

## Miniature Linear Way Bearings

### General Description

The LWL Series offered by AST Bearings is a miniature type linear motion rolling guide, incorporating two rows of steel balls arranged in four-point contact with the raceways. They provide stable accuracy and rigidity even in operations under fluctuating loads with changing direction and magnitude or complex loads. The standard products are made of stainless steel and incorporate seals. The LWL Series is widely used in such fields as medical equipment, semiconductor manufacturing equipment, and liquid crystal related equipment where its excellent performance has been proven.



The LWL miniature ways are available with many variations to suit each individual need. Some of the variations include either standard or wide rails, tapped rails for ease of mounting, with or without ball retainers, carbon steel material, and different preloads for varying loads. Please contact AST engineering for assistance in choosing which options will best suit your needs.

### Nomenclature/Dimensions

The following are series designations for each available miniature linear way that AST offers.

- **LWL** – Standard width, Standard Length, No Ball Retainer
- **LWL-B** – Standard width, Standard Length, Balls Retained
- **LWL-N** – Standard width, Standard Length, Tapped Rail Specification
- **LWL-CS** – Standard width, Standard Length, No Ball Retainer, High Carbon Steel
- **LWL-BCS** – Standard width, Standard Length, Balls Retained, High Carbon Steel
- **LWLC** – Standard width, Compact Length, No Ball Retainer
- **LWLC-B** – Standard width, Compact Length, Balls Retained
- **LWLC-N** – Standard width, Compact Length, Tapped Rail Specification
- **LWLG-B** – Standard width, Long Length (high rigidity), Balls Retained
- **LWLG-N** – Standard width, Long Length (high rigidity), Tapped Rail Specification
- **LWLF** – Wide width, Standard Length, No Ball Retainer
- **LWLF-B** – Wide width, Standard Length, Balls Retained
- **LWLF-N** – Wide width, Standard Length, Tapped Rail Specification
- **LWLF-CS** – Wide width, Standard Length, No Ball Retainer, High Carbon Steel
- **LWLF-BCS** – Wide width, Standard Length, Balls Retained, High Carbon Steel
- **LWLFC** – Wide width, Compact Length, No Ball Retainer
- **LWLFC-B** – Wide width, Compact Length, Balls Retained
- **LWLFC-N** – Wide width, Compact Length, Tapped Rail Specification
- **LWLFG-B** – Wide width, Long Length (high rigidity), Balls Retained

- **LWLFG-N** – Wide width, Long Length (high rigidity), Tapped Rail Specification

Rail width in mm is placed after the initial designation, before any suffixes. For example:

## LWLC12-B

This is a 12mm wide, standard width, compact length linear way with a ball retainer.

### Tolerances

The tolerances for AST LWL series miniature linear way bearings are tabulated below:

unit: mm

Item	Classification (Symbol)	High (H)	Precision (P)
Dim. <i>H</i> tolerance		± 0.020	± 0.010
Dim. <i>N</i> tolerance		± 0.025	± 0.015
Dim. variation of <i>H</i> <sup>(1)</sup>		0.015	0.007
Dim. variation of <i>N</i> <sup>(1)</sup>		0.020	0.010
Dim. variation of <i>H</i> for multiple assembled sets <sup>(2)</sup>		0.030	0.020
Parallelism in operation of C to A		See Fig. 1	
Parallelism in operation of D to B		See Fig. 1	

Note<sup>(1)</sup>: it means the size variation between slide units mounted on the same track rail.  
<sup>(2)</sup>: it applies to the interchangeable specification products.



## Internal Clearance/Preload

Different internal clearance specifications are available for the LWL series linear way bearings. Below is a table identifying each available preload specification. Please contact AST engineering for further assistance in choosing which preload best fits each specific application.

Preload type	Symbol	Preload amount (N)	Application
Clearance <sup>(1)</sup>	T <sub>0</sub>	0 <sup>(4)</sup>	- Very smooth motion
Standard <sup>(2)</sup>	(No symbol)	0 <sup>(5)</sup>	- Smooth and precise motion
Light preload <sup>(3)</sup>	T <sub>1</sub>	0.02C <sub>0</sub>	- Minimum vibration - Load is equally balanced. - Smooth and precise motion

Note<sup>(1)</sup>: Applicable to the non-interchangeable specification.

<sup>(2)</sup>: Not applicable to the size 2, 3, 4, and 6 models.

<sup>(3)</sup>: Not applicable to the size 2, 3, 4, 5, 6, and 10 models.

<sup>(4)</sup>: Zero or minimal amount of clearance

<sup>(5)</sup>: Zero or minimal amount of preload

Remark: C<sub>0</sub> means the basic static load rating.

## Lubrication

Lithium-soap base grease (MULTEMP PS No.2 (KYODO YUSHI)) is pre-packed in all LWL series linear way bearings. However, as the quality of any grease will gradually deteriorate as operating time passes, periodic re-lubrication is necessary. The re-lubrication interval varies depending on the operating conditions of the rolling guides. A six month interval is generally recommended, and, if the machine operation consists of reciprocating motions with many cycles and long strokes, re-lubrication every three months is recommended. The LWL series of bearings are provided with an oil hole or grease nipple for re-lubrication depending on the bearing size. The size 2, 3, 4, and 6 models are not provided with an oil hole. For lubrication of these models, apply grease directly to the raceways of the track rail.

## Fitting and mounting

LWL series miniature ways are provided with either through holes for mounting, or are available with tapped holes. The mounting bed of the linear ways should be machined appropriately to match the ground surfaces of the linear ways. Machined surfaces should be clean and free of burrs and sharp edges to ensure proper seating of the rails. Mounting bolts should also be properly torqued so that the rails lay flat and even.

When assembling each slide unit of the mounted rails, care should be taken so that proper assembly is achieved. All LWL series slide units are provided with dummy rails to assist in assembly of the slide units onto the rails. The proper procedure is to hold the unit with dummy rail in place flush with the mounted rail, and then gently slide the unit parallel until the slide unit is on the mounted rail, free of the dummy rail.

## Life and Load Ratings

### Basic dynamic load rating $C$

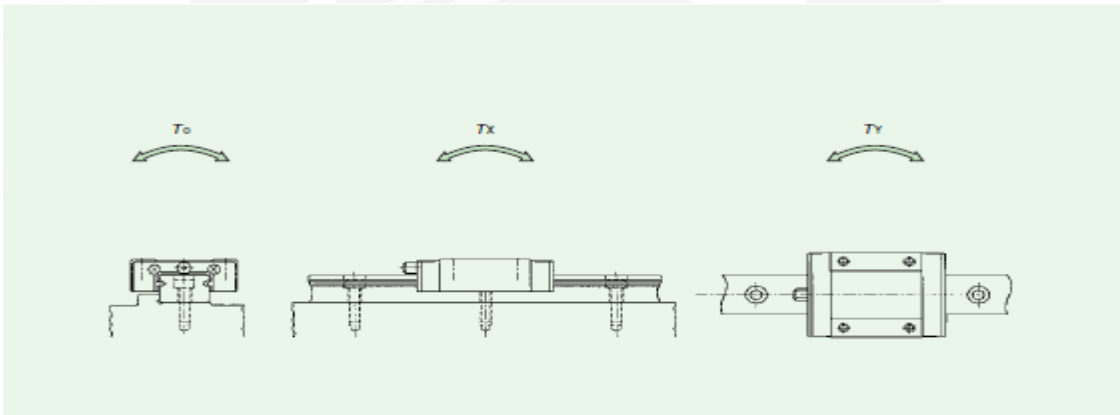
The basic dynamic load rating is defined as the constant load in both direction and magnitude under which a group of identical Linear Way Bearings are individually operated and 90% of those in the group can travel  $50 \times 10^3$  meters free from material damage due to rolling contact fatigue.

### Basic static load rating $C_0$

The basic static load rating is defined as the static load that gives a prescribed constant contact stress at the center of the contact area between the rolling element and raceway receiving the maximum load. It is the allowable limit load that permits normal rolling motion. Generally, the basic static load rating is used in combination with the static safety factor.

### Static moment rating $T_0, T_x, T_y$

The static moment rating is defined as the static moment load that gives a prescribed constant contact stress at the center of the contact area between the rolling element and raceway receiving the maximum load when a moment is loaded (see below). It is the allowable limit moment that permits normal rolling motion. Generally, the static moment rating is used in combination with the static safety factor.



### Load direction and load rating

Since the load ratings of LWL series linear way bearings given in the dimension tables found in the AST catalog are for upward/downward load, they must be corrected for the load direction for lateral load. The corrected basic dynamic load ratings and basic static load ratings are shown below.



# TECHNICAL INFORMATION



Load direction Size	Upward/downward direction		Lateral direction	
	Basic dynamic load rating	Basic static load	Basic dynamic load rating	Basic static load
2, 3, 4, 6	$C$	$C_0$	$1.13C$	$1.19C_0$
Other than 2, 3, 4, 6	$C$	$C_0$	$0.88C$	$0.84C_0$



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