner dia. of rubber body and inner dia. of the mating pipe flange are almost same and a holding power for the packing is enough.	Apply a gasket to use. Burr by welding indicated by arrow mark 1 may damage the packing sealing face. Remove burrs by file or sand paper and apply a gasket if required.	Not applicable. Load per unit area will get bigger and the packing sealing face will be damaged due to small contact area with protrusion indicated by arrow mark 2 and packing sealing face of the body.

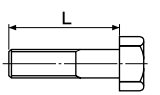
2. Fix the installation bolts from the rubber body side and tighten the nuts at the counter-pipe side.
In case of the fully threaded bolts, note the bolts edge not to protrude extraordinarily the rubber body side.
3. Tighten the installation bolts in even in the diagonal order referring to the following table of the space after tightening the bolts and nuts.
The abnormal installation like uneven bolts tightening, etc. will cause damage of the products.

Space after tightening the bolts and nuts

Nominal dia. (mm)	Space After Tightening (mm) LS Connector, LS Connector G-Type, LC Connector
20 – 125	8.5
150 – 500	13
600 – 800	18
900	20

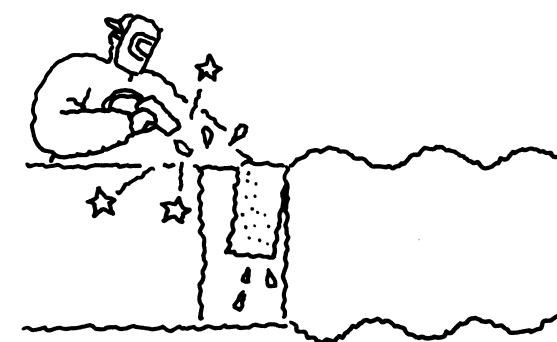


4. As to the installation bolts, refer to the following table.

 (JIS B1180: Metric Coarse Screw Thread)				
Nominal Dia.	JIS 10K		JWWA Flanges(F125)	
	Bolt	L	Bolt	L
15	M12	55		
20	M12	60		
25	M16	65		
32	M16	65		
40	M16	65		
50	M16	65		
65	M16	70		
80	M16	70	M16	70
100	M16	70	M16	70
125	M20	80	M16	70
150	M20	85	M16	80
200	M20	85	M16	80
250	M22	90	M20	85
300	M22	90	M20	85
350	M22	90	M22	90
400	M24	100	M22	90
450	M24	100	M24	100
500	M24	100	M24	100
600	M30	120	M24	110
700	M30	120	M30	120
800	M30	130	M30	120
900	M30	130	M30	130

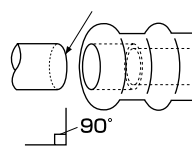
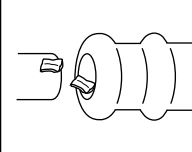
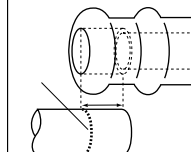
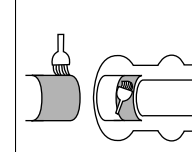
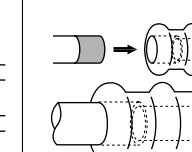
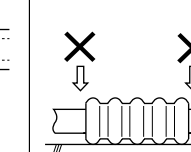
■ Bevel Welding Connection

When connecting LB connector, pay attention to protect the products from heat transmission.



■ Socket Joint Connection

Please refer to the working procedures of LV connector as follows.

 1. Check if the pipe for insertion is cut vertically.	 2. Clean the socket inside and insert pipe outside not to leave oil nor water.	 3. Measure dimension of H from the edge of inserting pipe and indicate as gage mark.	 4. Apply adhesive to collet of socket inside and to outside of inserting pipe (up to a marked line) in even.	 5. Insert a pipe to the position of a marked line and hold it for a while.	 6. Do not load to the connection forcibly after connection. Adhesion will be completed after drying.
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CORRECTION FOR COMPLEX MOVEMENTS

Allowable movements show max. single movement only. In case of complex movements, please follow the below expression for correction.

$$C. EL. C. = A. EL. C. \times \{1 - (L.M./A.L.M. + A.M./A.A.M.)\}$$

C. EL. C. = Correct Elongation and Compression

A. EL. C. = Allowable Elongation and Compression

L.M. = Lateral Movement

A.L.M. = Allowable Lateral Movement

A.M. = Angular Movement

A.A.M. = Allowable Angular Movement

(Example) For LS connector 300A of 200 lateral movement, correct elongation will be as follows when lateral movement 150 mm is required.

$$\text{Correct Elongation} = 40 \times \{1 - (150/200 + 0)\} = 10 \text{ mm}$$

(For LS series connectors, please calculate as A.M./A.A.M. = 0)

- In case LS connector for 200 mm lateral movement is deflected 200 mm, allowable elongation will be '0'. In case LS connector is deflected 200 mm and further allowable elongation is required, please apply LS connector for 300 mm lateral movement.

CONTROL UNIT

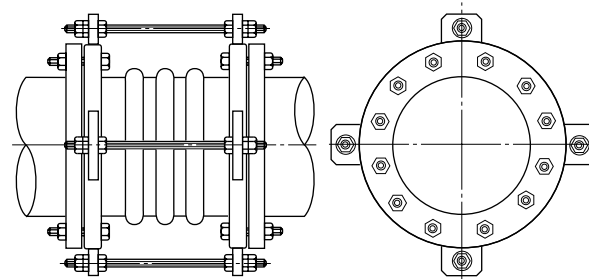
In case of the following conditions, control unit is recommended to use for protection of connectors.

- In case that it is hard to support reaction force(thrust) by pressure during the test operation or normal operation
- In case that lateral movement more than the design is anticipated.
- In case that the connectors are anticipated to be compressed when installation.

■ W-Type (Welding)

The triangle plates are welded directly to the flanges.

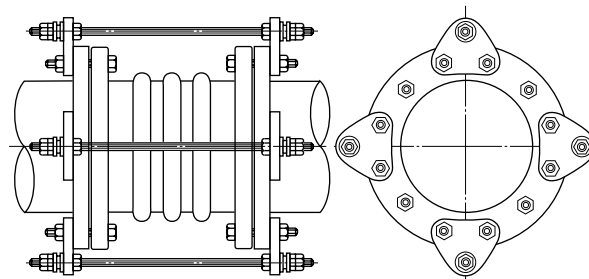
Illustration shows 4-point support.



■ BP-Type (Back Plate)

Triangle back plate type using bolt holes of counter flanges.

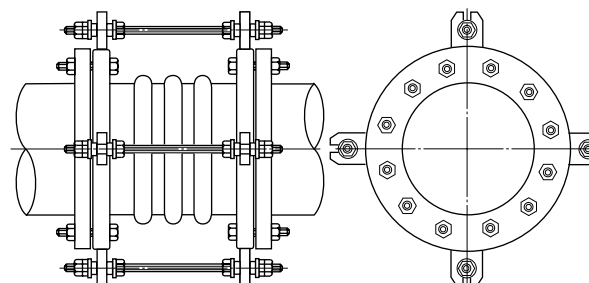
Illustration shows 4-point support.



■ U-Type (Welding) (New Type)

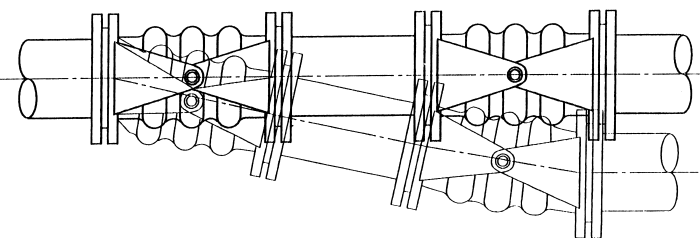
Easy installation and removing type even in a small space.

Illustration shows 4-point support.



■ HINGE-Type (TWIN ACTION-Type)

For a case that the excessive movement than the design is predicted.



Please refer to the following table of installation bolts for BP type control unit.

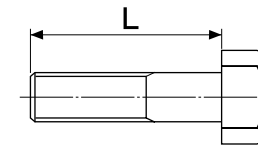
■ Table of Installation Bolts for BP Type Control Unit

Applicable Products:

LS Connector, LS Connector G-Type.

LC Connector, LENERFLEX C-Type 10K

(32A~300A)



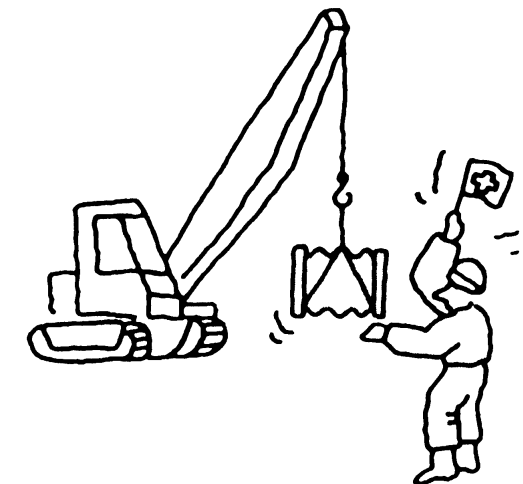
(JIS B1180: Metric Coarse Screw Thread)

Nominal Dia. (mm)	Applicable Flange		Nominal Dia. (mm)	Applicable Flange	
	JIS 10K	JIS 20K		JIS 10K	JIS 20K
32	M16 x 90L	M16 x 90L	300	M22 x 120L	M24 x 150L
40	M16 x 90L	M16 x 90L	350	M22 x 130L	M30 x 150L
50	M16 x 90L	M16 x 90L	400	M24 x 140L	M30 x 170L
65	M16 x 90L	M16 x 100L	450	M24 x 140L	M30 x 180L
80	M16 x 90L	M20 x 100L	500	M24 x 140L	M30 x 180L
100	M16 x 90L	M20 x 110L	600	M30 x 160L	M36 x 200L
125	M20 x 100L	M22 x 110L	700	M30 x 160L	—
150	M20 x 110L	M22 x 130L	800	M30 x 170L	—
200	M20 x 110L	M22 x 130L	900	M30 x 170L	—
250	M22 x 110L	M24 x 140L			

The material of counter flange will be SS400.

■ Notes of Transportation

1. Use a cloth lifting device (nylon sling) always in lifting and hanging during transportation.
2. The body is made of rubber. Do not transfer the products with a hook, steel pipe and fork of fork lift truck.
3. Do not give a big shock to the products. Do not roll over the products on the gravel, uneven surface, etc.

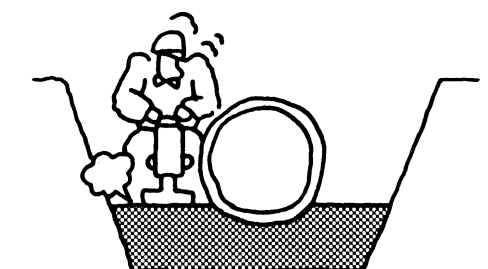


■ Notes of Re-burying

1. When re-burying, do not use soil including debris, macadam, wood chips, etc.
2. Bury the products in the ground pressing tightly soil and sand for re-burying every 30 cm depth. Do not bury the products at one effort up to the re-burying ground.
3. If soil pressing is not enough, the products may be loaded with excessive displacement than allowance in early stage. When insufficient soil pressing is anticipated,

calculate the design movements including subsidence after installation.

4. Pay attention not to damage the products when soil pressing.



HANDLING MANUAL

■Notes of Use

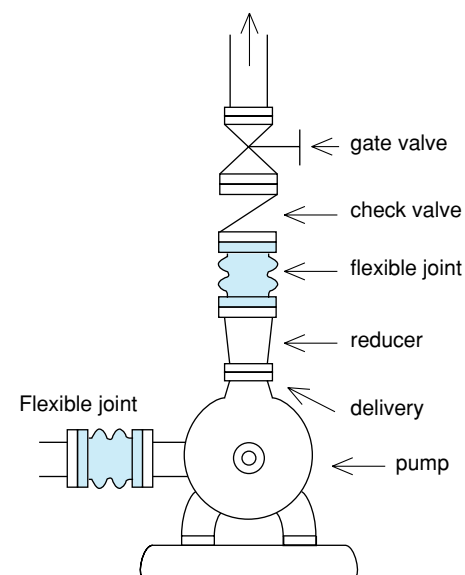
1. Damage of Body
Please check existence of damage on the body before use. If any damage are found out especially on the packing area, inner rubber, etc. do not use the products.
2. Operating Conditions
Please use the products checking max. working pressure and temperature to be within the working conditions.
3. Valve Position Checking
The products might be damaged by improper operation like complete shut-off operation, etc.
Please check the valve position of 'Open-Close' securely when operation.
4. Valve Operation
Please operate the valve not to flow liquid suddenly.
5. Flow Velocity through Pipe
Please use the products in less than 3 m/sec. of flow velocity through the pipe.
6. Adhesion
Please pay attention not to adhere oils and fats, organic solvent (thinner, toluene, etc), acid, alkali, etc. to the products. If adhered, wipe off at once.

■Notes of Storage

1. Pay attention to protect the products from damage during transportation and storage.
If damaged, do not use the products.
2. In case of storage for a long time, avoid the direct rays of the sun and store the products in the cool and dark place.
3. Do not leave the products in the place in more than 40°C and excessive moisture for a long time.
4. Protect the products from fire and heat.
5. Do not load to the products.

■Notes of Installation

1. In case of the products in displacement, pay attention to the products not to touch the structure and/or equipment (especially sharp edge).
2. Measure and make alignment accurately not for unnecessary outer force (compression, tension, torsion, etc.) to add when the products are connected to the pipe.
3. When welding or cutting the pipe nearby after installation, protect the products with cover like our SPARK-GUARD from sparks.
In case heat transmission is anticipated, take some measure like taking off the products from the pipe, etc.
4. When installation to the outdoor pipe, make lagging to the products to prevent the rubber body ageing.
5. In case the products are used to the pump for the purpose of vibration isolation, refer to the followings for installation.



ANCHORING AND GUIDING THE PIPING SYSTEM

Pipe connectors can only be effective if correctly installed. Special attention must be paid to anchor points due to the force imposed by internal pressure.
The proper location of rubber expansion joints is close to a main anchoring point.
Following the joint in the line, a pipe guide or guides should be installed to keep the pipe in line and prevent undue displacement of the line. It is a simple application of a joint to absorb the elongation and compression of a pipeline between fixed anchor points.

■Anchor Installation

When a rubber expansion joint is used, anchors (fixing points) with sufficient strength are required.
The installation locations and types of anchors are as follows.

■Intermediate Anchor (Intermediate Fixing Point)

Intermediate section of each rubber expansion joint, when 2 or more rubber expansion joints are used between the main anchors.
Anchor base (installation leg) section of duplex type expansion joint

■Main Anchor (Main Fixing Point)

You will notice that in all cases solid anchoring is provided at the following locations.

- End section of straight piping installed with a closed plate
- Bending section where flow direction changes
- Between 2 expansion joints whose piping diameters differ due to the use of a reducer
- Section with a valve installed at the piping section between 2 expansion joints
- Inlet section of branch piping with unrestricted expansion joint

■Calculation of Thrust

When rubber expansion joints are installed in the pipeline, the static portion of the thrust is calculated as a product of the area of the I.D. of the arch of the rubber expansion joint times the max. pressure (design or test) that will occur with the line. The result is a force expressed in kgf.

$$T = \frac{\pi}{4} (D)^2 (P)$$

T = Thrust (kgf)

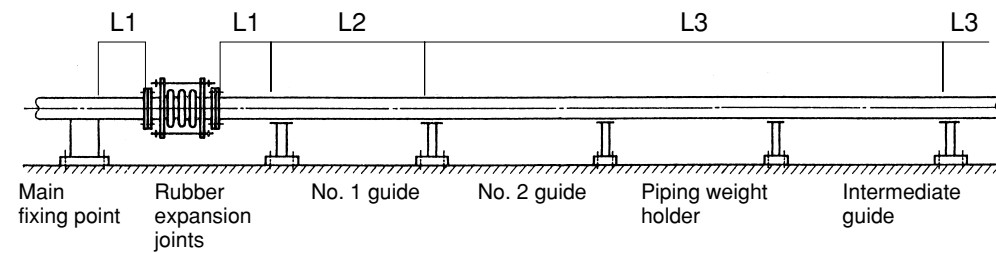
P = kgf/cm²

D = Arch I.D. (mm)

ANCHORING AND GUIDING THE PIPING SYSTEM

Installation of Guides

In order for a rubber expansion joint correctly elongation and compression, guides are required for the alignment of the expansion joint with the pipe and also for the natural transmission of a force required for the movement in the axial direction to those guides. Install each guide at the following intervals.



L1 = Distance between rubber expansion joint and first No. 1 guide

L2 = Distance between No. 1 guide and No. 2 guide

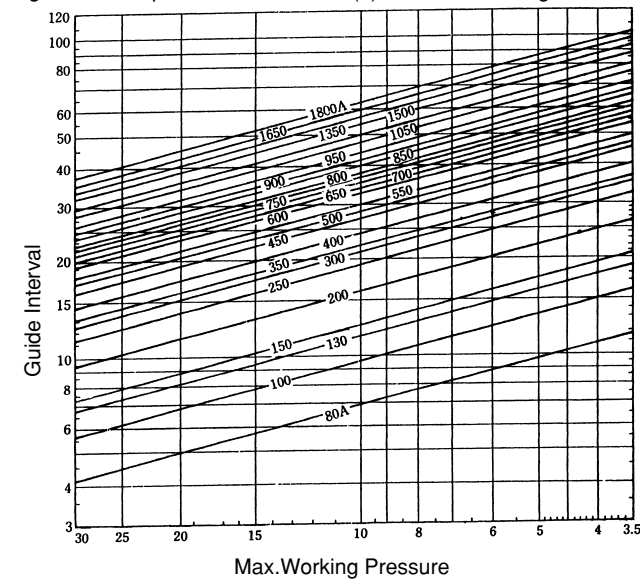
L3 = Distance between No. 2 guide and intermediate guide

Obtain the max. installation interval of each guide from the following equation. In addition, the intermediate guide interval L3 can be obtained from the following figure of relationship with guide interval (L) and max. working pressure.

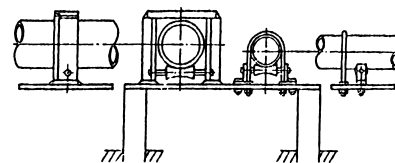
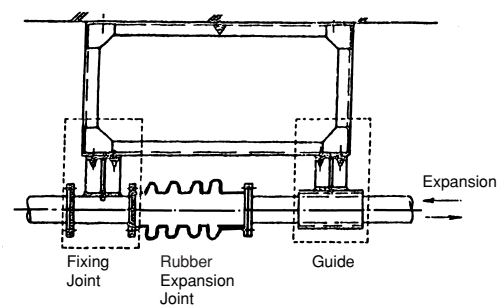
$$L1 \leq 4D \quad L2 \leq 14D$$

D = Outer Pipe Diameter (mm)

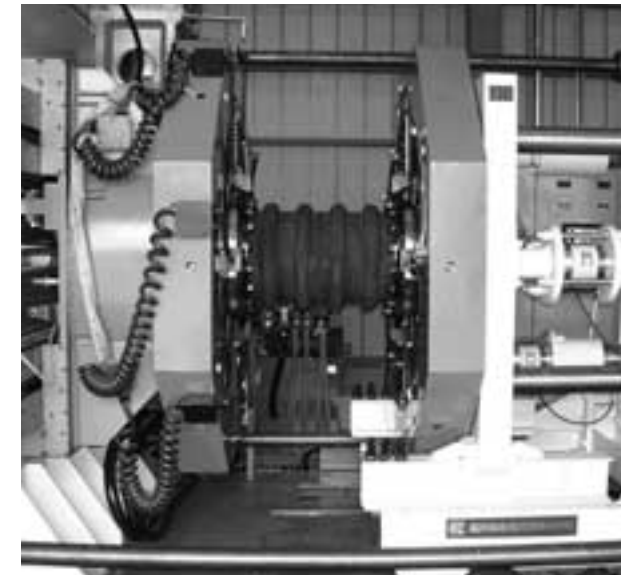
Fig. Relationship with Guide Interval (L) and Max. Working Pressure



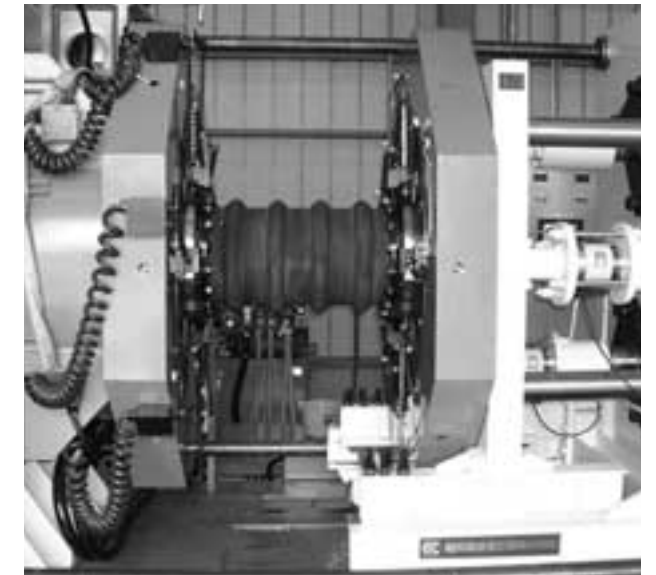
Example of Guide



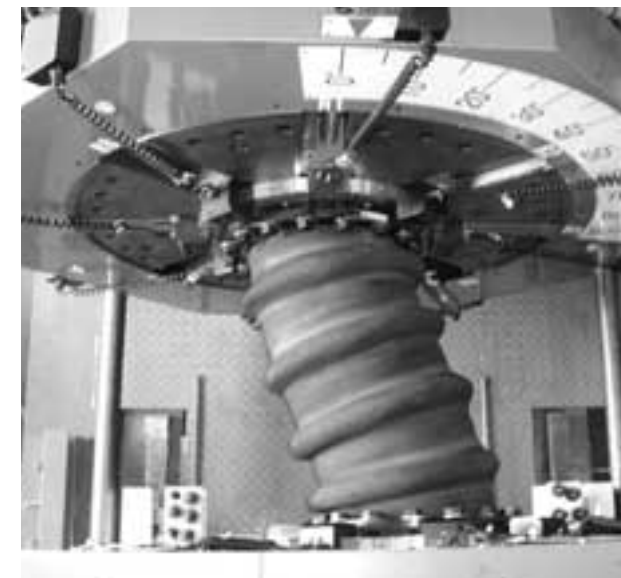
TESTING EQUIPMENT



1 Absorption of: Axial Compression



2 Absorption of: Axial Elongation



3 Absorption of: Lateral Movement



4 Pressure Resistance

Customer					
Project Name					
Size	Nominal Diameter	()A			
	No. of Arch	()			
	Overall Length	()mm			
Application		☐ Aboveground ☐ Underground			
End Connection	Flange	Standard	☐ JIS ()K ☐ BS4504 PN() ☐ ANSI ()# ☐ DIN PN ()		
		Material	☐ SS400 ☐ SS304 ☐ Others ☐		
		Finish	☐ Unichrome ☐ H.D.Galv. ☐ Tar Epoxy ☐ Others		
	Others	☐ Socket ☐ Bevel End ☐ Others ☐			
Filled Arch		☐ Yes ☐ No ☐ ☐			
Control Unit		☐ Yes ☐ No ☐ ☐			
Movement	Lateral	☐ 20mm ☐ 50mm ☐ 100mm ☐ 200mm ☐ 300mm ☐ 400mm ☐ Others ()mm			
	Elongation	()mm			
	Compression	()mm			
Medium					
Pressure	Normal ()	☐ MPa ☐ Kg/cm ² ☐ Bar ☐ psi. ☐ mmHg ☐ mmAq			
	Max. ()	☐ MPa ☐ Kg/cm ² ☐ Bar ☐ psi. ☐ mmHg ☐ mmAq			
Temperature	Normal ()	☐ °C ☐ °F			
	Max. ()	☐ °C ☐ °F			
Quantity		() pcs.			
Drawing		☐ Yes () copies ☐ No			
Required Inspection					
Delivery		() days after receipt of order			
Remarks					



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AGENT

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