

# Cautions

## Cautions for handling of chains and sprockets

Before handling chains and sprockets, please understand the respective structures and specifications correctly, and read the following cautions for using them safely.

### 1 Handling of chains and sprockets

#### For safe work



- Always wear clothes suitable for work and proper protection (safety glasses, safety shoes, etc.).
- In addition to site workers, other people near the work site are also required to be careful.
- Strictly observe Section 1 "General Standards" (prevention of danger by prime movers, revolution shafts, etc.), Chapter 1, Part 2 of Occupational Safety and Health Regulations.
- For working, keep things in order in and around the work site.
- Before installation, be sure to switch off the power.  
Before installing, removing, lubricating or otherwise servicing a chain and sprockets, be sure the main electric power switch and all secondary power switches of the equipment are turned off. Also, take precaution to ensure that power will not be switched on accidentally. Furthermore, exercise care to prevent clothing or any part of the body from being caught by a chain, sprocket or other part during work.
- When any lifting apparatus is used, never stand beneath it.

#### Handling

For handling (See P127 ~ 137 and P329 ~ 342.)

- For handling, follow the instructions in this catalog and in the instruction manual. Select, layout, install, adjust and maintain chains and sprockets in the way that is recommended to ensure a high-performance installation.
- When connecting a chain, employ an installation method suitable for the type of connecting link.
- For the layout, installation, adjustment and maintenance, observe both recommended equipment instructions and cautions.

#### Warning



- Do not partially replace a part of a chain. Do not partially exchange a worn or damaged chain and sprockets. Replacing only the worn or damaged part does not restore overall strength and risks further breaking or destruction. Always replace the entire chain and sprockets.
- Do not modify chains or sprockets. Most of the components of a chain are heat-treated. If they are reprocessed, strength is diminished and breaking or destruction can result.
- Electroplating may cause hydrogen embrittlement.
- Welding may lower the strength of chains and components due to a flaw or heat, and result in destruction.
- Annealing can lower the performance of products and components and may result in destruction.

### 2 Chain Installation

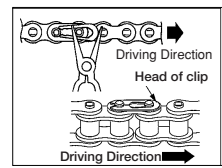
#### Connection

- (1) Before installation, please read the previous section (1).
- (2) Use connecting links and offset links as described below.

When installing a connecting link or offset link, confirm its construction. (P17)

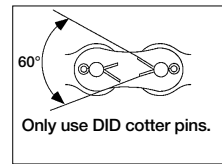
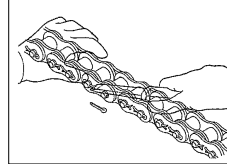
- For installing the clip on the connecting link, refer to the method illustrated below.

Chain clip installation method



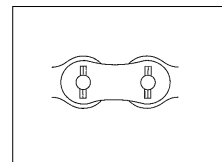
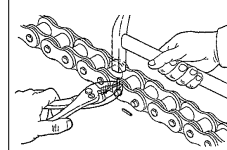
- For installing a cotter pin on the connecting link, refer to the method illustrated below.

Cotter pin installation method



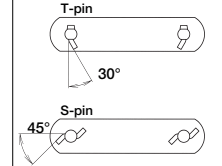
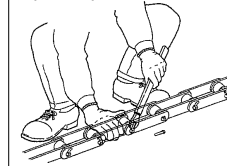
- For installing a spring pin, refer to the method illustrated below. Spring pins are used for interference-fitted connecting links used in DIDHI-PWR-S, HK and HI-PWR-SHK series (P50 ~ 59, P60 ~ 61, P62 ~ 63).

Spring pin installation method for HI-PWR-S series



- For installing a T-pin or S-pin, refer to the method illustrated below.

T-pin or S-pin installation method



- For installing a one-pitch offset link, follow the installation method for the cotter pin type connecting link, and for installing a two-pitch offset link, follow the installation method of the connecting link used.

For other special types of connecting links, please consult us.

**Warning**

- Do not attempt to modify any components. When assembling, never drill a hole on a connecting plate to make it larger and never file a pin to make it thinner for smooth insertion of the pin into the connecting plate.
- Do not use used chains. Do not reuse clips and do not install a used cotter pin, connecting link or any other component for a new chain.

**Adjustment**

- (3) For proper operation of a chain, install and adjust it correctly. (See P127 ~ 134 and P340 ~ 342.)

**Confirmation**

- (4) After installing a chain and sprockets, confirm the following before switching on the power:
- Is the connecting link correctly and securely connected?
  - Is the chain engaged with the teeth of the sprockets?
  - Is the amount of lubrication proper?
  - Is anything likely to cause interference or be scattered?
  - Is the safety cover correctly installed?
  - Is there anything interfering with the safety cover?
  - Whether or not there is anything interfering with the chain.
  - If there is anything abnormal about the connecting link portion, etc. and whether the respective components of the chain are flawed, rusty or abnormal in any other way.
  - Do not stay in the rotation direction of the chain.
- (5) If any abnormal noise is generated after switching on the power, switch off the power and re-confirm.

**Avoidance of Danger**

- Install a safety cover. For the apparatus with a chain and sprockets installed, be sure to install a safety cover. Any unexpected fracture may cause the chain to be thrown from the sprockets. In addition to a sufficient protector, install a stopping device such as an overload limit switch or brake so as not to cause overload.
- Check for chain interference. Any obstacle which interferes with a driven chain and sprockets is dangerous and shortens the life of the chain and sprockets. Always check for any interfering objects, and remove them.

## 3 Maintenance

To prevent any serious accident caused by a chain and sprockets, and to prolong the life of the chain and sprockets, take the following maintenance actions:

**Lubrication**

- (1) Lubrication (See P.132 ~ 134 and P.342.) Except for some chains of special materials or elements, most chain life can be prolonged with lubrication. A chain which requires lubrication will be shortened in life without lubrication. For example, chain elongation, corrosion and stiff joint occur due to wear of some chain parts.

**Washing**

- (2) Washing If a chain is used with a material such as sand or metallic powder, the promotion of wear, stiff joint, etc. will be caused, shortening life. Wash away such harmful materials.

For washing, dip the chain into kerosene, dry, and sufficiently lubricate. However, in the case of O-ring chain, since the O-ring may be deteriorated by kerosene, do not dip it for more than 10 minutes.

For washing, do not use an acid, alkali, gasoline or highly volatile solvent detrimental to the chain and sprockets. For an O-ring chain, do not use a wire brush.

**Adjustment**

- (3) Adjustment of tension and timing of exchange (See P130 ~ 131, P137 and P341 ~342.)

Chains and sprockets are consumable products.

The wear of a chain and sprockets causes sag on the chain. Periodically check the chain for sag, and adjust the tension to the optimum condition.

If a chain and sprockets show any rust or harmful flaw in appearance, or if the elongation of a chain or the wear of a sprocket becomes critical, immediately replace them.



- Do not use an offset link for lifting.
- Excessive oil on the chain will cause fouling by scattering. Wipe off extra oil to prevent it from scattering.
- For washing, do not use gasoline or highly volatile solvent. Furthermore, do not allow any material containing acid or alkali to come in contact with it.

## 4 Others

Even chains of the same kind and size have a different service life depending on the service environment, numbers of teeth of the sprockets, lubrication and other conditions. This also applies to the life of sprockets. Chains and sprockets are different in wear life. If a new chain is used on an old sprocket with worn teeth, failure or rupture of the chain may occur.

When a chain or sprocket must be replaced, replace both the chain and sprockets.

If anything remains unclear, please consult us.

## Cautions for using roller chains for lifting

Based on the "Chain Safety (Technical) Standards" and "End Fittings" proposed by Japan Chain Association to the Japan Parking System Manufacturers Association Incorporated and multilevel parking machine manufacturers in February and October, 1993, the cautions necessary for using roller chains (hereinafter called chains) for lifting are stated below.

### 1 Safety factor

The "Mechanical Parking Area Technical Standard" sets the safety factors of ropes and chains as "5 for system A", "7 for system B" and "10 for system C". However, if a chain is used at a safety factor of 5 in system A, the acting tension of the chain generally exceeds the Max. allowable tension of the chain. That is, repeated use causes the chain to rupture due to fatigue. Therefore, when a safety factor of 5 for system A is adopted, periodically replace the chain under strict life control.

### 2 Selection of chain

#### 2-1 Max. tension

The Max. tension allowed to apply to a chain is set at not higher than the value obtained by dividing the minimum tensile strength of the chain by a safety factor. However, be sure to examine the selecting methods recommended by us (See P120 and 121), and adopt a safer method.

The Max. tension corresponds to the "corrected chain tension" which includes dynamic load at starting and stopping in addition to offset load by a motor vehicle (difference in weight between front and rear wheels, horizontal shift of the motor vehicle in reference to a pallet, offset load due to the chain lifting position, etc.)

#### 2-2 Connecting link of chain

A general connecting link (R type and C type in this catalog) has pins clearance-fitted in the connecting plate holes.

The connecting link is lower in fatigue strength than the base chain. When a connecting link higher in fatigue strength is necessary, use a special connecting link with pins interference-fitted connecting plate holes (F type or H type in this catalog).

In this case do not use any offset link (OJ or 2POJ). As for the types of connecting links, see P16 ~ P17.

### 3 Connection between a chain and an end fitting

The connection between a chain and an end fitting (hereinafter called a fitting) is the section likely to cause troubles. For safety purposes, take the following matters into account when you design.

#### 3-1 General cautions

- (1) If the dimensional difference between the inner width of an outer link of a chain and the width of a fitting or the dimensional difference between the pin diameter and the fitting hole is too large, a large bending stress acts to lower the pin strength dramatically.  
Refer to "3-3 Dimensions of fitting" for your design.
- (2) If the fitting hole suffers "wear" or "roll over" at its ends during use, the strength of the pin greatly declines as in the case of (1). Periodically check, and if "wear" or "roll over" is found in the fitting hole, replace the fitting.
- (3) Rust or corrosion is the major cause of deterioration of strength. Apply grease to chains periodically to prevent rust.
- (4) If a partial load, lateral load or torsional load acts on a chain, the strength of the chain declines. To prevent it, exercise sufficient care in the horizontality of fitting of the hole, installation accuracy of fitting, etc.

#### 3-2 Material of fitting and heat treatment

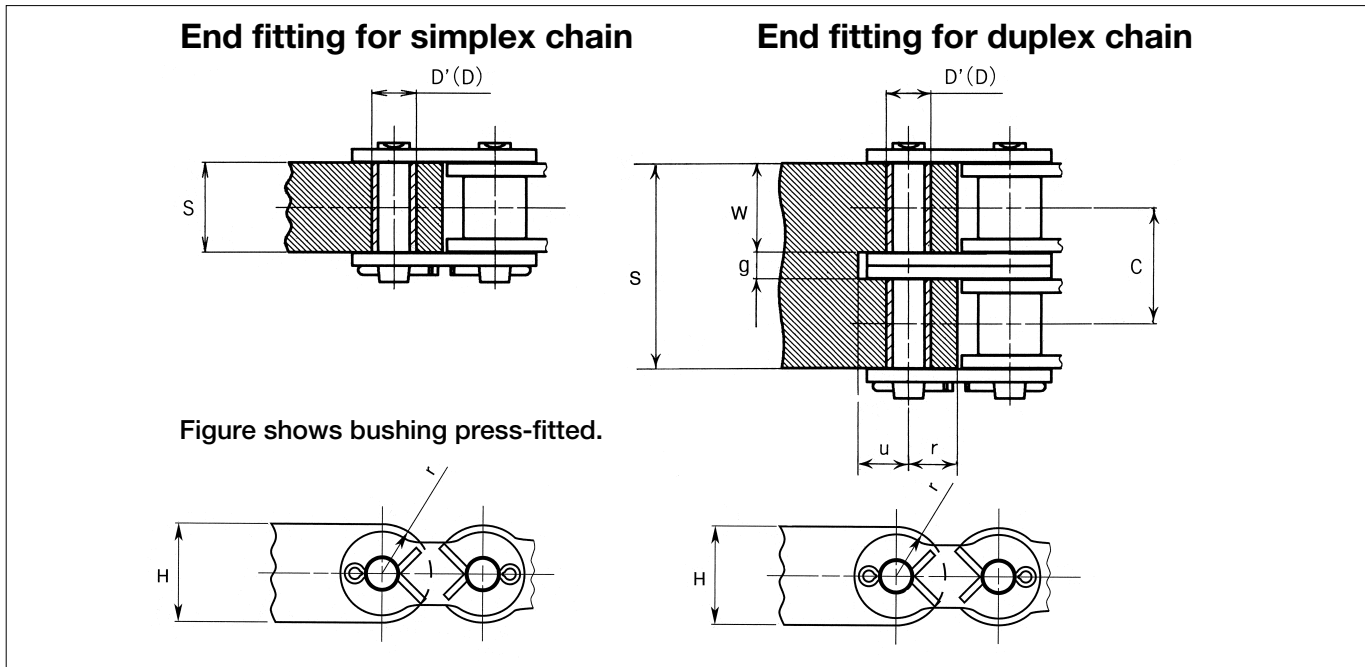
- (1) Hardened fitting  
The fitting is generally hardened and tempered. Thoroughly examine the size and material hardness of the fitting, and select a material which ensures a sufficient hardness.
  - a. In general, select a material which ensures the required hardness from tough hardening steels (SCM435, SCM440, etc.) and medium carbon steel.
  - b. Harden the fitting, and temper at a high temperature, avoiding the temper brittleness range, to a hardness of about HRC30 to 45.
  - c. In the case of a threaded fitting, keep the hardness at not higher than HRC40, to lower the susceptibility of the threaded portion to delayed fracture.  
Select the size of the threaded portion to achieve a tensile strength not lower than the tensile strength of the chain.
- (2) Non-hardened fitting  
If the fitting is used without being hardened and tempered, the following must be considered.
  - a. Since the fitting hole is likely to suffer from wearing during use, press a hard bushing into the fitting hole.
  - b. Since the strength of the fitting is lower than that of a hardened and tempered fitting,

adequate strength must be secured by adopting corresponding dimensions.

### 3-3 Dimensions of fitting

Dimensions of general hardened fittings for standard roller chains are listed below. For the fittings of more than triple strand chains and fittings of other shapes, please consult us. When

designing an end fitting for any chain other than standard roller chains, work out a safe design based on sufficient understanding of this section. If there is anything unclear, please consult us.



### Dimensions of End fitting

Unit (mm)

Chain No.	g	W (Reference)	S	D (Without Bushing)	D' (With Bushing)	C	r (Reference)	u (Reference)	H (Reference)
DID 35-1	—	—	7.5 <sup>+0.0</sup> <sub>-0.2</sub>	3.62 <sup>+0.05</sup>	5.02 <sup>±0.02</sup>	—	4.5	—	9.0
DID 35-2	2.8 <sup>+0.1</sup>	7.2~ 7.4	17.5 <sup>-0.3</sup>			10.1 <sup>±0.1</sup>		4.7	
DID 40-1	—	—	11.2 <sup>+0.0</sup> <sub>-0.2</sub>	4.00 <sup>+0.05</sup>	5.58 <sup>±0.02</sup>	—	6.0	—	12.0
DID 40-2	3.2 <sup>+0.1</sup>	10.9~ 11.1	25.4 <sup>-0.3</sup>			14.4 <sup>±0.1</sup>		6.3	
DID 50-1	—	—	13.8 <sup>+0.0</sup> <sub>-0.2</sub>	5.12 <sup>+0.05</sup>	7.16 <sup>±0.02</sup>	—	7.5	—	15.0
DID 50-2	4.3 <sup>+0.1</sup>	13.6~ 13.8	31.9 <sup>-0.3</sup>			18.1 <sup>±0.1</sup>		7.9	
DID 60-1	—	—	17.8 <sup>+0.0</sup> <sub>-0.2</sub>	5.99 <sup>+0.05</sup>	8.40 <sup>±0.02</sup>	—	9.2	—	18.1
DID 60-2	5.2 <sup>+0.1</sup>	17.4~ 17.7	40.4 <sup>-0.3</sup>			22.8 <sup>±0.1</sup>		9.5	
DID 80-1	—	—	22.6 <sup>+0.0</sup> <sub>-0.2</sub>	7.97 <sup>+0.1</sup>	11.27 <sup>±0.02</sup>	—	12.2	—	24.2
DID 80-2	6.8 <sup>+0.1</sup>	22.3~ 22.6	51.8 <sup>-0.3</sup>			29.3 <sup>±0.1</sup>		12.7	
DID 100-1	—	—	27.5 <sup>+0.0</sup> <sub>-0.3</sub>	9.57 <sup>+0.1</sup>	13.47 <sup>±0.02</sup>	—	15.2	—	30.2
DID 100-2	8.5 <sup>+0.1</sup>	27.1~ 27.4	63.1 <sup>-0.3</sup>			35.8 <sup>±0.1</sup>		15.8	
DID 120-1	—	—	35.5 <sup>+0.0</sup> <sub>-0.3</sub>	11.15 <sup>+0.1</sup>	15.64 <sup>±0.02</sup>	—	18.2	—	36.2
DID 120-2	10.1 <sup>+0.1</sup>	35.1~ 35.4	80.7 <sup>-0.3</sup>			45.4 <sup>±0.1</sup>		19.0	
DID 140-1	—	—	37.2 <sup>-0.3</sup>	12.75 <sup>+0.1</sup>	17.94 <sup>±0.02</sup>	—	21.2	—	42.3
DID 140-2	12.0 <sup>+0.1</sup>	36.7~ 37.0	85.8 <sup>-0.3</sup>			48.9 <sup>±0.1</sup>		22.2	
DID 160-1	—	—	45.2 <sup>-0.3</sup>	14.33 <sup>+0.1</sup>	19.94 <sup>±0.02</sup>	—	24.2	—	48.3
DID 160-2	13.6 <sup>+0.1</sup>	44.7~ 45.0	103.4 <sup>-0.3</sup>			58.5 <sup>±0.1</sup>		25.4	

Note:

- 1) The dimensions of D' can be applied only when DID bushings are used. If these dimensions are applied to the bushings for chains produced by other manufacturers, the strength may be lower.
- 2) Dimensions "g" and "S" of duplex chain chain with bushings include the dimensions of the bushings.