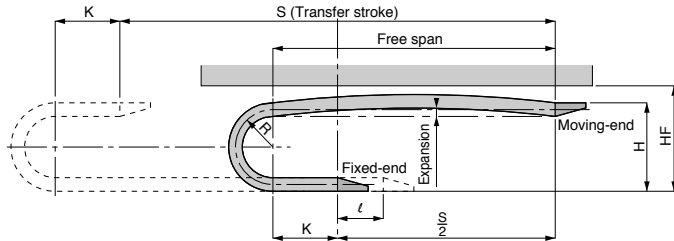


# Plarailchain HPE

## Characteristics

- The holding space comprises two halves, each of which has its own flaps. Accordingly, the cables can be divided by the type, and the flaps of only one side can be opened for replacement of cables there.
  - Plarailchain material: Nylon 6 + Glass 20%
  - Bracket material: SPC+Unichrome plating

## Calculation of Number of Links



\*1. HF in the chart above is the height which Plarailchain is able to pass through using under the length of free span with allowable expansion without load such as cables, hoses, etc.  
 \*2. Please make inquiries for special travel conditions.

Series	R		H		HF		K		a	
	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch
HPE408, 412	50	50	140	5.51	180	7.08			257.0	10.12
	75	75	190	7.48	230	9.05			385.0	15.15
	100	100	240	9.45	280	11.02	50	1.97	414.0	16.30
	150	150	340	13.38	380	14.96			571.0	22.47
	200	200	440	17.32	480	18.89			728.0	28.65

Number of links is to be calculated by the following equation:

$$n = \frac{\frac{S}{2} + a + \ell}{P}$$

n: Number of links (Figures below decimal point are raised to one positive number)  
 S: Transfer stroke (mm or inch)  
 a:  $\pi R + 2K$  (R: Bending radius (mm or inch), K: Play (mm or inch))  
 $\ell$ : Distance from intermediate point (mm or inch) when the fixed-end is not in the middle of transfer stroke (when the transfer stroke is in the intermediate point : 0)  
 P: Pitch (mm or inch)

<Note>  
 Setting fixed-end in the intermediate point of transfer stroke minimizes required number of Plarailchain.

## Specifications

Model	408		412	
Max. transfer stroke	m	1.9	m	1.9
	ft	6.23	ft	6.23
Max. contents weight	kg/m	2.5	kg/m	2.5
	lb./ft	1.68	lb./ft	1.68
Max. transfer speed	2.50m/sec. or 8.20ft/sec.			
Plarailchain weight	kg/m	1.1	kg/m	1.3
	lb./ft	0.74	lb./ft	0.87
Plarailchain material	Nylon 6 (glass 20%)			
Bracket material	SPCC with chrome plating (RoHS compliance)			
Service temp. range	14 ~ 176°F / -10 ~ 80°C			
Operating environment	Avoid using in acid/alkaline atmosphere or in hot water			

## Model Designation (Example)

HPE **408** - **R75**  
 (1) (2)

(1) Size (Overall dimensions: H x W)

Code	408	412
mm	40x78	40x117
in.	1.57x3.07	1.57x4.61

(2) Bending radius

Code	R30	R45	R50	R60	R90
408	○	○	○	○	○
412	○	○	○	○	○

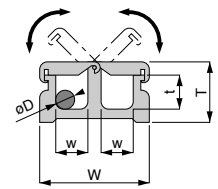
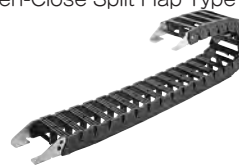
\* Two kinds of brackets, one for fixed-end and the other for moving-end, are required. Select a designation code for the bracket on right.

► In case of ordering, please apply Model code in the following chart.

## Detailed Safety Instructions

Before using the PISCO device, be sure to read the "Safety Instructions", "Common Safety Instructions for Products Listed in This Manual" on page 13 to 15 and "Common Safety Instructions for Plarailchain" on page 288.

## HPE Open-Close Split Flap Type



Model	No. of links		Pitch		W		T		w		t		oD (max.)		Free span	
	/m	/ft.	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	m	ft.
HPE408-R50																
HPE408-R75																
HPE408-R100	23	7	45	1.77	78	3.07	40	1.57	24.5	0.96	24	0.94	20	0.79	1.0	3.28
HPE408-R150																
HPE408-R200																
HPE412-R50																
HPE412-R75																
HPE412-R100	23	7	45	1.77	117	4.61	40	1.57	44	1.73	24	0.94	20	0.79	1.0	3.28
HPE412-R150																
HPE412-R200																

### Cautions

- \*1. Free span is the maximum length that Plarailchain can travel horizontally.
- \*2. The metal brackets must be ordered separately. (See below)
- \*3. Build-to-order production



The products listed in this page are ECO-friendly products.  
 \* Please refer to page 4 for the details of ECO-friendly products.

## Metal Brackets for Attachment of Plarailchain

Use	For moving-end			
Bracket type	Hole type (for moving-end)			
Screwing position	Inside	Outside	Inside	Outside
Orientation	Outer periphery fix	Inner periphery fix	Outer periphery fix	Inner periphery fix
Type	Model	Model	Model	Model
HPM408	E4-MAO	E4-MAI	E4-MAO	E4-MAI
HPM412				
Use	For fixed-end			
Bracket type	Pivot type (for fixed-end)			
Screwing position	Inside	Outside	Inside	Outside
Orientation	Outer periphery fix	Inner periphery fix	Outer periphery fix	Inner periphery fix
Type	Model	Model	Model	Model
HPM408	E4-FAO	E4-FAI	E4-FBO	E4-FBI
HPM412				



Caution  
 \* Select best-suited bracket for your application from above selection. Moving-end (the hole type) and fixed-end (the pivot type) must be ordered separately when you need them both.



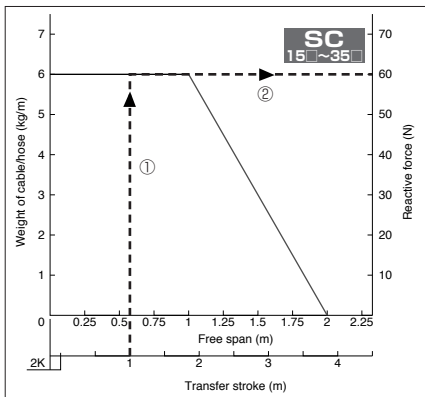
# Common Safety Instructions for Plarailchain

Be sure to read the following instructions before selecting and using the PISCO devices. Also read the detailed instructions for individual series.

Warnings: 1. Never step on Plarailchain. Otherwise the chain may break and you will fall down.

2. When connecting, opening, closing, or carrying out maintenance and checks, hold the Plarailchain motionless. otherwise the Plarailchain may run or fall under its own weight, thus doing injuries to you.
3. Pay attention to the flexing areas of the Plarailchain. You can get injured with your hand caught in the flexing area.
4. Before conducting maintenance or checks of Plarailchain, be sure to turn off power supply to the equipment for your safety.
5. The Plarailchain should only be used within stated specifications and conditions.
6. Never perform disassembly or remodeling that can affect the basic structure, performance or function of the equipment.
7. Please tighten it surely so that a fitting does not loosen. There is danger to cause the damage of the whole system when the slack occurs.
8. An inertial force, mass load, and reactive force (the force that Plarailchain is going to lug out) are added to the mount of the Plarailchain depending on the specification of the system. When designing the mount, please secure sufficient strength. There is danger to cause the damage of the whole system when the strength of the mount is not enough.

In addition, the reactive force can be obtained from the capability diagram of each Plarailchain.



- ① By the capability diagram of the target model, straight up at the transfer stroke value. (as for left diagram, it is the case when the transfer stroke value of the system is 1m.)
- ② From the crossing point with the capability curve, tracing it to the direction of reactive force axis. Intersected value becomes the maximum reactive force. (in the case of the left graph, the value is 60N.)

9. When attaching/detaching caps of SP series, please pay attention not to injure your hands by a screwdriver.

Cautions: 1. Please check "Plarailchain capability diagrams" well and please choose the most suitable Plarailchain. In addition, please use it after testing it because various factors influence on actual usage.

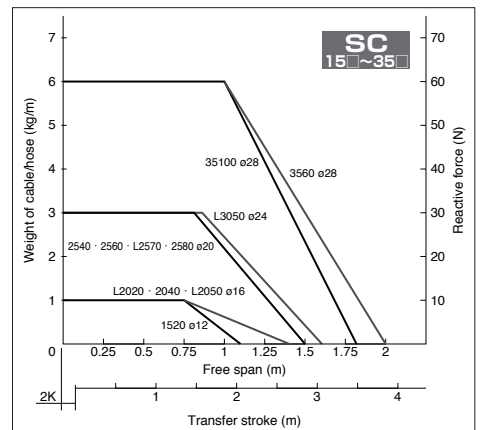
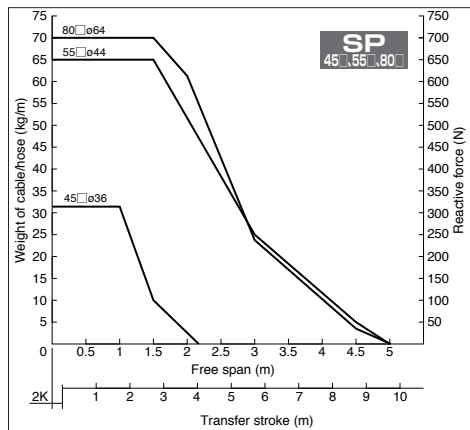
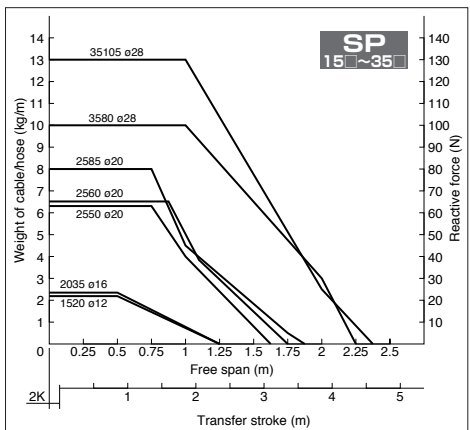
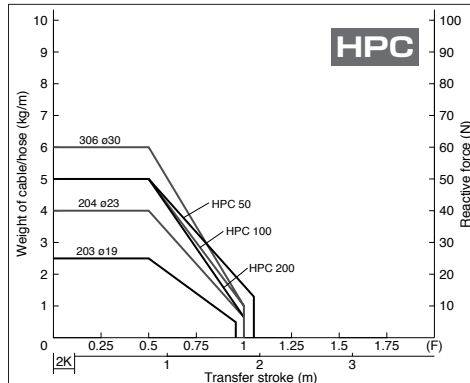
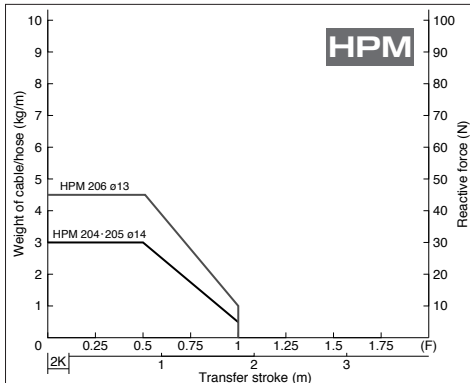
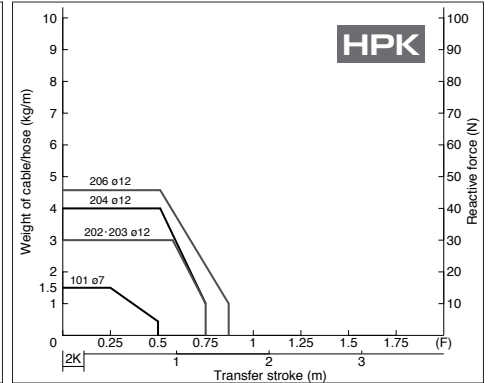
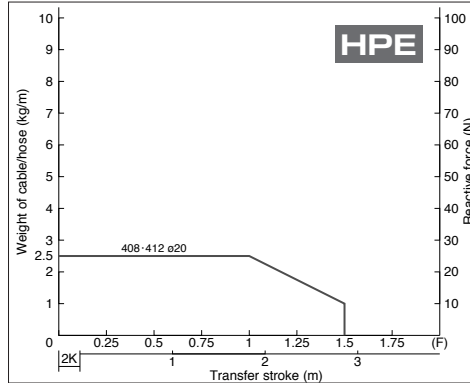
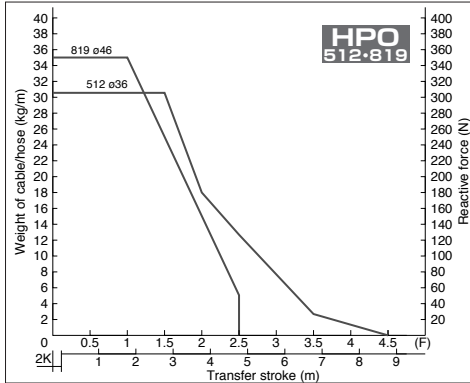
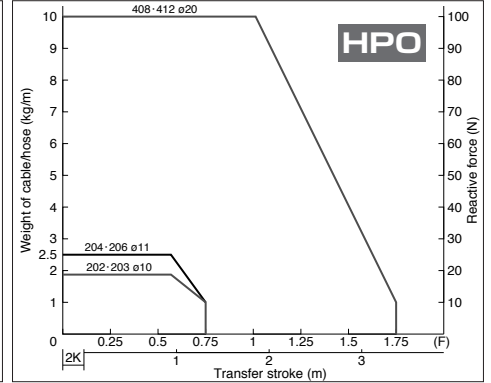
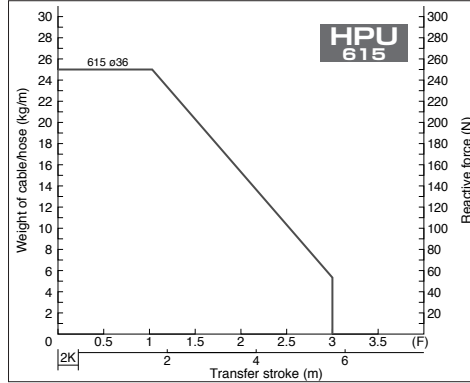
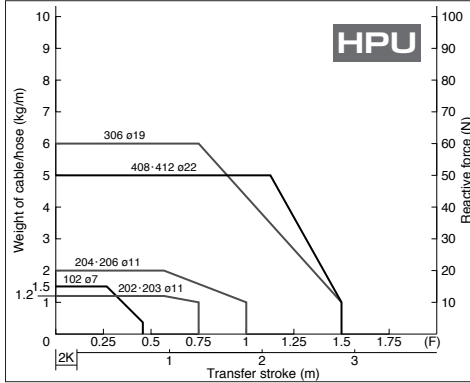
2. The Plarailchain lugs out without contents because it is designed to prevent growing down when contents is filled.
3. The length of Plarailchain can be adjusted by increasing and decreasing. When designing or length adjustment is necessary, please calculate the number of the necessary links with confirming the link calculating formula in this catalogue.
4. When installing Plarailchain on equipment, please attach the brackets of moving end and fixed end in parallel along the traveling axis. In addition, it becomes the cause of damaging the whole system when the twisting movement is involved.
5. Cables and hoses to be stored must be flexible and wear-resistant. Do not use wire-braided ones, which are prone to damage.
6. When weight of cable and hose is heavy, and transfer speed or acceleration is fast, around the bending position may lug out by inertia at start or right after stop. When designing the system, please secure enough HF dimensions.
7. For use under special circumstances, contact our nearest sales office.
8. The total volume of contents (tube, hose or cable) to be fitted into Plarailchain should be arranged not to exceed 60% (70% for SP and SC type) of its inside capacity of each model.
9. Contents should be lined up without crossing each other when they are stored into Plarailchain.
10. Contents should be stored well balanced in right, left, up, and down.
11. Avoid applying excessive forces to Metal Brackets.
12. In case of different contents such as air tubes, water tubes, cables, and/or etc. are stored into the same body, please select bending radius of Plarailchain according to the largest bending radius among the contents.

## Capability Diagram

When total weight and max. diameter of cable hose, and transfer stroke are decided, please select a best suitable Parailchain from the following capability diagram. The bending radius of Parailchain must be larger than the one of cable/hose.

### Remarks

1. F = Free span = Length can be travelled horizontally
2. The diagram is a case when fixed-end is set to the center of transfer stroke.
3.  $\phi$ : Maximum diameter of cable or hose to be stored.



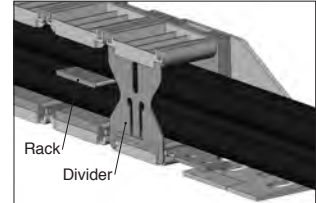


# ! Safety Instructions for fixing storage items (tubings/ cables)

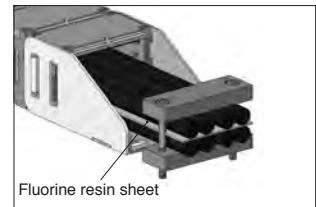
□ This instruction is only examples to decrease the wear and tear of tubings/ cables inside the Plarailchain, but do not guarantee the effect for all types. As such, please conduct test use before actual operation.

## 1. Storage of tubings/cables

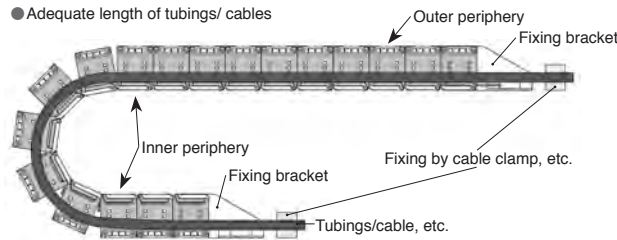
1. Please select tubings/cables with less than the minimum-bending radius of plarailchain. In addition, please fix crook of tubings/ cables before installing in Plarailchain.
2. When plenty of tubings/cables are installed, please use "divider" or "rack" inside in order to avoid spiral twist of the contents.



3. Other than partition by divider or rack, partition by a sheet with low surface sliding resistance such as fluorine resin sheet or equivalent can be possible. The sheet with 0.3-0.5mm thickness is recommended. Thinner sheet might stretch and resulting wavelike block, bending, overlapping, tear, and unnecessary load to storage items, which possibly cause troubles. Furthermore, when the sheet is too thick or the sheet tension is stronger than storage items, they might rub them unnecessary against inner wall of Plarailchain and cause early wear and tear.

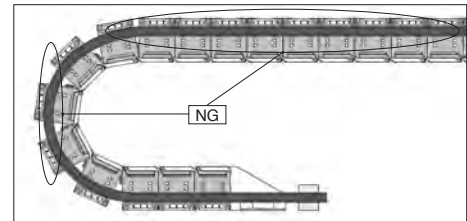


4. Please maintain adequate length of tubings/cables so as not to be overloaded inside Plarailchain.



### ① Troubles caused by too long tubings/cables

- Abrasion (wire disconnection, etc.) by excessive contact with inside outer periphery wall of Plarailchain.
- Entanglement of Tubings/cables
- Protrusion of tubings/ cables from the clearance between flaps of Plarailchain.



### ② Troubles caused by too short tubings/cables

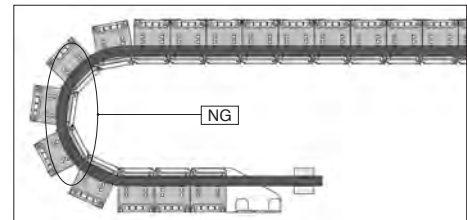
- Abrasion (wire disconnection, etc.) by excessive contact with inside inner periphery wall of Plarailchain.

#### Countermeasure ①

After storing tubings/cables at the stroke end condition in the installed device, please make sure that they are not too long or too short in the range of full transfer stroke

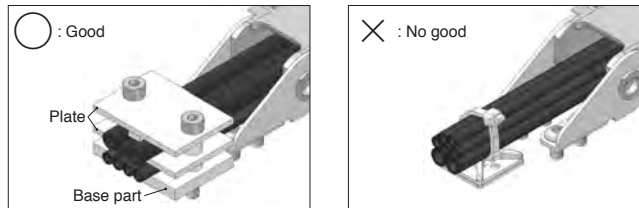
#### Countermeasure ②

To get a rough idea, fix tubings/ cables by a cable clamp, etc. at one side of fixing bracket, and then pull them lightly at the other side to check if there is no loosening condition (Tubings/cables touch to inner wall of Plarailchain). From that position, loosen tubings/cables about 5mm~10mm (0.197~0.394in.) and fix them by cable clamps, etc., which realizes approximate adequate length. However, there are exceptions depending on the types of tubings/cables.

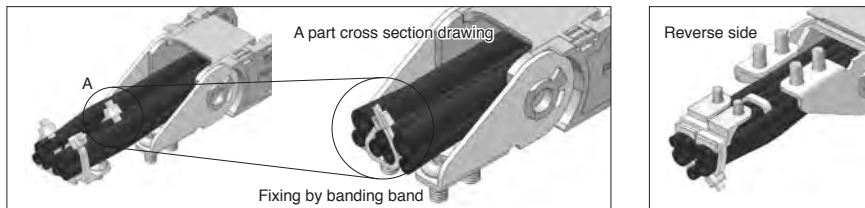


## 2. Fixing of tubings/cables

1. Please fix tubings/cables as close as possible to the fixing bracket at both ends. Fixing far apart from the bracket causes looseness of the tubings/ cables.
2. Applying metal or resin plates with large surface friction resistance as fixture is acceptable. Tuck tubings/cables between base part and plate as shown below.  
Note) When a number of tubings/cables are fixed by a banding band together as shown below, some of them might not be touched and fixed by the band and causes loosening.



3. When a number of tubings/cables are fixed by banding band, please fix them one by one. If it is not possible due to space shortage, try to make a bundle of few tubings/cables.



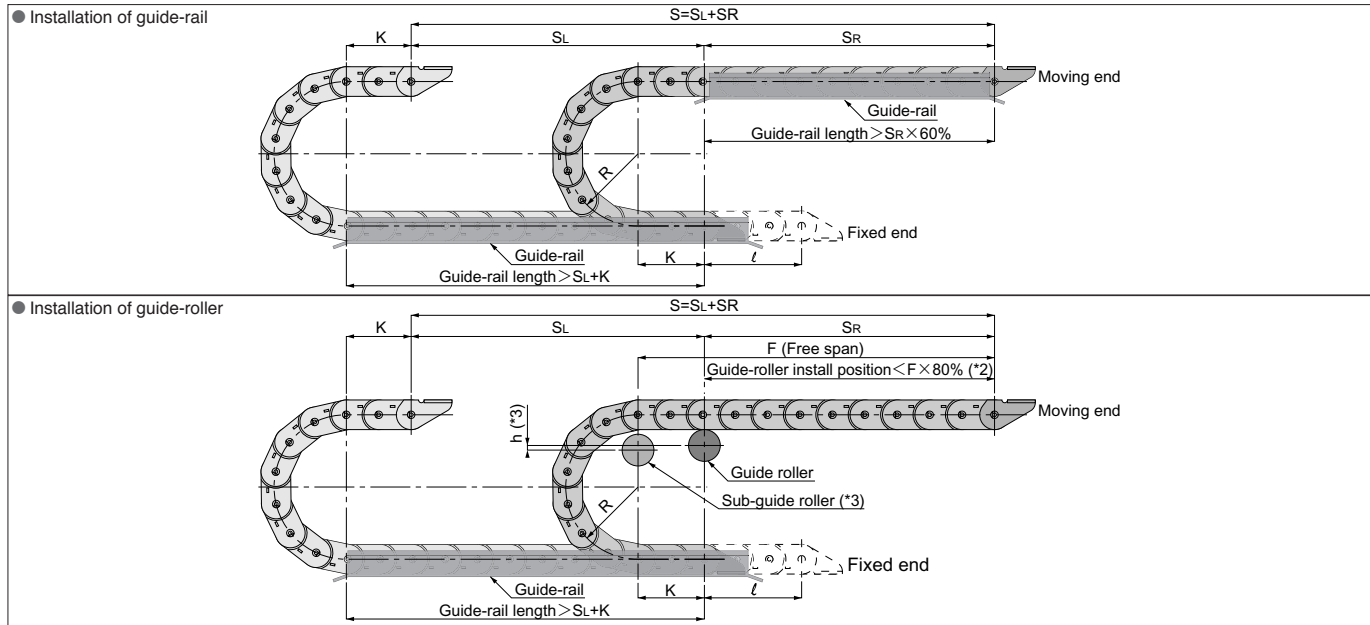


# ! Safety Instructions for safety device (guide-rail) installation

□ When Parailchain is used in long stroke or for long time even within the acceptable value of the free-span, the installation of safety device such as guide-rail can prevent sagging or loosening of Parailchain. (However, the moving speed and acceleration speed are limited by the installation.) Moreover, since the following instruction is only rough indication, please contact PISCO for details.

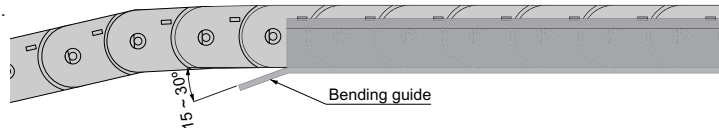
## 1. Installation of guide-rail and guide-roller

\* Do not use guide-roller for the application of more than 1m/s moving speed. Please consider guide-rail installation instead.



- S: Transfer stroke
- SL: S/2 (When fixed end is located in the middle of transfer stroke)
- SR: S/2 (When fixed end is located in the middle of transfer stroke)
- K: Required minimum allowance length (Refer to page ???)
- t: Distance from middle point when fixed end is not located in the middle of transfer stroke

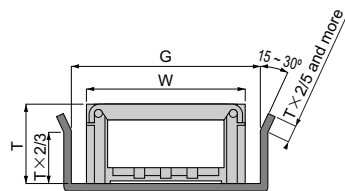
\*1. Please create bending guide and avoid edge shape at the end of guide-rail.



\*2. Multiple guide-rollers are required for the application using more than allowable free-span value. In this case, please contact PISCO.

\*3. We recommend installing sub-guide-roller in order to put Parailchains smoothly on the guide-roller when the moving end moves from SL side to SR side. Since the install dimension differs by specification, please contact PISCO.

## 2. Rough dimensions for guide-rail design



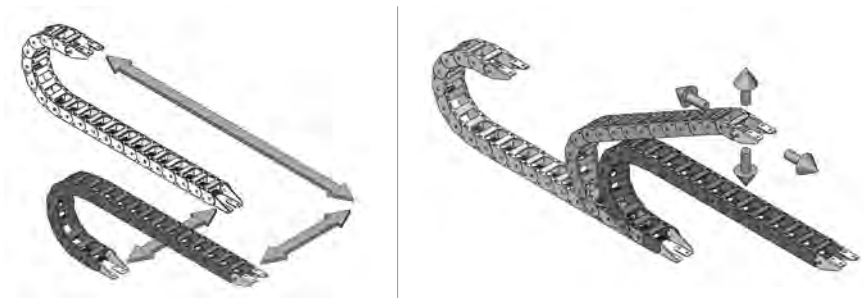
1. Estimation of G dimension

- $W < 100\text{mm}$   
 $G = W + 5 \sim 10\text{mm}$
- $W > 100\text{mm}$   
 $G = W + 15 \sim 20\text{mm}$

\* As above dimensions are only rough and they differ by the specification, please contact PISCO for details.

### 3. Operation of multiple movements

When biaxial running or multiple movements are operated as shown below, please confirm the specification and contact PISCO.



### 4. Other safety instructions for long stroke and multiple movements operation

1. Using safety devices such as guide-rail or guide-roller cause abrasion where the devices and Plarailchain contact. As such, please apply material made of low surface sliding resistance for the safety devices.  
Taping low friction sheet (such as super-high-molecular polyethylene sheet) to the all-contact face reduces the dust from abrasion and longer operating life is expected.
2. As for long stroke, Plarailchain is affected by the cables, etc. inside and might cause twist. Therefore, please insert cables with no winding or twisting.
3. The cables inside are easy to tangle for long stroke use. As such, please use divider or rack to divide room inside in order to avoid spiral twist of tubings/cables.
4. Long stroke or multiple movement operation cause accident such as protrusion of cables from middle part of Plarailchain due to pull-in effect. In order to prevent this, please fix cables firmly at the outlet of Plarailchain.
5. In the case of special operations, installation of safety device such as guide-rail may differ depending on the specification, please contact PISCO for details.



## Safety Instructions

- This Safety Instructions aim to prevent injuries to human bodies and damage to properties by requiring proper use of PISCO devices.


Also the relevant requirements of ISO 4414 and JIS B8370 must be observed.

ISO 4414: Pneumatic fluid power ... Recommendations for the application of equipment to transmission and control systems.

JIS B 8370: General standards for pneumatic systems

Safety instructions are classified into "Danger", "Warning" and "Caution", depending on the degree of danger or damage involved when the safety instructions are not complied with in handling the equipment.

 **Danger** : Failure to heed the warning of apparent danger may result in death or serious injuries.

 **Warning** : Failure to heed the warning of conditionally dangerous situations may result in death or serious injuries.

 **Caution** : Failure to heed the warning of conditionally dangerous situations may result in minor or not too serious injuries or damage to properties.

 **Warning** : 1. Make a selection of pneumatic equipment.

(1) Well knowledgeable and experienced persons such as a pneumatic system designer or who is in charge of deciding specification should select pneumatic equipment.

(2) The applicable conditions of the products in this catalogue are diverse. Therefore, judge the conformity of systems with required analysis or tests by system designers or persons who is in charge of deciding specifications. The guarantee of initial performance and safety of the system is on responsibility of the person who decides specifications. Hereafter, examine all the specification with updated products catalogues and technical documents in order to avoid malfunctions of equipment, and then develop systems.

2. Handle pneumatic equipment with enough knowledge and experience.

(1) Mishandling of compressed air is dangerous. Conduct assembly, operation and maintenance of devices with pneumatic equipment by persons with enough knowledge and experience.

3. Do not operate and remove the equipment until safety is confirmed.

(1) Conduct inspection and maintenance of equipment after confirming fail-proof measures of work pieces or runaway-proof device are properly working.

(2) When removing equipment, make sure that above safety measures are conducted. Then, stop air supply and electric source of equipment making sure the pressure inside the system is zero before removing equipment.

(3) When re-activate equipment, make sure safety measures against fly-out are taken and re-activate equipment with care.

\* Safety Instructions are subject to change without advance notice.





# Common Safety Instructions for Products Listed in This Manual

□ PISCO products are designed and manufactured for use with general industrial machinery and equipment. Therefore be sure to observe the following safety instructions:

△ Danger : 1. Do not use PISCO devices with the following equipment:

- (1) Equipment used for the sustenance or control of people's health or lives
- (2) Equipment used for the movement or transport of people
- (3) Equipment used specifically to ensure safety

△ Warning : 1. Avoid the following uses for PISCO devices:

- (1) Use under conditions not specified for the device
- (2) Use in any outdoor environment
- (3) Use in locations where the device is exposed to excessive vibration or shocks
- (4) Use in locations where the device is exposed to any corrosive gas, inflammable gas, chemicals, seawater, or vapor.

\* Certain PISCO devices, however, can be used in environments as described above. Therefore check on the specifications for the use of individual devices.

- 2. Do not disassemble or remodel the PISCO devices in such a way as may affect the basic structure, performance or function of them.
- 3. Never touch the release ring of the Quick-Fitting Joint when there is pressure working on it. Touching may release the ring, which in turn may cause the tube to fall out.
- 4. Avoid too frequent switching of air pressure. Otherwise the device body may heat up to cause burns on you.
- 5. Do not allow tension, twist or bending forces to act on the joints. Undue forces may damage the joint body.
- 6. For applications in which the threaded side or the tube connection side is subject to vibration, use Rotary Joints, High Rotary Joints or Multi-Circuit Rotary Blocks only. Swinging or rotation may damage the joint body.
- 7. For applications with hot water of 60°C (140°F) or above or thermal oil, use no other joints than Die Temperature Control Fitting, Tube Fitting Stainless SUS316, Tube Fitting Stainless SUS316 Compression Fitting, and All Brass Compression Fitting. Heat or hydrolysis may damage the joint body.
- 8. For applications in which the scattering of static electricity or charging must be prevented, use no other joints than EG Joints. Static electricity may cause system malfunction or trouble.
- 9. Never use joint other than Tube Fitting Spatter or Tube Fitting Brass where they are exposed to spatter. Otherwise can cause fire.
- 10. Carry out maintenance and checks of equipment only after turning power off, shutting fluid off and making certain that the pressure in the piping has dropped to zero. Please conduct maintenance after confirming following points.
  - (1) Make sure that maintenance is safe for all the systems involving PISCO products.
  - (2) When re-activate equipment after maintenance, make sure safety measures against fly-out are taken and re-activate equipment with care.
  - (3) Please secure space for maintenance when the circuit is designed.
- 11. When the fluid is admitted to the equipment and if there is a possibility to cause damage to it due to leakage, conduct safety measures such as protect cover beforehand.

△ Caution : 1. In installing the piping, be sure to remove dust or drainage from within the piping. Dust or drainage left unremoved may enter other equipment, thus causing troubles.

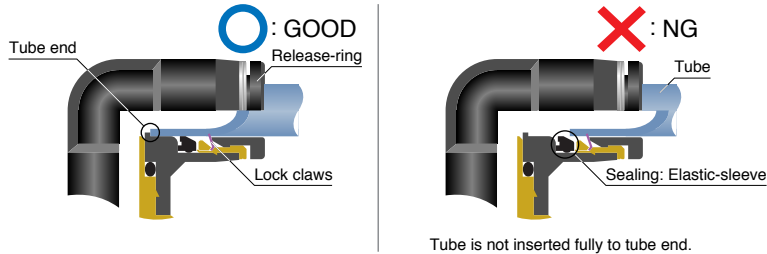
- 2. When using an ultrasoft tube to connect to a Quick-Fitting Joint, be sure to use an insert ring in the bore of the tube. Otherwise the tube may fall out to cause leakage.
- 3. When you use tubes of brands other than ours, be sure to confirm that the outside diameter of the tubes satisfies the tolerance specified Table 1.

Table 1. Tube O.D. Tolerance

mm size	Nylon tube	Urethane tube	inch size	Nylon tube	Urethane tube
ø1.8mm	—	±0.05mm	ø <sup>1</sup> / <sub>8</sub>	±0.0039in.	±0.0059in.
ø3mm	—	±0.15mm	ø <sup>5</sup> / <sub>32</sub>	+0.0039in.	±0.0059in.
ø4mm	±0.1mm	±0.15mm	ø <sup>3</sup> / <sub>16</sub>	±0.0039in.	±0.0059in.
ø6mm	±0.1mm	±0.15mm	ø <sup>1</sup> / <sub>4</sub>	±0.0039in.	±0.0059in.
ø8mm	±0.1mm	±0.15mm	ø <sup>5</sup> / <sub>16</sub>	+0.0039in.	±0.0059in.
ø10mm	±0.1mm	±0.15mm	ø <sup>3</sup> / <sub>8</sub>	±0.0039in.	±0.0059in.
ø12mm	±0.1mm	±0.15mm	ø <sup>1</sup> / <sub>2</sub>	±0.0039in.	±0.0059in.
ø16mm	±0.1mm	±0.15mm	ø <sup>5</sup> / <sub>8</sub>	±0.0039in.	±0.0059in.

#### 4. Cautions on the fitting of tube

- (1) Make certain that the end of the tube is cut at right angles, the tube surface is free from flaws, and the tube is not deformed into an ellipse.
- (2) When fitting a tube, insert the tube to the tube end completely as drawings shown below to prevent leakage.



- (3) On completion of fitting, make certain that the tube does not come out at your pulling.

#### 5. Cautions on the release of tube

- (1) Before releasing the tube, make certain that the pressure inside the tube is zero.
- (2) Push the release ring fully inside and pull out the tube. Unless you push it completely in, the tube may not come out and scrapings of tube may be left inside the joint.

#### 6. Cautions on the installation of joint body

- (1) When installing the joint body, tighten it with a proper tool, using the outside or inside hexagon.
- (2) In tightening the screw, use the tightening torque recommended in Table 3.
  - Use of a torque higher than the recommended level may damage thread or deform gasket, thus causing leaks.
  - Use of a torque lower than the recommended level may cause loose screw and leakage.
- (3) With the joint whose piping direction will not change after tightening, make adjustment within the recommended range of tightening torques.

Table 3. Tightening Torque, Sealock Color and Gasket Material

Thread type	Thread size	Tightening torque	Sealock color	Gasket material
Metric thread	M3×0.5	0.7N·m (0.52lbf·ft)	n/a	SUS304, NBR
	M5×0.8	1.0 ~ 1.5N·m (0.74 ~ 1.11lbf·ft)		
	M6×1.0	2.0 ~ 2.7N·m (1.48 ~ 1.99lbf·ft)		
	M3×0.5	0.5 ~ 0.6N·m (0.37 ~ 0.44lbf·ft)	n/a	POM (Polyacetal)
	M5×0.8	1.0 ~ 1.5N·m (0.74 ~ 1.11lbf·ft)		
	M6×0.75	0.8 ~ 1.0N·m (0.59 ~ 0.74lbf·ft)		
Taper pipe thread	M8×0.75	1.0 ~ 2.0N·m (0.74 ~ 1.48lbf·ft)	White	n/a
	R1/8	7 ~ 9N·m (5.16 ~ 6.64lbf·ft)		
	R1/4	12 ~ 14N·m (8.85 ~ 10.33lbf·ft)		
	R3/8	22 ~ 24N·m (16.23 ~ 17.70lbf·ft)		
Unified thread	R1/2	28 ~ 30N·m (20.65 ~ 22.13lbf·ft)	n/a	SUS304, NBR
	No. 10-32UNF	1.0 ~ 1.5N·m (0.74 ~ 1.11lbf·ft)		
National Pipe Thread Taper (American standard)	1/16-28NPT	7 ~ 9N·m (5.16 ~ 6.64lbf·ft)	Gray	n/a
	1/8-27NPT	7 ~ 9N·m (5.16 ~ 6.64lbf·ft)		
	1/4-18NPT	12 ~ 14N·m (8.85 ~ 10.33lbf·ft)		
	3/8-18NPT	22 ~ 24N·m (16.23 ~ 17.70lbf·ft)		
	1/2-14NPT	28 ~ 30N·m (20.65 ~ 22.13lbf·ft)		

#### Recommended tightening torque for silencer

Thread Type	Thread Size	Tightening Torque
Metric thread	M5×0.8	1/6 turn after hand-tightening
	M6×1.0	
	M10×1.0	
Parallele pipe thread	G1/8	1/2 ~ 1 turn after hand-tightening
	G1/4	
	G3/8	
	G1/2	

#### 7. Cautions on the removal of joint body

- (1) When removing the joint body, loosen it with a proper tool, using the outside or inside hexagon.
- (2) Remove sealant sticking to the thread on the mating equipment. The sealant left sticking may enter the peripheral equipment and cause trouble.

#### 8. Clean-room package option

\* The product is washed by clean air after assembling in the normal assembly process as same condition as standard specification model. Then, it is packed in ISO class 6 clean-room.