

Chapter 3

Bridge

”DCNC LSM 80x160,8E”

3.1 Introduction

This chapter outlines the assembly of the Bridge, using a ”DCNC LSM 80x160,8E”.

Step by step it is explained which action should be performed.

This chapter consists of the following sections:

- Considerations
- Required tools
- Preparations
- Assembly
- Aligning the Z axis
- Testing the Z axis

3.2 Considerations

Please bear in mind that the used high precision parts and components require special care.

The most critical measures are listed below, and repeated during this chapter.

- Hiwin carriages contain multiple guidance balls. These balls will disappear when the carriage runs off the rails, leaving the Hiwin carriage unusable! Never slide Hiwin carriages off the end of the rails without the plastic tube to keep the balls in place, and never remove the plastic tube unless you intend to mount the Hiwin carriage onto a rail.
- Analogous to the first attention point, ballnuts also contain balls. Without the aluminum tube these balls might disappear leaving the ballnut unusable! Never remove the aluminum tube unless you wish to mount the ballnut to a ballscrew: remove the rubbers and carefully insert the ballscrew on the side where the aluminum tube has no groove on the edge.
- Unless stated otherwise, do not tighten alignment sensitive parts such as rails, and Hiwin carriage mounts until the system is complete and ready for alignment.

3.3 Required tools

The required tools are listed below:

- Tap M8
- Allen Keys
- Open-end, or Ring-Wrench 5 mm
- Magnetic stand, with Dial Gauge, or "Puppitast" gauge
- Small hammer
- 3mm punch
- 10-30V DC Power Supply Unit
- Plastic hammer
- Screw driver 0,8 x 5,5
- Bearing press tools, or a benchvise
- Grease
- Loctite 641 (cilindrical locking compound) or similar
- Loctite (medium strength for threads) or similar
- Open end Wrench 17mm

3.4 Preparations

Perform the following preparations:

- Mount the grease nipples to the Hiwin carriages, and align the texts in the same direction:

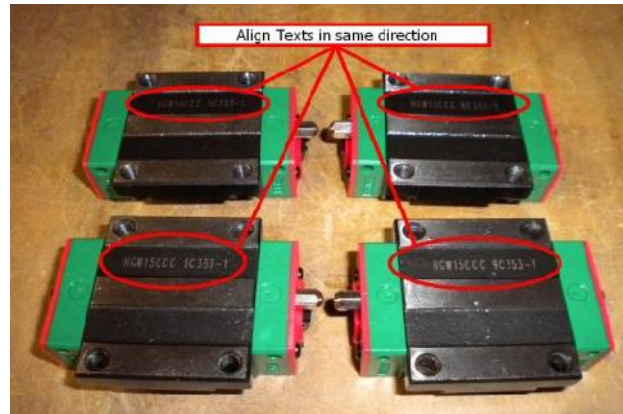


Figure 3.1:

- Apply a thin film of Loctite 641 or similar on the bearing slot on the DCNC-BearingBlocks. Press the bearings in both parts using a bearing press or a bench vise. The bearings must be flush with the surface of the aluminum part.

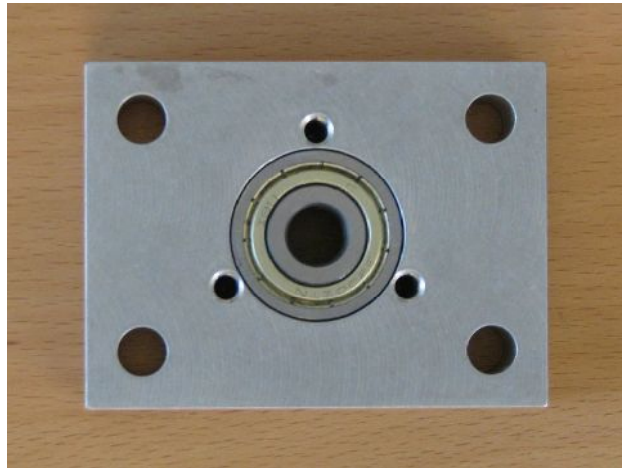


Figure 3.2: DCNC Bearing Block with mounted bearing, used at motor end of the spindle

- Mount the T nuts, by spreading them evenly on the designated slot:

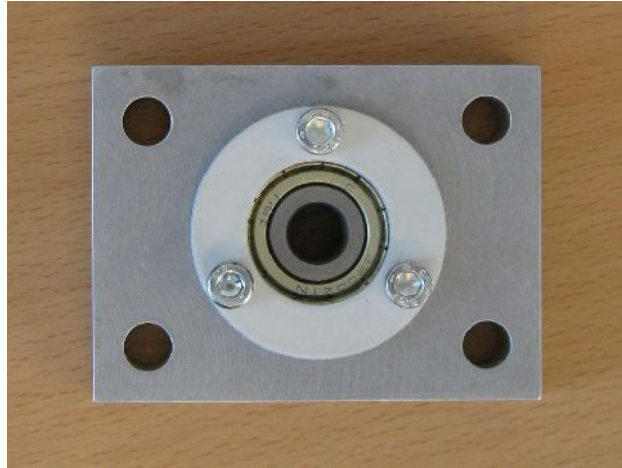


Figure 3.3: DCNC Bearing Block with mounted bearing and ring, used at non motor end of the spindle



Figure 3.4:

3.5 Assembly

Now the preparations are completed, you can start assembling.

- First, place the rails with the arrows indicating the same direction above the placed T nuts as is shown in figure 3.5. Fasten the supplied M4x20 bolts such that the bolthead is lower than the top of the rail, but not tightened; allowing the rail to move a little. If necessary center the rails on the profile.

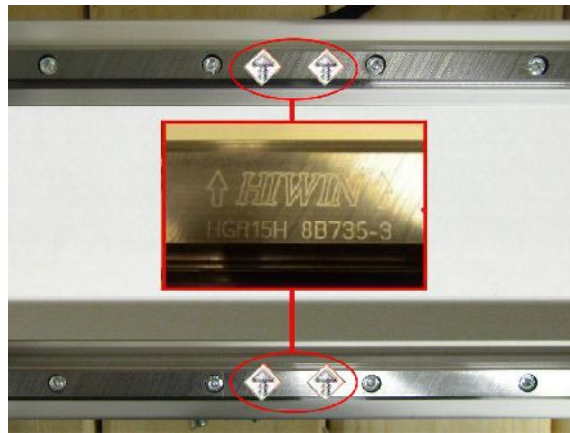


Figure 3.5: Orientation of the rails

- Carefully place the first Hiwin carriage on the rail; push the plastic tube out in the process as shown in figure 3.6:

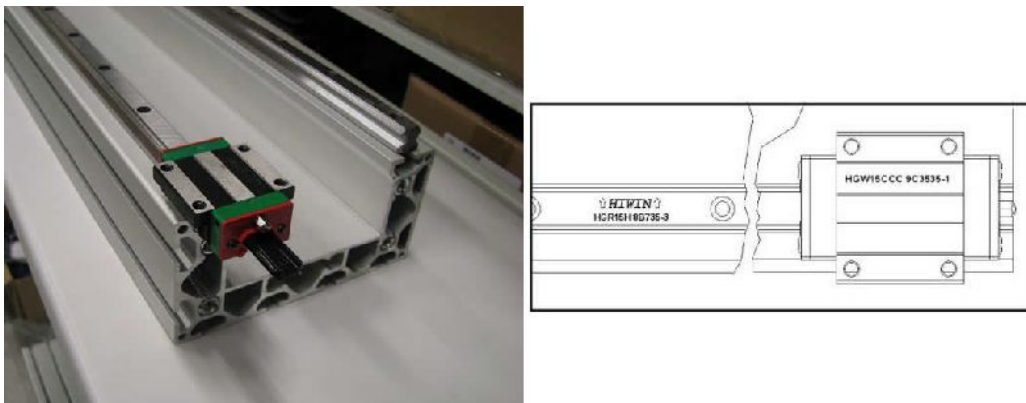


Figure 3.6: Hiwin grease nipples should face each other; place first carriage as shown. Also, align the text of the carriages with the text of the rail

- Place your magnetic stand on the Hiwin carriage, and set the dial gauge to 0.00 on the side of the 80x160E profile as shown in figure 3.7:

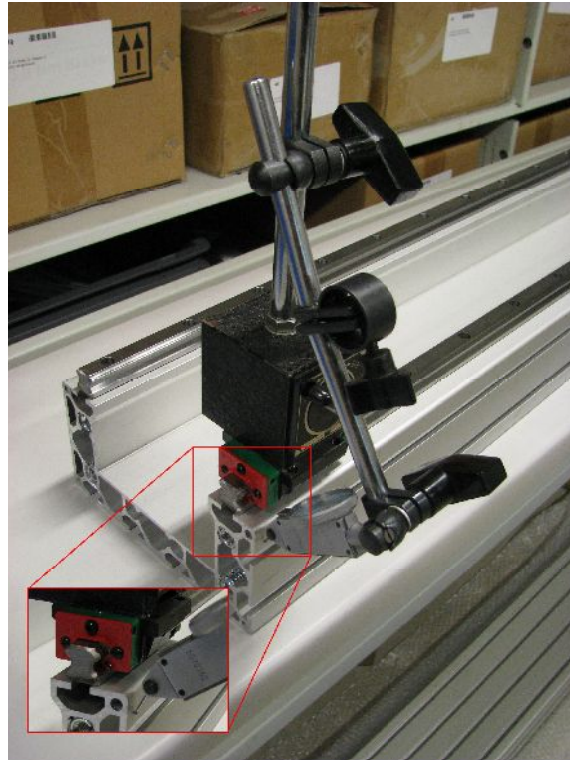


Figure 3.7: Align the rails using a dial gauge

Translate the Hiwin carriage until next bolt appears. Now adjust the rail such that the gauge reads 0.00 again, and tighten the M4x20 bolt.



Figure 3.8:

Repeat this process until all bolts of the first rail are tightened; be careful not to run the Hiwin carriage off the end of the rail.

- Next, place the remaining three Hiwin carriage on the rails as shown in figure 3.9:

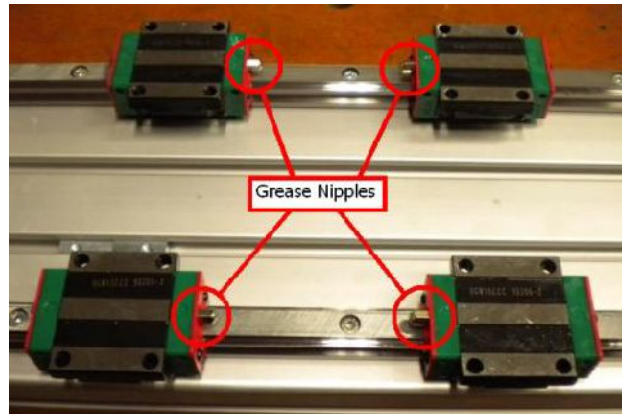


Figure 3.9: Orientation of the Hiwin carriages: text aligned and grease nipples facing each other

Place slideplate on top of the four Hiwin carriages.

Loosely attach the slideplate on to the Hiwin carriages using the supplied M5x20 bolts and thread Loctite.



Figure 3.10: Mount slideplate bolts loosely

Now move the slideplate along the entire length of the rails multiple times to align the second rail. Be very careful not to run the carriages off the end of the rails! Tighten the M5x20 bolts firmly afterwards.

- Now the remaining M4x20 bolts should be fastened: Tighten the first bolt firmly, then move the slideplate until the adjacent bolt appears; tighten this bolt also. Repeat this procedure until the slideplate reaches the end of the stroke.



Figure 3.11:

Now slide the slideplate back and fasten the remaining M4x20 bolts.

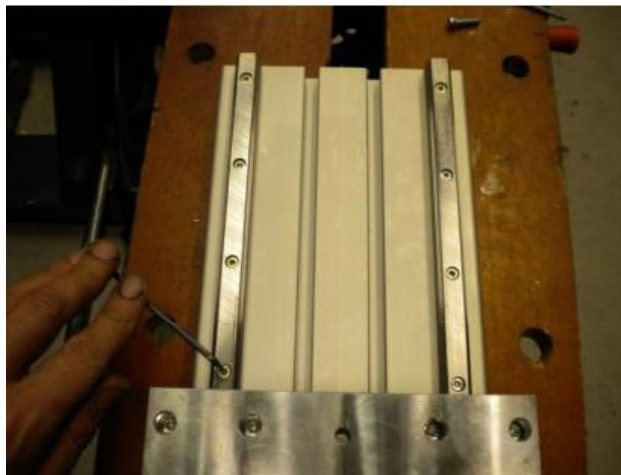


Figure 3.12:

- Apply thread Loctite to the M8x30 bolts, and firmly tighten the sideplate against the profile.
- Move the slideplate to the headplate, and align the slideplate with the headplate. While aligned, tighten the 16 bearingblock bolts.

- Next remove the rubber O-ring of the aluminum tube of the ballnut. Then insert the ballscrew in the aluminum tube of the ballnut on the side without a groove.

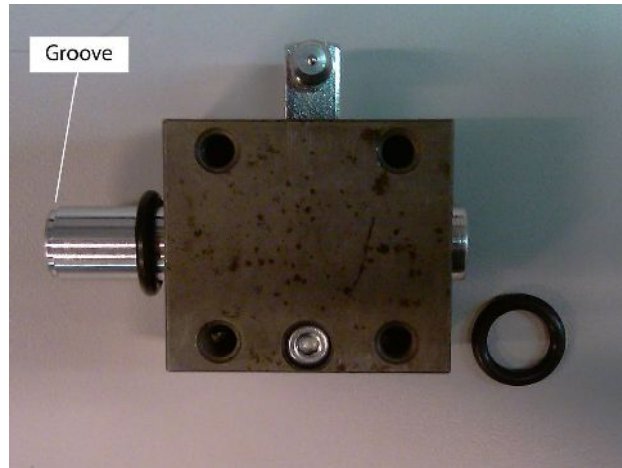


Figure 3.13:

Now turn the spindle gently into the ballnut; the aluminum tube automatically leaves the ballnut. After this is done you can tweak the bolt of the ballnut in order to adjust the play. The bolt should be carefully tightened up unto the point that the ballnut does not operate smooth anymore. Then rotate the bolt 30 degrees anti-clockwise and check if the ballscrew turns smoothly without binding.

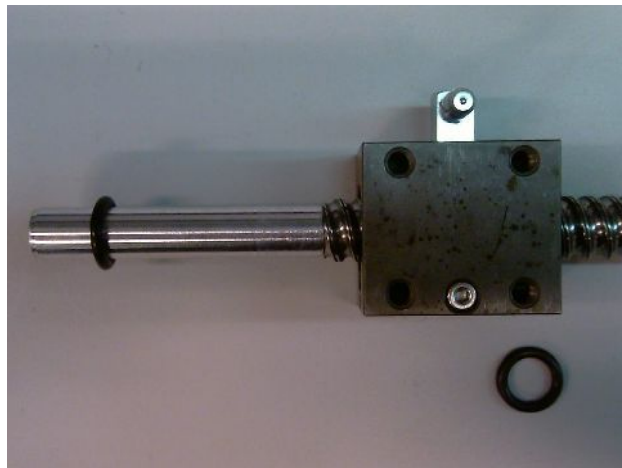


Figure 3.14:



Figure 3.15:



Figure 3.16:

- Apply four washers on the spindle end:

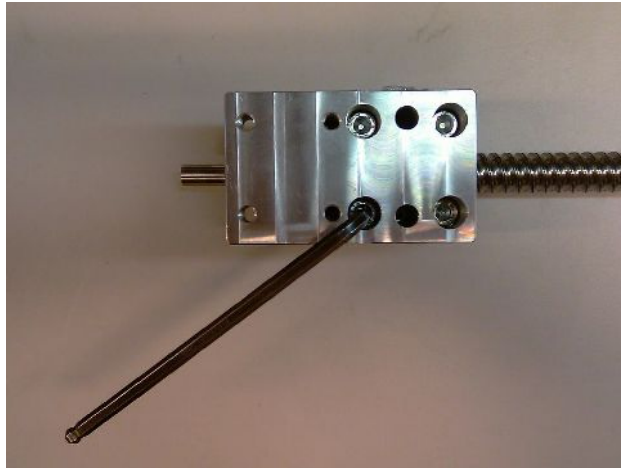


Figure 3.17:



Figure 3.18:

- Apply a thin film of grease on the ballscrew, and slide the ballscrew through the bearing into the headplate:



Figure 3.19:



Figure 3.20:

- Apply the M10x0.75 locknut on the ballscrew thread, and tighten the nut using the DamenCNC wrench and a flex coupler. If you use a shaft coupler to hold the spindle from rotating, remove it after the locknut is placed:

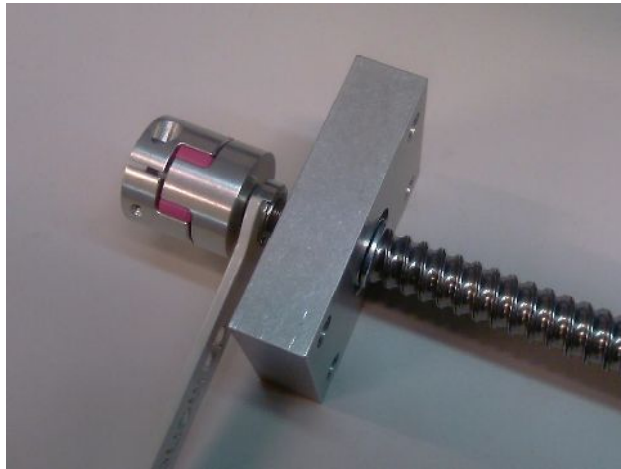


Figure 3.21:

- Attach the NEMA 23 motor mount to the bearing block with 3 M5x20 bolts:

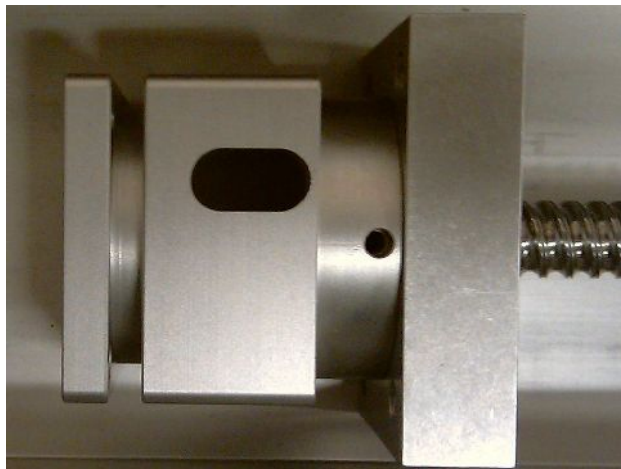


Figure 3.22:

- Attach the shaft coupler to the motor. Note the orientation of the bolts in the spacer should be like pictured:

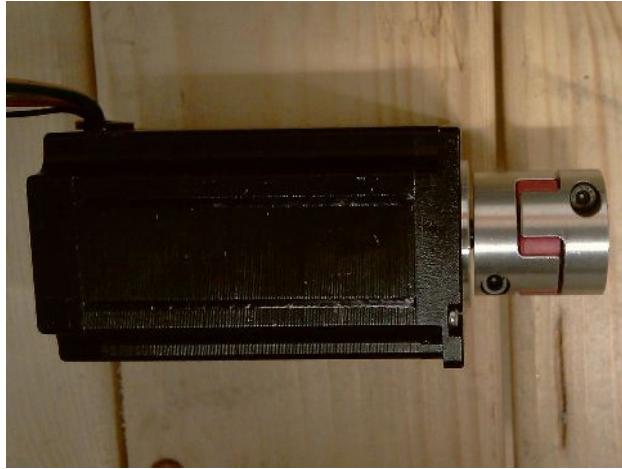


Figure 3.23:

- Attach the motor to the NEMA 23 mount:



Figure 3.24:

- Tighten the shaft coupler to the spindle using an allen key:



Figure 3.25:

- Position the spindle-motor subassembly in the 80x160E profile, with the ballnut placed approximately at the right place under the slideplate:
- Position bearing block on the non-motor end of the spindle:
- Position bearing block on the non-motor end of the spindle:
- Attach the ballnut loosely to the slideplate:

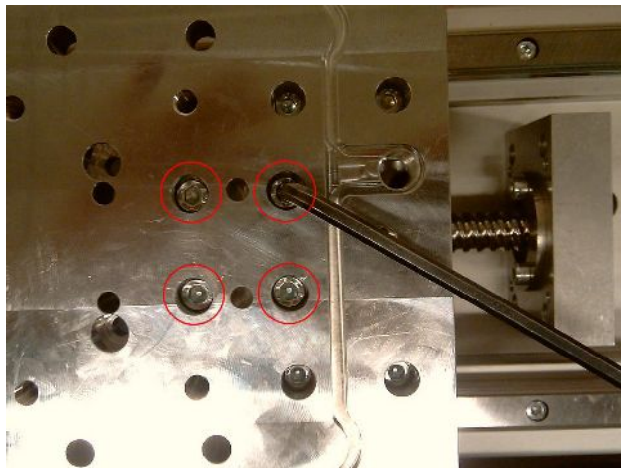


Figure 3.26: