

Accuracy Test Procedure Novamatic 2000 CNC



NOVAMATIC 2000 - CNC
5 Axis CNC Tool Grinding Machine



Accuracy Test Procedure

Manufacturer's Number : _____

Work Piece Headstock Type : _____

Year of Manufacture : _____

Customer Number : _____

Customer : _____

Date : _____

Technician : _____

Manufacturer : _____

Accuracy Test Procedure Novamatic 2000 CNC

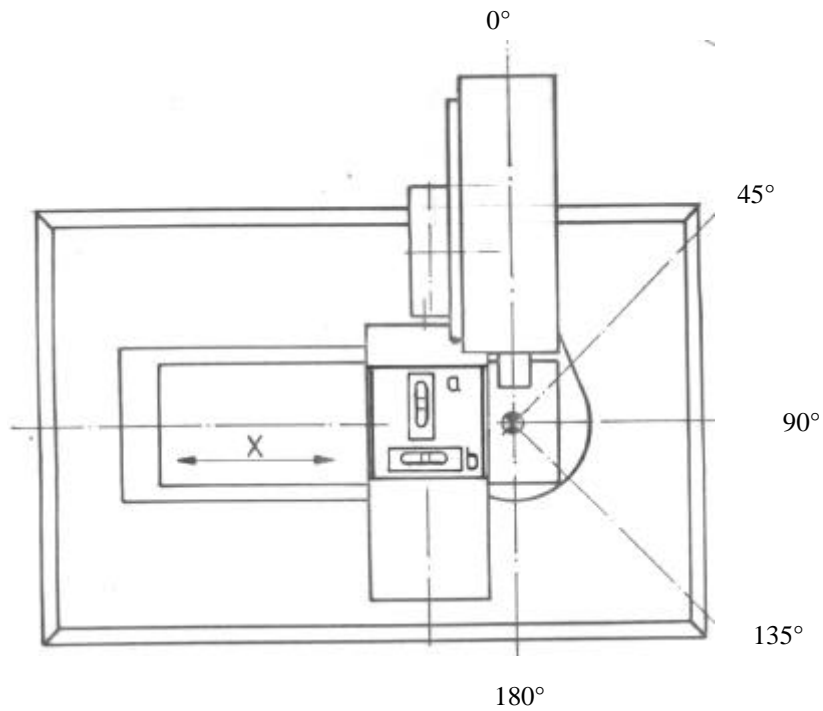
Measurement No. 1 Flatness of the mounting surface of the work piece headstock with the B axis in various positions.
 (Examination of stability when swiveling the B axis)

Testing Tools Water Level (0.04 mm/m)

Procedure The level is laid onto the ground mounting surface of the work piece headstock (Z axis carriage) widthwise (measurement a) as well as lengthwise (measurement b). Measurements are taken with the B axis in the following positions: 0°

Note

- With poor sub-support in the floor large differences may occur.
- The measurement is made at the factory and at the customer site, and is prerequisite for the following measurements.



Measurement Results : Deviation [inch]

B Axis Position	Width allowable	Width measured	Length allowable	Length measured
0°	0.0016"		0.0016"	

Accuracy Test Procedure Novamatic 2000 CNC

Measurement No. 3 Squareness of the Z axis to the X axis.

Testing Tools

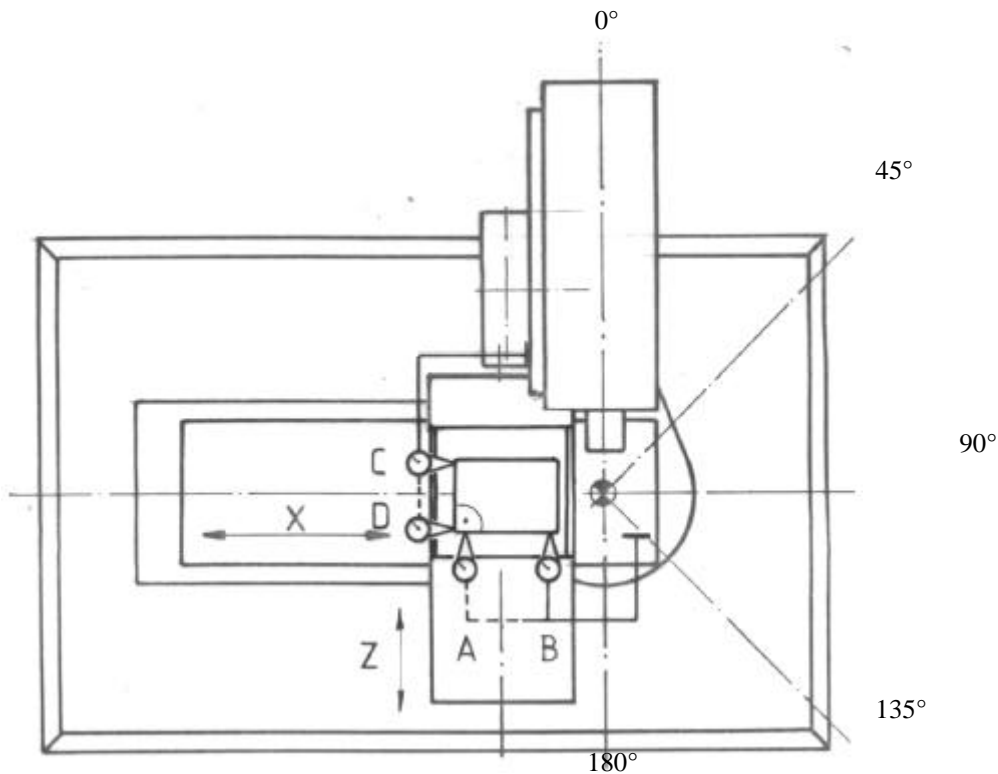
- Dial gauge (0.001 mm).
- Test platen ground exactly square (150 * 100).
- Magnetic clamp.

Procedure

- Place the magnetic clamp onto the Z axis and mount the test platen. Align the dial gauge to the front face of the platen.
- Travel path AB with the X axis and align the platen to the dial gauge at exactly zero.
- Travel path CD with the Z axis and record the value displayed by the dial gauge.

Note

- The test platen must be ground exactly square.
- This measurement is only made at the factory, or for severe collisions of the Z or X axes.



Measurement Results [inch]

Measurement Path	Measurement Length	Allowable Deviation	Actual Deviation
AB	3"	0.00008"	
DC	2"	0.0002"	

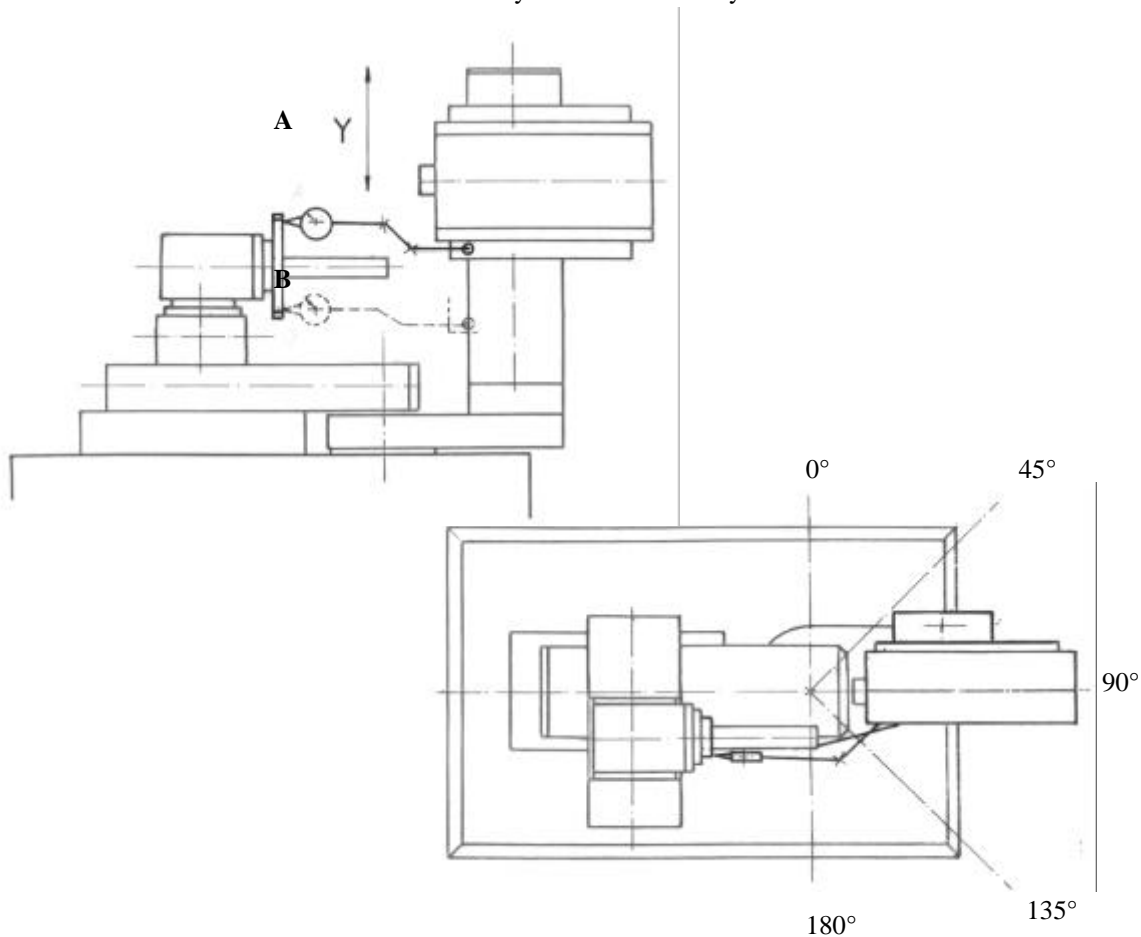
Accuracy Test Procedure Novamatic 2000 CNC

Measurement No. 4 Angle of the Y axis to the machine table.

Testing Tools Special test mandrel.
Dial gauge (0.001 mm.).

Procedure Align the dial gauge to the vertical surface of the test mandrel and travel path AB with the Y axis. This measurement is repeated at the following positions: 0°, 45°, 90°, 135° and 180°. Record the values.

Note Measurements 1 and 2 are prerequisite for this measurement.
The grinding wheel spindle is set at roughly 90°.
This measurement is only made at the factory.



Measurement Results [inch]		Measurement Length : 8 inch				
Deviation at Path AB	Pos. 0°	Pos. 45°	Pos. 90°	Pos. 135°	Pos. 180°	
Allowable	0.015	0.015	0.015	0.015	0.015	
Actual						

Accuracy Test Procedure Novamatic 2000 CNC

Measurement No. 5 Squareness (alignment) and parallelism of the X axis to the B axis and the grinding wheel mount.
Alignment of the B axis to the reference offset.

Testing Tools Dial Gauge (0.001 mm).
Test mandrel for the grinding wheel spindle mount (HSK 50).

Procedure

1. Insert the test mandrel into the grinding wheel spindle mount.
2. Place the dial gauge support onto the Z carriage.
3. Travel path AB (figure 1) with the X axis and align axis B until the dial gauge no longer demonstrates any displacement along this path.
4. Travel path CD (figure 2) with the X axis and record the displayed value. If the allowable deviation is exceeded, the spindle motor must be adjusted. The measurement must then be repeated starting with step 3.
5. Record the measured deviation along path CD.
6. At the 0° position of the B axis the test mandrel must stand at a perfect right angle (90°).
7. Set the B axis to zero (CE/E)
8. Move all axes to the reference position (F6)
9. Record relative travel [B]
10. Control (Steering) Off
11. Exit Windows (Alt + F4)
12. Select program Pe3 (pe3 + Return)
13. Press Alt+C keys (Alt + c)
14. Enter I variable: 526 (then Return)
15. Change to „jump to“ with the TAB key (then Return)
16. Calculation: Offset (new) = relative travel [b] × 116508,444
17. Enter calculated offset (old value ± new offset value)
18. Change to „Close“ with TAB key (then Return)
19. Enter „Save“ (then Return)
20. End program with Alt+ F4
21. Change path (cd.. then Return)
22. Start Windows (type in „win“) (win)
23. Start reference run (F6)
24. Travel exactly 90° with the B axis. Monitor the 90° position with the dial gauge. If this value exceeds the allowable deviation => set B axis to zero and repeat step 3. Record relative travel (indicate ±).
25. Repeat steps 10 through 15.
26. Record the offset value (new).
27. New calculation : (observe if value is + or -). Offset (old) - Offset (new) = X
28. Continue with step 22 until the deviation is within the allowable range.
29. Record the deviation measured at path AB.

Note These measurements and alignments are only undertaken at the factory.

Accuracy Test Procedure Novamatic 2000 CNC

Figure 1:

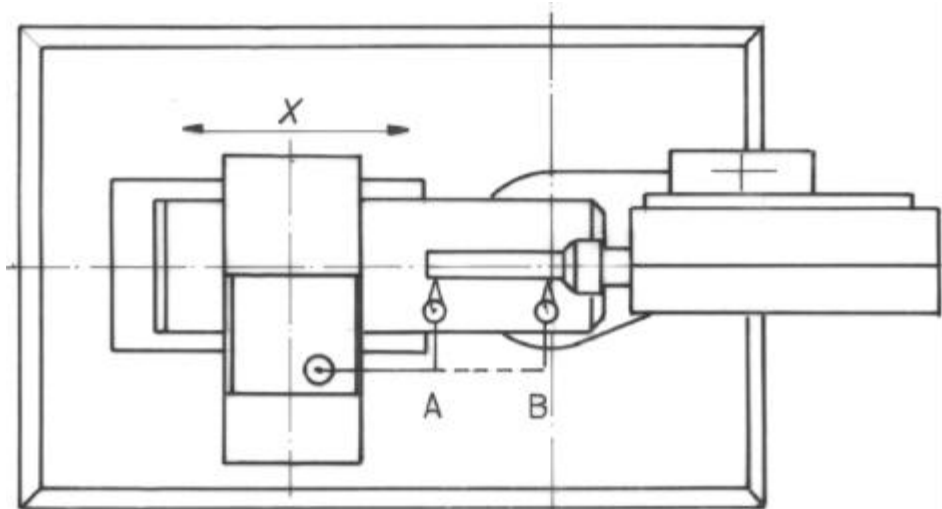
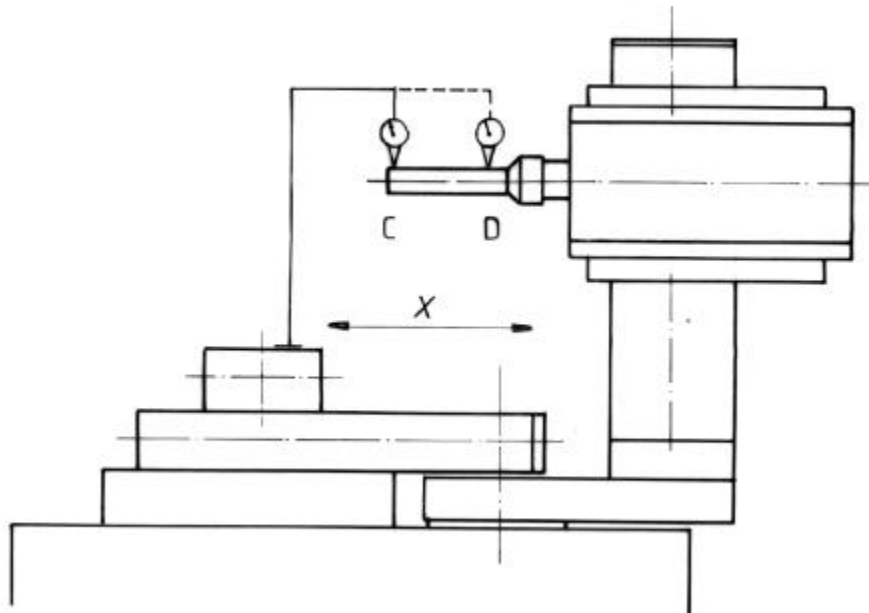


Figure 2:



Measurement Results [inch]

Measurement Path	Measurement Length	Allowable Deviation	Actual Deviation
AB	8"	0.0002"	
DC	8"	0.0004"	

Accuracy Test Procedure Novamatic 2000 CNC

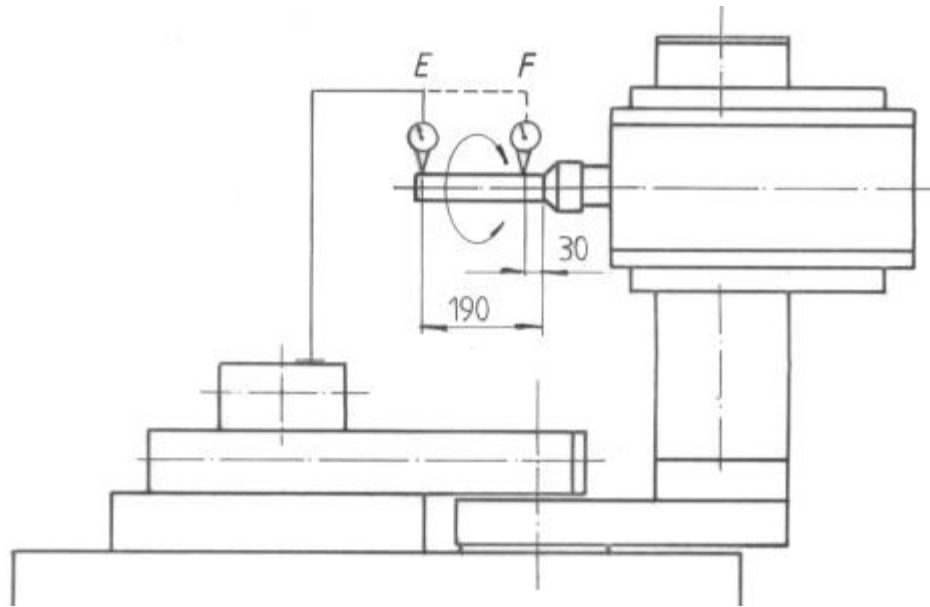
Measurement No. 6 Concentric accuracy of the grinding wheel spindle mount.

Testing Tools Dial gauge (0.001 mm).
 Test mandrel HSK 50.

Procedure

- Align dial gauge to point E and point F.
- Turn the spindle by hand.
- Record the respective values displayed by the dial gauge.

Note This measurement is only made at the factory.



Measurement Results [inch]

Measurement Point	Clearance Test Mandrel	Allowable Deviation	Actual Deviation
E	1.4800"	0.00075"	
F	1.1811"	0.0004"	

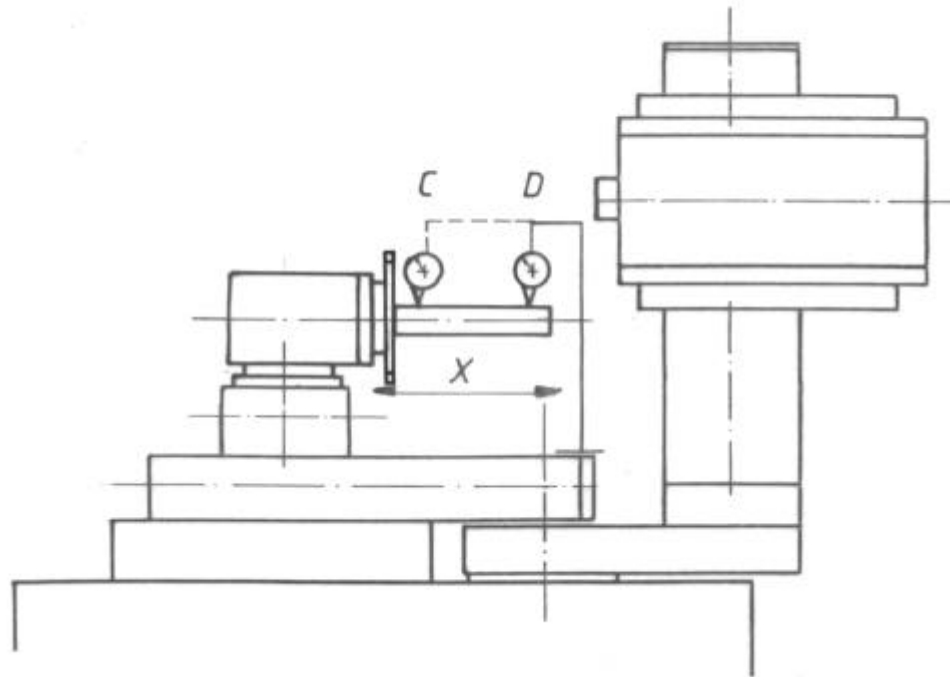
Accuracy Test Procedure Novamatic 2000 CNC

Measurement No. 7 Parallelism of the work piece headstock axis of rotation (Z axis) to the X axis.

Testing Tools Special test mandrel Sk40 or ISO 50.
Dial gauge (0.001 mm).

Procedure - Make a rough adjustment of the work piece headstock according to measurement 8.
- Travel the full length of the test mandrel with the X axis.

Note This measurement is only made at the factory or for severe collisions.



Measurement Results [inch]

Measurement Path	Measurement Length	Allowable Deviation	Actual Deviation
CD	10"	0.0005"	

Accuracy Test Procedure Novamatic 2000 CNC

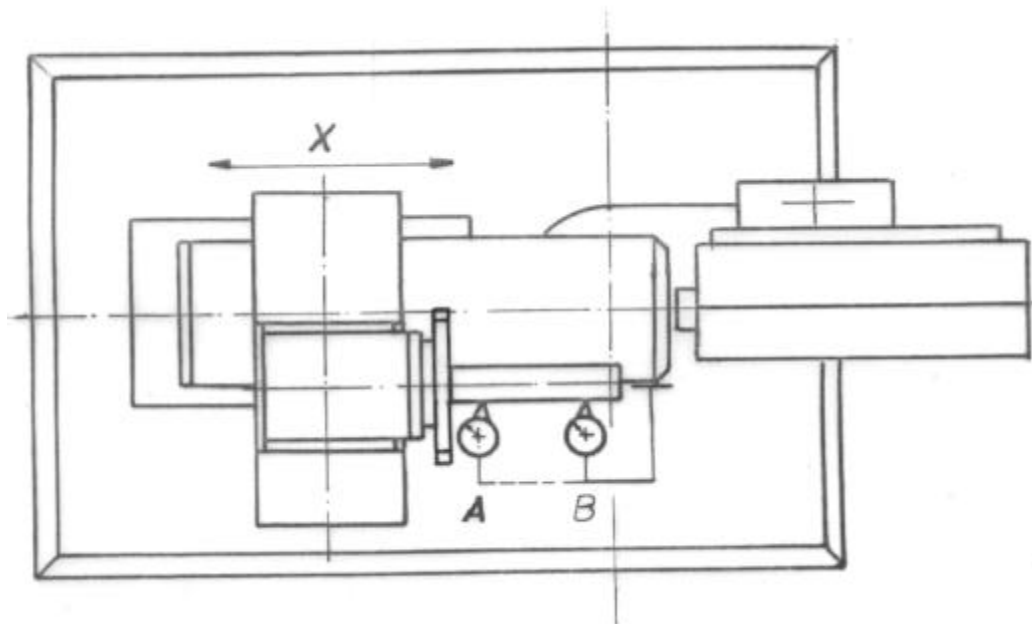
Measurement No. 8 Alignment of the work piece headstock (C axis) to the X axis.
 (alignment of the C axis).

Testing Tools Dial gauge (0.001 mm)
 Special test mandrel Sk40 or ISO 50

Procedure

- Measurement 7 is prerequisite to this measurement.
- Travel path AB with the X axis and at the same time align the work piece headstock (C axis) until the dial gauge no longer demonstrates any displacement.
- Turn the screws down tight and repeat the measurement.

Note This measurement is made after transport at the customer's premises or after collision.



Measurement Results [inch]

Measurement Path	Measurement Length	Allowable Deviation	Actual Deviation
CD	10"	0.0002"	

Accuracy Test Procedure Novamatic 2000 CNC

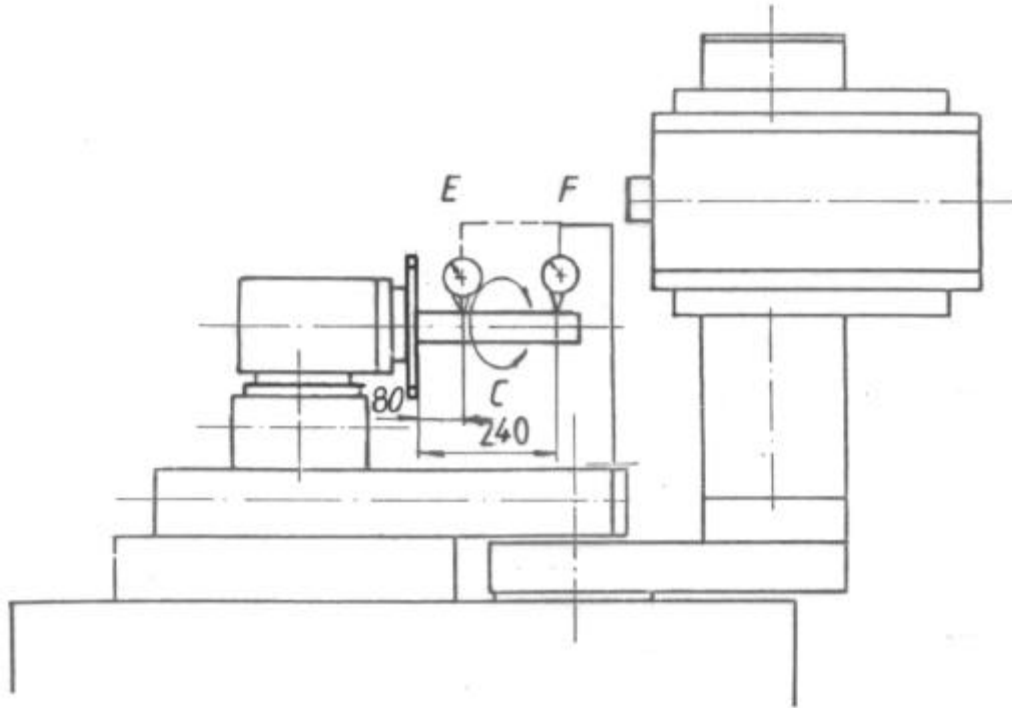
Measurement No. 9 Concentric accuracy of the work piece headstock (C axis).

Testing Tools Special test mandrel Sk40 or ISO 50.
Dial gauge (0.001 mm).

Procedure

- Align dial gauge to point E and point F.
- Turn C axis slowly.
- Record values.

Note This measurement is only taken at the factory.



Measurement Results [inch]

Measurement Point	Clearance Test Mandrel	Allowable Deviation	Actual Deviation
E	3.1496"	0.0003"	
F	9.4488"	0.0008"	

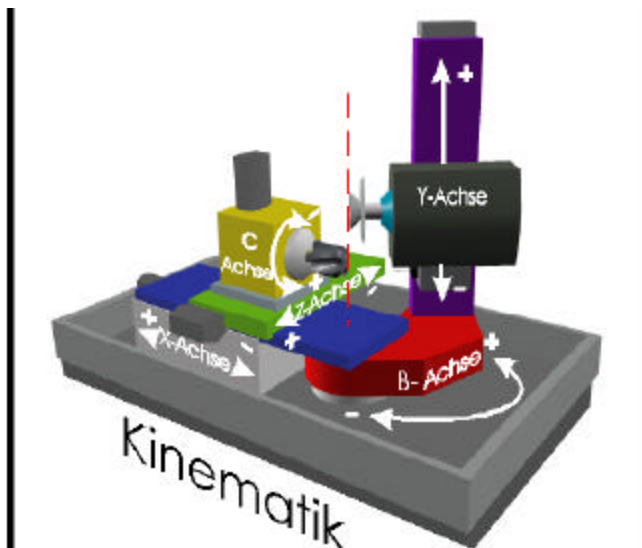
Accuracy Test Procedure Novamatic 2000 CNC

Measurement No. 10 Mechanical backlash of the 5 axes.

Testing Tools Dial gauge (0.001 mm) .

- Procedure**
- Prerequisite : I variables in PMAC set to „0“
 - C axis : characteristic no. 686
 - B axis : characteristic no. 586
 - X axis : characteristic no. 186
 - Y axis : characteristic no. 286
 - Z axis : characteristic no. 386
 - Align the dial gauge to the respective axis.
 - Travel a short distance in one direction with the respective axis.
 - Set the relative value of the axis to „0“ [CE key].
 - Travel slowly in the opposite direction with the handwheel (manual operation, 0.001), until the value displayed by the dial gauge changes.
 - Record the relative values.

- Note**
- This measurement is only made at the factory.
 - If, after a lengthy period of time, the backlash of the C axis exceeds the allowable deviation, the play must be re-adjusted. (see operating instructions)



Measurement Results [mm]

CNC Axis	Measurement Point	Allowable Deviation	Actual Deviation
C	approx. 40mm from the spindle center		
B	at the grinding wheel mount		
X	at the work piece headstock		
Y	at the grinding wheel mount		
Z	at the work piece headstock		

Accuracy Test Procedure Novamatic 2000 CNC

Measurement No. 11 Backlash compensation of the axes.
 Backlash of the 5 axes according to compensation of the axes via the controls (PMAC)

Testing Tools Dial gauge (0.001 mm)

Procedure In order to maintain backlash in the μ -range, the axes can be compensated with the PMAC controls. The allowable deviations from measurement no. 10 must, however, be maintained.

Actual Sequence:

1. All I variables must be set to zero, as with measurement no. 10.
2. Determine and record all backlash for the individual axes (see measurement 10).
3. Determine backlash compensation for each axis.
 FORMULA: Compensation Data = 16 * 1024 * Play [mm]
4. Exit Windows
5. Select program Pe3 (pe3 + Return)
6. Press Alt+C keys (Alt + c)
7. Enter I variables: (see table for measurement 10) (then Return)
8. Change to „jump to“ with the TAB key (then Return)
9. Enter the calculated compensation data for one axis after the other.
 The respective axes can be called up with „jump to“.
10. Change to „Close“ with the TAB key (then Return)
11. Enter „Save“ (then Return)
12. End the program with Alt+ F4
13. Change the path (cd.. then Return)
14. Start Windows (type in „win“) (win)
15. Measure and record backlash for each axis once again.
16. If the allowable deviations are exceeded, the compensation sequence must be repeated.

Note Compensation is adjusted at the factory.

Measurement Results [mm]

CNC Axis	Measurement Point	Allowable Deviation	Actual Deviation
C	approx. 40mm from the spindle center		
B	at the grinding wheel mount		
X	at the work piece headstock		
Y	at the grinding wheel mount		
Z	at the work piece headstock		