HIWIN®

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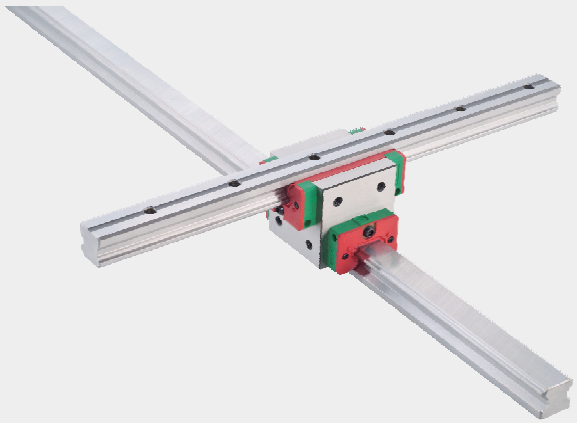
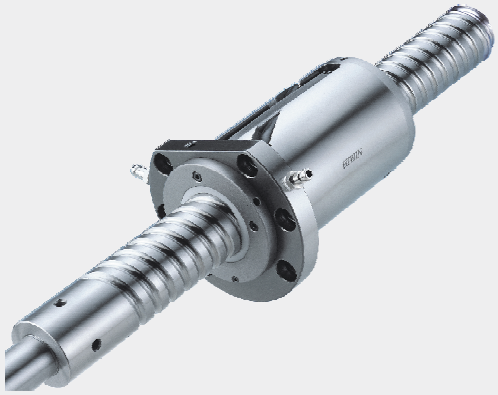
LM GUIDE & BALL SCREW

Assembly Instructions



Linear Guideways



Ballscrews

CONTENT

SUMMARY FOR LM GUIDE & BALL SCREW INSTRUCTIONS

BALL SCREW NUT ASSEMBLY & DIS-ASSEMBLE

HIWIN single axis can be separated by the material of the axis profile and the profile rail used.

Points to Note during Assembly

- Ensure that the Ball screws are free from Dust, Burrs & Rust.
- Ensure that the nut sleeve does not rotate.
- Prefer vertical installation for Ball Screw's Nut.
- For long length, horizontal mounting can be used if required.
- Ensure the nut end seal rubber does not come upward during assembly, as it can cause vibration and hard movement.

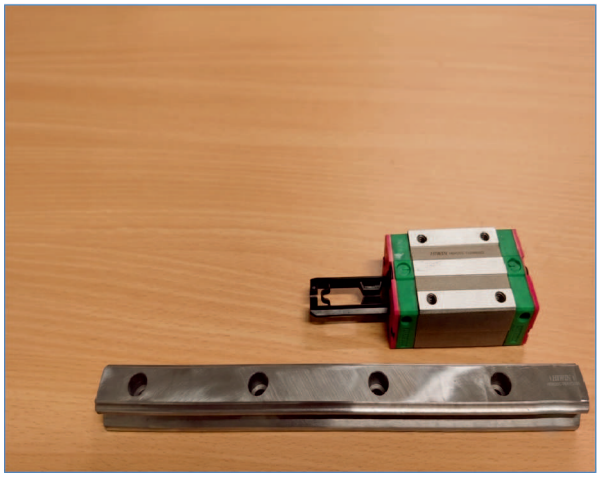
BALL SCREW NOISE & VIBRATION TROUBLE SHOOTING POINTS

- Missalignment between the ball screw & linear guideways, resulting in uneven loading during upward travel.
- Insufficient or improper lubrication of the ball screw assembly, leading to increased friction & noise under load.
- Incorrect preload or wear in the support bearings (BK/BF units), which may produce noise when the screw is subjected to axial load in the upward direction.
- Misalignment of the motor coupling, causing vibration & abnormal sound during operation.
- Excessive preload or internal damage in the ball nut, leading to rough operation in one direction of travel.
- Contamination inside the ball screw assembly, such as dust, metal particles, or other foreign materials affecting smooth ball circulation.
- Loose mounting bolts or inadequate rigidity of the mounting structure, resulting in vibration and noise under lifting conditions.
- Uneven or excessive vertical load, particularly if the application lacks proper counterbalance mechanisms, increasing the load on the ball screw during upward motion.
- Servo motor tuning issues or insufficient motor Speed/Torque settings, which may cause resonance or abnormal operating noise while moving against gravity.
- Wear or damage to the recirculating balls or ball tracks, which can become more noticeable during upward movement due to load direction.

LM GUIDE INSTALLATION & UN-INSTALLATION

Points to Note during Assembly

- Ensure that the base is clean & burrs free before fitting the Linear Guideway, and that there is no dust or rust present.
- Clean the LM Guide, remove any dents, or use a new rail if the problem is severe.
- Kindly ensure that the LM Guide is installed as per the HIWIN ARROW Directions.
- For Butt Joint Primary & Secondary Rails should be aligned properly.
- Use a C-Clamp to align both rails properly before performing the butt joint process or Normal Process.



LM GUIDE BLOCKS SLIDING TROUBLE SHOOTING POINTS

- **Surface Not Clean** - Dust, dirt, or metal particles on rail or mounting surface can block smooth movement.
- **Improper Alignment** - Rail and mounting surface not parallel or straight. Misalignment causes uneven load and jerky motion. Check alignment with dial gauge
- **Improper Mounting Torque** - Screws either over-tightened or under-tightened. This can distort the rail or block.
- **Lack of Lubrication** - Insufficient or no grease/oil leads to high friction. Dry operation causes sticking or noise. Apply proper lubrication
- **Damaged Rail or Block** - Dents, scratches, or deformation on rail. Ball track damage inside block.
- **Contamination Inside Block** - Dust, coolant, or chips entering block. Causes internal ball circulation problem.
- **Incorrect Preload Selection** - High preload increases friction. May feel hard or tight while sliding.
- **Load Misalignment** - Load not acting in proper direction. Uneven force creates binding. Verify mounting torque
- **Parallelism Issue Between Two Rails** - If twin rails are used and not parallel → block gets stuck.
- **Improper Installation Sequence** - Rail not mounted using correct tightening procedure.
- **End Machining or Base Unevenness** - Uneven Base plate or improper machining affects motion.

IMPORTANT NOTES FOR BALL SCREWS & LM GUIDE

- **For Ball Screws** - It is recommended to inspect the alignment, lubrication condition, support bearings, motor coupling, and overall assembly of the vertical axis to accurately determine the root cause and implement the appropriate corrective action.

- **For Linear Guideway** - It is recommended During LM Guide Way assembly, ensure that the mounting surface is completely free from dust and that proper parallelism is maintained between the surface and the LM Guideway base. Also always Fitted the LM Guideway with the help of C Clamp & Bolting the Allen Key as per HIWIN Torque Standard.

- **HIWIN** – Never Recommended Nickel & Hard Chrome Plating on Linear Guideways.

✗ Raceways / Ball Tracks – NOT ALLOWED ✗ Reference Datum Edges – NOT ALLOWED

Any plating is the customer's responsibility and must not affect :

- Accuracy - Preload - Smooth motion - Service life

- When Plating Is Acceptable, Plating may be done ONLY for corrosion protection.
- HIWIN - Safe Recommended Plating

✓ **Electroless Nickel Plating (High-Phosphorus)**

Most recommended & safest option

Specification :

- Type : High-P ENP (10-13% P)
- Thickness : 5-8 μm (MAX 10 μm)
- Finish : Uniform, non-magnetic
- Heat treatment : ✗ Not allowed

Do NOT plate :

Ball raceways

Ball return grooves

Precision reference edges

Plating Area :

- Rail outer surfaces
- Mounting faces
- Side faces

Plating NOT Recommended by HIWIN :

✗ Hard Chrome ✗ Zinc / Zn-Ni ✗ Thick ENP (>10 μm) ✗ PVD / DLC on raceways

IMPORTANT NOTES FOR BALL SCREWS & LM GUIDE

Reasons :
- Alters geometry & preload

Masking Requirement (MANDATORY)
- Mask all rolling contact areas
- Mask reference edges
- Only external non-functional faces allowed

Post-Plating Checks (Mandatory)
- Visual inspection
- Thickness check
- Rail straightness check
- Smooth motion test with carriage
- Preload verification

Typical Pharma Machine Requirement
- Coating: High-P ENP
- Thickness: 5–8 µm
- Corrosion resistance: ≥ 500 hrs NSS
- Lubricant: NSF / FDA approved grease

HIWIN Recommendation Plating on raceway

✕ Not allowed
- Allowed coating High-P ENP
- Max thickness 10 µm
- Masking Mandatory Application
- External surfaces only
- Need an OEM-style

FMEA FOR LM GUIDE

Burning
Cracks
Flaking
Rust And Corrosion
Fretting Corrosion
Water Or Coolant Invasion

LM Guide

Step 1 Check the failure mode

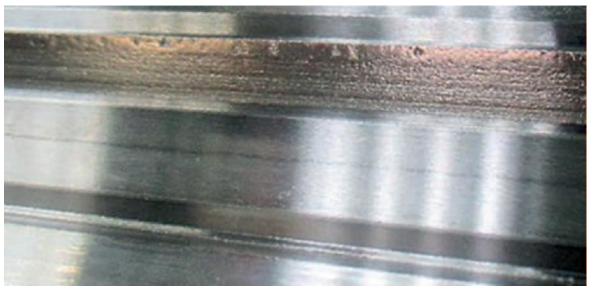
Step 2 Root cause analysis

Step 3 Trouble shooting

FAILURE MODE ANALYSIS

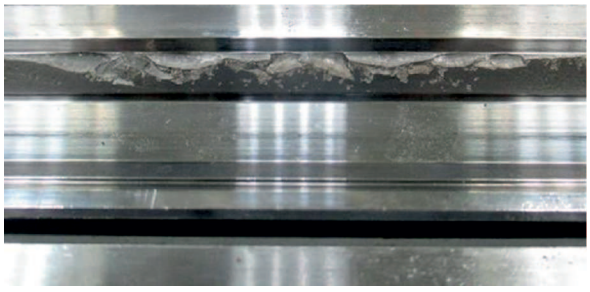
Failure mode : **Burning**

Root cause
- Poor Lubrication.
- Excessive Load.
- Wrong Selection of LM Guide Size.



Failure mode : **Cracks**

Root cause
- Excessive External Impact Force.
- Poor Circulation of Balls or Rollers.

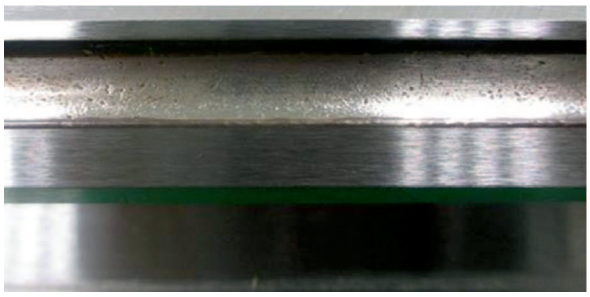


FAILURE MODE ANALYSIS

Failure mode : **Flaking**

Root cause

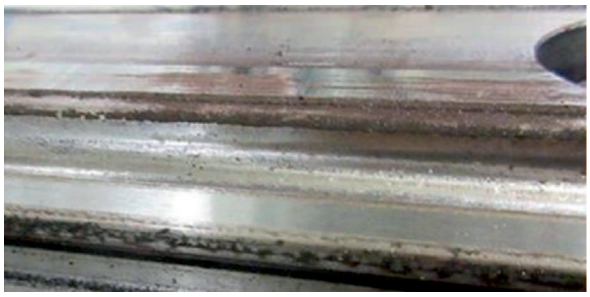
- Improper LM Guideway size selection.
- Excessive Load.
- Poor Lubrication.
- Particle Invasion.



Failure mode : **Rust & Corrosion**

Root cause

- Poor Lubrication & Maintenance.
- Coolant Invasion.
- High-Humidity Environment.



Failure mode : **Fretting Corrosion**

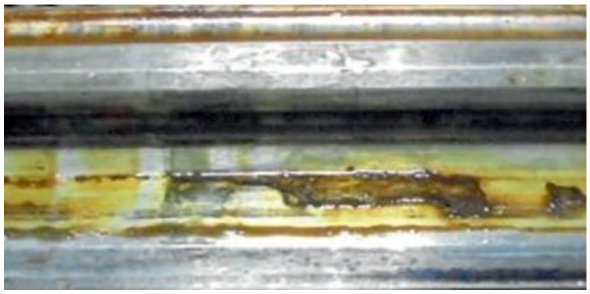
Root cause

- Micro-Motion (Short Stroke).
- Poor Lubrication.
- Excessive Load.

Failure mode : **Water or Coolant Invasion**

Root cause

- Water or Coolant solution Invasion.
- Harsh Environment.



FMEA FOR BALLSCREW

Flaking
Cracks
Burning
Rust And Corrosion
Foreign Body Invasion

Ball Screw

Step 1 Check the failure mode

Step 2 Root cause analysis

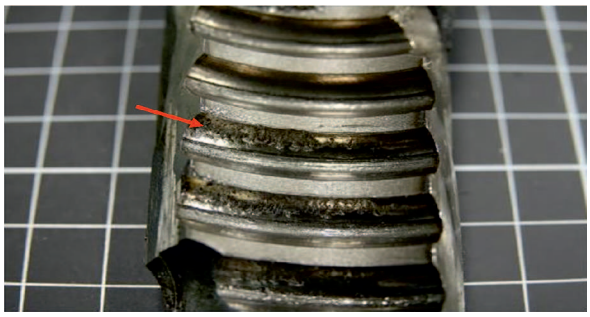
Step 3 Trouble shooting

FAILURE MODE ANALYSIS

Failure mode : **Flaking**

Root cause

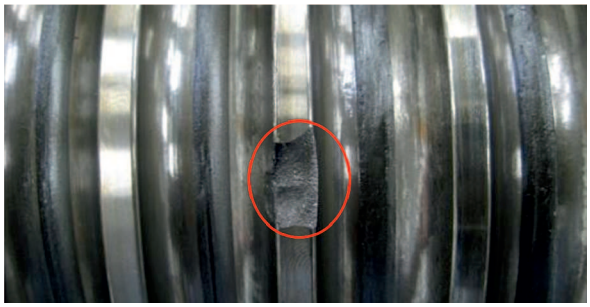
- Improper Ball Screw Selection.
- Excessive Loading.
- Poor Lubrication.



Failure mode : **Cracks**

Root cause

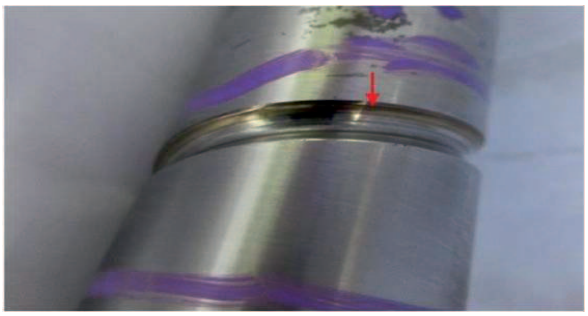
- Excessive External Impact Force.
- Poor Re-circulation of Balls.



Failure mode : **Burning**

Root cause

- Poor Lubrication.
- Excessive Load
- Wrong Selection of Nut Size.



Failure mode : **Rust & Corrosion**

Root cause

- Poor Lubrication & Maintenance.
- Coolant Invasion.
- High-Humidity Environment.

Failure mode : **Foreign Body Invasion**

Root cause

- Improper Dust Proof Selection.

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