

ANGLE HEAD HALF OPERATION MANUAL

HFD7/HFD12
HFT4/HFT6

MAR 2006

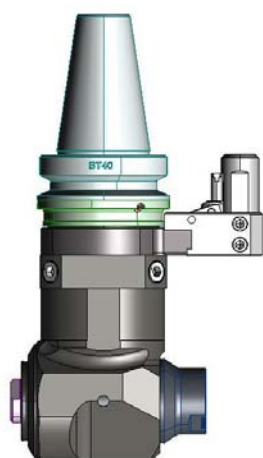
Thank you for choosing angle head half.

In order to ensure that the features of the product are effectively used to improve the efficiency, please be sure to read this instruction manual.

After reading the instruction manual, please store it in a place easily accessible to the users.

If there are any questions, please contact us.

DETAIL



| | | |
|--|-----------------------------|-----------------------|
| HOLDER TYPE | H F D 1 2 H F T 6 | H F D 7 H F T 4 |
| COLLET TYPE | DETa-1 D 1 2 | DETa-1 D 7 |
| CHUCKING RANGE | 2.5mm-13mm M3-M6 (M8) | 1mm-7mm M2-M4 (M5) |
| MAX RPM | 4 0 0 0 min-1 | 6 0 0 0 min-1 |
| GEAR RATIO SHANK/HEAD | 1 / 1 | |
| ROTATION WAY M/C SPINDLE/ HOLDER SPINDLE | COUNTER CLOCKWISE/CLOCKWISE | |

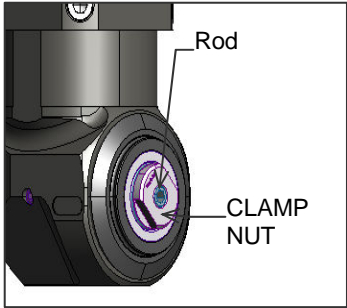
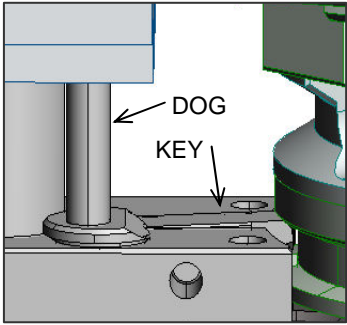
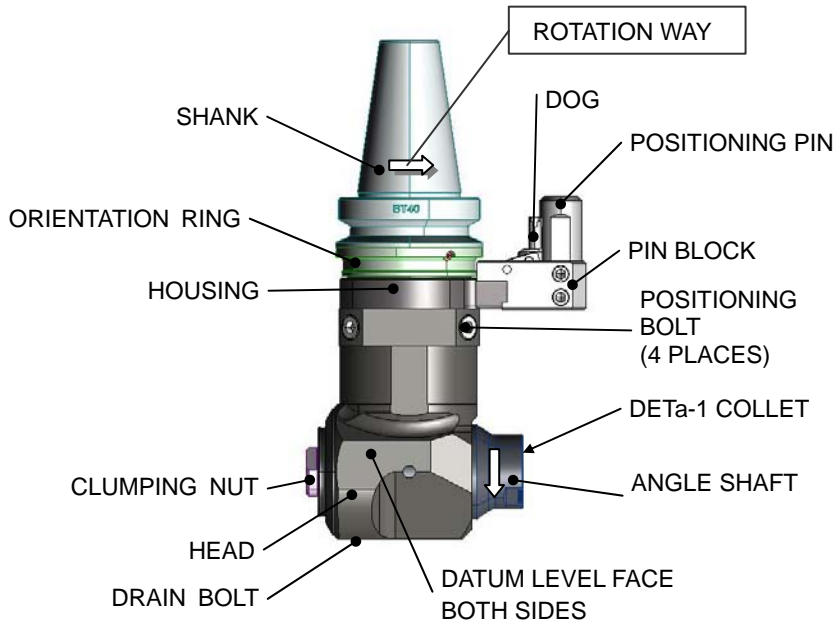


CAUTION

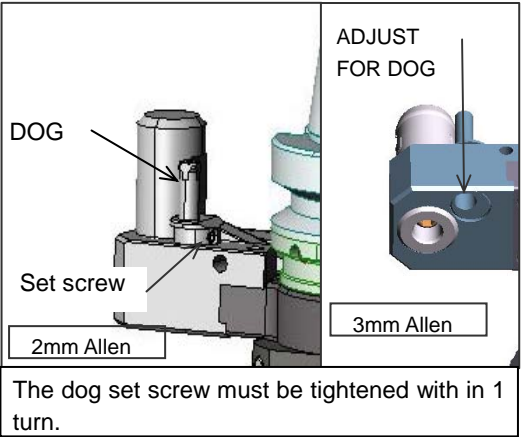
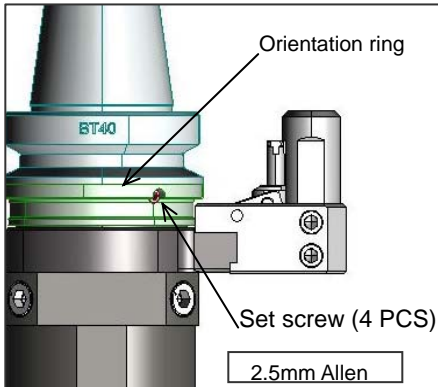
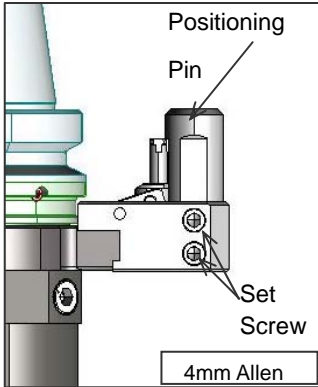
CAUTION FOR OPERATION

- ① Using the drawings and the instruction manual for the machine tool, carefully check for any interference between the angle head and each part of the machine tool.
- ② Do not use the ATC (automatic tool change) until the following settings and checks are finished:
 - At the ATC, the arm and any part of the machine tool do not cause interference and there is no interference in the magazine.
 - The ATC weight capacity of the machine tool is sufficient for the angle head weight.
 - It is not necessary to change the ATC speed to a low speed (when the ATC weight capacity is small).
 - The settings for the positioning pin and dog as well as those for the orientation ring are completed (see P. 3).
- ③ The rigidity and allowable torque of the angle head are too small to withstand large load. Decrease the feed and cutting width by more than 50% from the normal cutting conditions (see the cutting data). Do not use any tool whose nose is no longer sharp enough.
- ④ Gear noises and heat generation occur to some extent, but this is not abnormal.
- ⑤ Take care not to spray coolant directly to the interface between the rotating shaft and the housing.

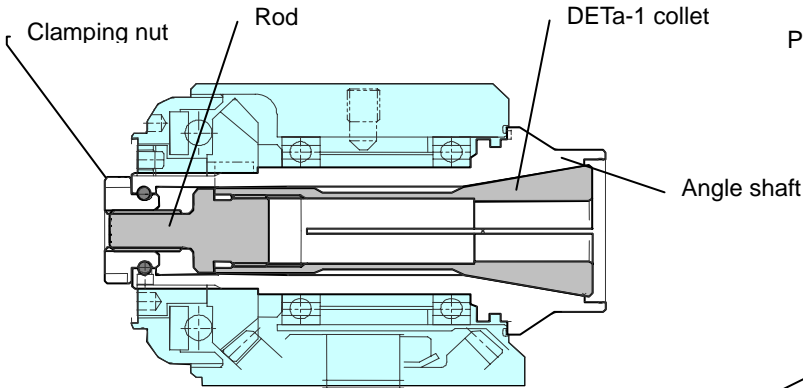
DETAIL



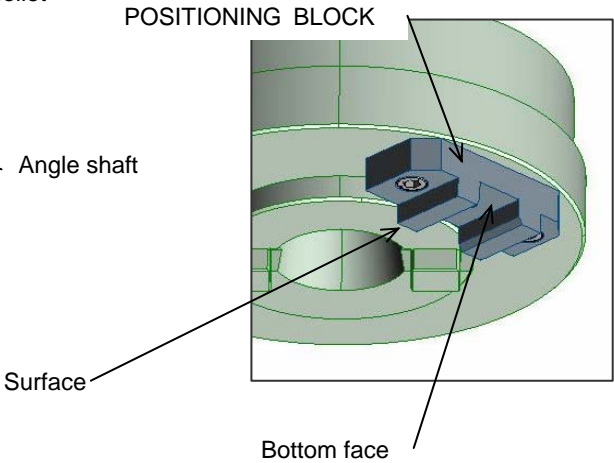
ADJUSTMENT PIN AND BLOCK



Clamping mechanism for cutting tools

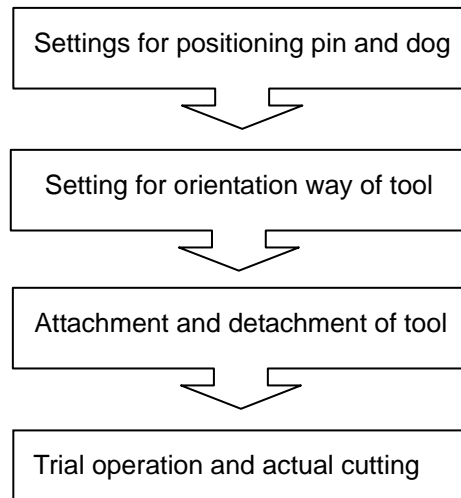


Positioning block for machine spindle



□ Preparations

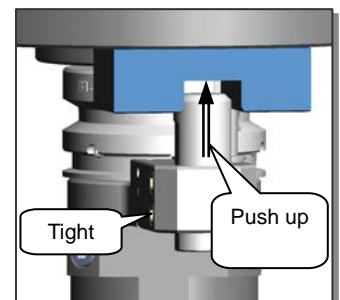
For the initial settings, perform the steps shown on the right side.



1 SETTING FOR POSITIONING BLOCK AND PIN

Preparations

1. Lower the positioning pin and dog so that they do not make contact with the positioning block when the angle head is inserted and clamped into the spindle.
2. Loosen all the setscrews to allow the orientation ring to rotate freely.
3. Lock the spindle of the machine tool to the orientation phase.
4. Setting of positioning pin
5. Clamp the angle head to the spindle of the machine tool.
6. Manually push up the positioning pin so that it fits into the fitting groove in the block. When the top of the positioning pin makes close contact with the bottom of the block, tighten the setscrew for the positioning pin using the provided wrench.

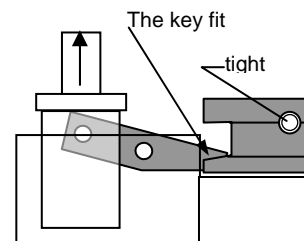


⚠ CAUTION

Be sure to use the provided Allen wrench to tighten the set screw for the positioning pin. Do not tighten it with excessive force. Otherwise, the locking block will be deformed and this causes the dog and key to malfunction, preventing the ATC from occurring anomaly.

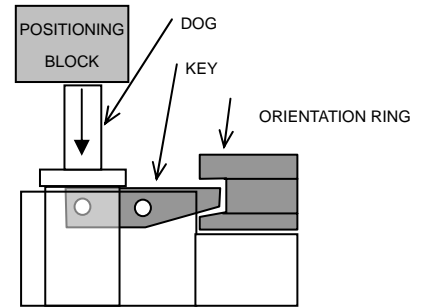
Setting for orientation ring

1. Check that the key is engaged with the orientation ring(see the right illustration).
If not, turn the orientation ring so that they are engaged with each other.
2. Now the orientation phase has been determined. Tighten the setscrew.



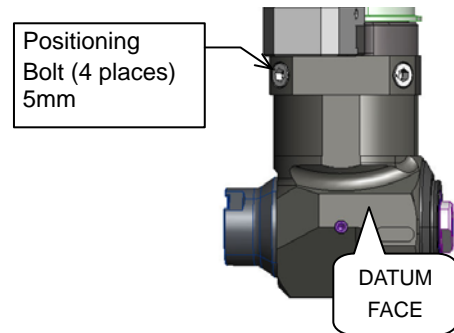
Setting for extruding amount of dog

3. Insert the Allen wrench from the dog height adjusting hole and then turn it clockwise. This will allow you to push the dog out with the screw. (If the Allen wrench cannot be turned, slightly loosen the dog setscrew.)
4. When the top of the dog makes contact with the block surface, the key starts moving. Extrude the dog by turning the wrench until the highest position of the key (where the wrench can no longer be turned) (see the right illustration).
5. Release the spindle of the machine tool.
Slowly turn the spindle by hand to check that the key has been released.
6. Remove the angle head from the spindle and tighten the dog setscrew.
Push the dog and key with your finger to ensure that they move normally.



2 Cutter way adjustment.

1. Loosen the phase locking bolt (see the right illustration) and adjust the orientation of the casing.
2. The datum surface is in parallel with the orientation of the tool nose. Using the feed of the machine tool, measure the datum surface with the indicator to set the orientation of the tool nose
3. Tighten the phase locking bolt in 4 places with uniform force. When the phase locking bolts are tightened, the phase may change. Gradually tighten them while checking the phase.

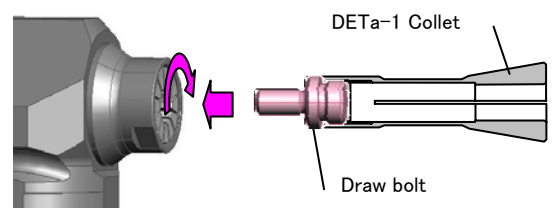


3 Set-up cutting tool

CAUTION

- ① The tool should be attached on the tool-clamping table or in a place where the work can be done comfortably. Avoid using any place, such as on the machine tool, where the wrench slips and causes danger.
- ② Be sure to insert the shank of the tool at least exceeding the minimum clamping length.
- ③ To clamp the tool, be sure to use two dedicated spanners for the angle shaft and the nut.

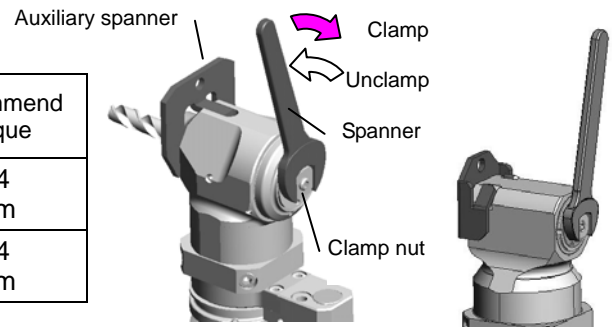
1. Attaching the data-1 collet
 - Screw the draw bolt into the DETa-1 Collet.
 - Hold the leading end of the DETa-1 Collet and insert the collet into the folder hole starting with the draw bolt.
 - Turn the clamp nut to draw the collet into the folder.



2. Tightening the tool

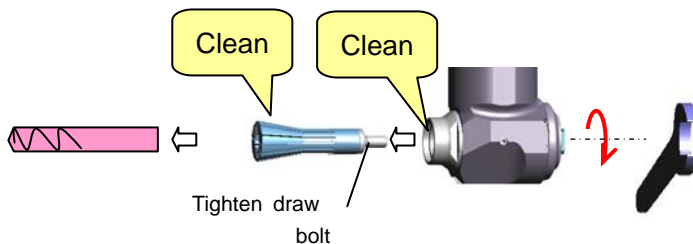
- Insert the tool to depth equal to or larger than the minimum claming length (see the following table).
- Tighten the clamp nut while holding the angle shaft with the auxiliary spanner.

| HEAD | Collet ID | Minimum Insert length | Spanner code | Recommend Torque |
|--------|-------------------|-----------------------|--------------|------------------|
| HFD 7 | ϕ 2,2.5,3,4 | 12mm | SS-13 | 14 Nm |
| | ϕ 5,6,7 | 16mm | SS-22 | |
| HFD 12 | ϕ 4,6 | 16mm | SS-17 | 34 Nm |
| | ϕ 8,10,12,13 | 20mm | SS-30 | |



3. Changing the tool

- When changing the tool, be sure to remove the DETa-1 Collet and the draw bolt, clean their insides, and then check that the draw bolt has been tightened.



⚠ CAUTION

To remove the tool, loosen the clamp nut by using the auxiliary spanner and the spanner as in the case of tightening the clamp nut.

⚠ CAUTION

In the process of loosening the clamp nut to remove the tool, the loosened tool may pop up due to adhesion between the main body and the collet. For safety, lightly hold the tool with waste cloth or the like.

4 Test cut – Actual cut

⚠ CAUTION

1. Before starting cutting, check that all of the positioning block, each part of the angle head, and the tool clamp are tightened completely.
2. Ensure that the spindle of the machine tool rotates in the reverse direction (M04) (the tool rotates in the forward direction).
3. Never exceed the maximum allowable speed of the angle head.
4. If the tool nose becomes dull, the cutting resistance of the tool suddenly increases resulting in great load on the angle head. Do not use any tool whose nose is no longer sharp enough.

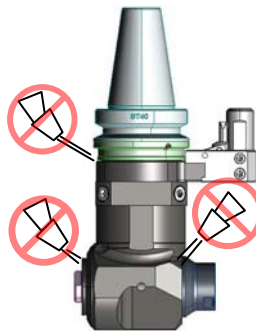
1. At the trial operation, ensure slow rotations and check for any abnormality. Next, gradually increase the rotation speed to about 500 rpm and then carry out the break-in operation at this level for several minutes. During the rotations, slight gear noises are heard, but this is not abnormal.
2. Before the actual cutting, carry out experimental cutting starting with low cutting conditions, and then gradually increase the conditions without causing excessive load (see the cutting data).



CAUTION

1. As the load increases due to the cutting resistance, the drilled hole and the machined surface may show large leaning.
2. The relative roughness of the finished surface is approximately of medium finishing (6.3s to 12.5s).
3. If the cutting load is too large or if there are excessive vibrations, decrease the conditions.
4. Spray coolant toward the tool nose. Do not spray coolant directly to any of the rotating parts of the angle head (see the following illustration).

Avoid spraying coolant directly to the following parts indicated in the right illustration.



Cutting data

The conditions vary depending on your machine tool.

| Angle head | BT40-HFD12-180 | | BT40-HFT6-180 | BT40-HFD12-120 | |
|------------------------|----------------|-------------|---------------|---------------------------|---------------------------|
| TEST CUT | 12mm DRILL | 5.1mm DRILL | M6 TAP | 10mm ENDMILL SLIDE CUT | 10mm ENDMILL SLIDE CUT |
| MATERIAL | S55C | S50C | S50C | S55C | S55C |
| CUTTING SPEED m/min | 25.2 | 22.4 | 3.77 | 11 | 11 |
| FEED SPEED mm/min | 67 | 140 | 200 | 50 | 50 |
| RPM min-1 | 670 | 1400 | 200 | 350 | 350 |
| DEPTH | 10 | 18 | 10 | 10×2 | 3 |
| POSITIONG PIN | STRAIGHT | STRAIGHT | STRAIGHT | TAPER | TAPER |
| NOTE | | | TAPPING | Climb-Cutting | Climb-Cutting |

MAINTENANCE

1. Keep clean the DETa-1 collet, the hole in the holder, the shank, and the moving parts of the positioning pin and the dog. If chip or dust is attached to any of those parts, the decreased accuracy or malfunction can result.
2. If the angle head half is not used for an extended period of time, clean it and coat the entire surface with machine oil or the like to prevent rust.
3. Add grease at the frequencies indicated in the following table in accordance with your operating situation. Remove the phase locking bolt, remove the head from the housing, and then apply grease directly to the internal gear.
4. If the angle head is exposed to cutting fluid during the operation, the cutting fluid may enter the inside of the angle head. Loosening the drain bolt allows you to drain the cutting fluid stored inside and also to check for intrusion of cutting fluid. If cutting fluid is liable to enter the inside, take remedial actions such as changing the direction of spraying cutting fluid, and add grease early.

GREASE UP

| | | |
|---|-------------------|-----------------------------|
| COOLANT | 2 HOURS USING/DAY | LESS THAN 2 HOURS USING/DAY |
| NOT USING SO MANY COOLANT | 200 HOURS | EVERY HALF YR |
| COOLANT HITTING ANGLE HEAD BODY DIRECTLY. | 50 HOURS | EVERY MONTH |