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Analysis of Reject Part Adapter CN-235 (N70)

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Abstract *- Part CN CN 235 (N70) adapter is a part for the infrared radar sensor seat holder or housing on the aircraft. This part requires high accuracy and there should be no mistakes in the manufacturing process. Analysis of Part Adapter damage is done because there is a discrepancy in the size of zone 30 that is the standard 0.5 micron while the result is 0.7 micron. The analysis was performed using the measurement protocol method on the Deckal Maho machine. The results of measurement analysis on the Deckal Maho machine showed a deviation on the C axis of 24 microns from a tolerance of -20 to 20 microns. Calibration is carried out on the C axis by using calyces geometry measurements and parameter settings for the input data on the Deckal Maho machine monitor. Calibration results on Axis C show deviations of -10 microns, still within tolerance.*

Keywords: *Calyces Geometry, Protocols, Deckal Maho 210 U, Deviations.*

I. INTRODUCTION

CN 235 (N70) Part Adapter is a part for the infrared radar sensor holder or housing on the aircraft. This part requires high accuracy and there should be no mistakes in the manufacturing process. Errors or incompatibility of the Adapter part significantly impact the failure of the aircraft to fly and result in accidents due to high pressure when in the air. High accuracy and tolerance are needed for the aircraft industry.

Part Adapter is a part of an aircraft that is mounted under the fuselage which functions to place the antenna or omni radar infrared sensor. The radar functions as a detector of airplanes or ships while flying in the air while the radar that is read is only a graphic form of the body of the ship or crew approaching. Mismatched parts that are forced to be assembled on the aircraft impacted the crack on the aircraft components.

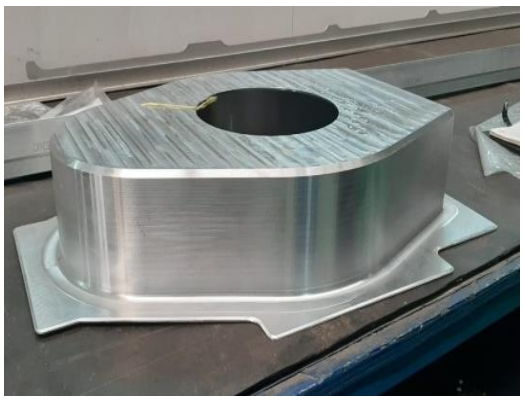

Fig.1 Part Adapter

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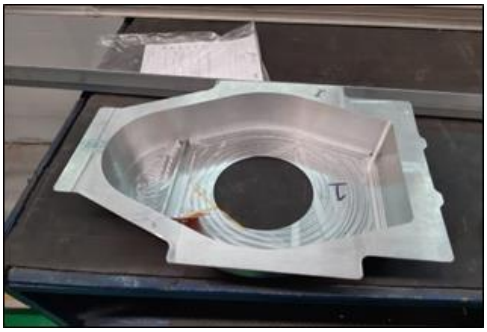


Fig.2 Part Adapter (Top view)

II. BASIC TEORY

2.1 Decal Maho DMG MORI DMC 210 U Machine

Maho DMC 210-U Deckel CNC machine is a DMG machine made from Germany and has a universal 5 axis, this milling type machine has 1500 spare parts and 63 packing hits then packed into 10 cases and shipped to various countries. The function of this machine is to manufacture aircraft components of medium size as in the manufacturing of Hinge Rib 4 parts for A380 Air Bus aircraft.

Fig.3 Decal Maho DMC 210-U Machine

Product Specification Decko Maho DMC 210-U
Driving Power : 85 KW
Rotating Speed : 30,000 rpm
Spindle Torque : 40 Nm
Cooling Pressure : 50 bar
Has 60 magazine pockets / 60 cutter cutter houses
Max. distance limit:
X axis = 1,800 mm
Y axis = 2,000 mm
Z axis = 1,250 mm
Max. feeding speed:
X axis = 60,000 mm/min
Y axis = 40,000 mm/min
Z axis = 40,000 mm/min
Max. feeding strength:
X axis = 1,800 mm
Y axis = 2,100 mm

Z axis = 1,250 mm
Engine strength : 0.012 mm
Air pressure : 6 bar
Main mover : AC motor and digital control
NC-paller turntable : 1,400 x 1,600 mm
Surface clamping : 1,400 x 1,600 mm
Control unit : iTNC 530 Heidenhain

1.2 Spindle

Spindle are used to install different tools for working on workpieces, tools that are clamped on the spindle to workpieces in rotation of 90 degrees. The DNC 210-U engine spindle has a maximum rotating speed of 30,000 rpm.

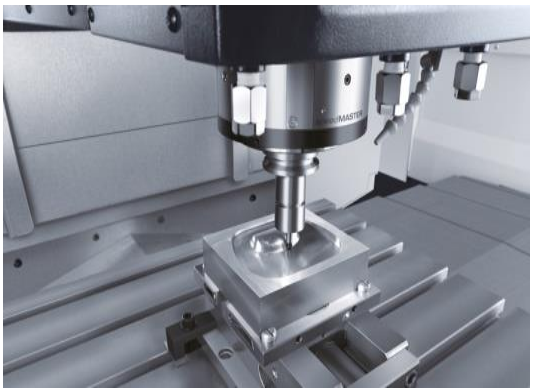


Fig.4 Spindle

2.3 NC Circular Table with Pallet

The pallet is located on the pallet support, while the NC circular is located in the machining compartment of the machine. The pallet can rotate 1,400 x 1,600 mm. The usefulness of the pallet for storing materials or often referred to as the table holders of parts that are done by the spindle.

Fig.5 Pallet

2.4 Laser Measuring Tool

The Laser Measuring or blum-micro tool is used to measure the length of the tool, the diameter of the tool, and enter the data into the tool data list. Tool measurements are carried out by moving the laser beam on the tool from above and from the side.

Fig.6 Laser Measuring Tool

2.5 Magazine Tool

Magazine Tool is where the Cutting tool is stored in a CNC machine, all the Cutting tool that will be used in the process of forming workpieces is stored in the tool magazine and the amount in the magazine tool is 60 units. This magazine tool will move when the program is ordered by the operator

Fig.7 MagazineTool

III. METHODOLOGY

This research uses a methodology in the form of a protocol from a Deckal Maho DMG MORI DMC 210 U machine. The protocol process in this report is a guideline for measuring geometry calyces and being the correct setting when experiencing touble shooting axis deviations on the machine. The calyces geometry measurement procedure on the Deckal Maho DMG DMC MORI 210 U:

3.1. Gentry's Axis Measurement Protocol.

This measurement protocol is where a spindle is flanked by 2 axes namely the Z axis and the help axis called the Gentry axis. The measurement is assisted by measuring the dial indicator with a 0.002 mm exact size, while the measurement instructions are as shown below. Place the dial indicator on the pallet table then move or move using the spindle to the end of

the pallet table that leads to the X axis, while the tolerance of this measurement is 0.002 mm for half the pallet table 500 mm and 0.003 mm for the 1000 mm pallet table or table end.

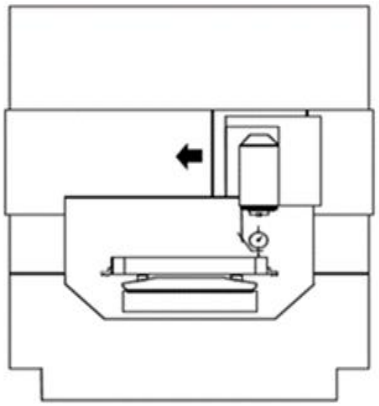


Fig.8 Gentry measurement protocol

3.2 Axis measurement protocol A.

In the axis A measurement protocol in relation to vertical movements, the measurement test is the same as using a dial indicator, but it is assisted by a holder or some kind of tool specifically for measuring calyces geometry.

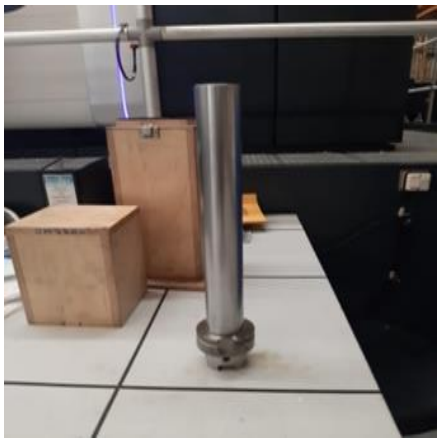


Fig.9 Arbor

3.3 Axis Measurement Protocol A axis (B)

This measurement with the movement of the work spindle swing and lengthen the dial indicator. As for the measurement procedure, place the milling head in the center of the first pallet, measure the side of the arbor from the top of the arbor to the bottom of the bottom arbor but before measuring the spin first the spidle is 180 °. This tolerance must be considered this measurement of 0.02 mm and a permissible diameter of 300 mm

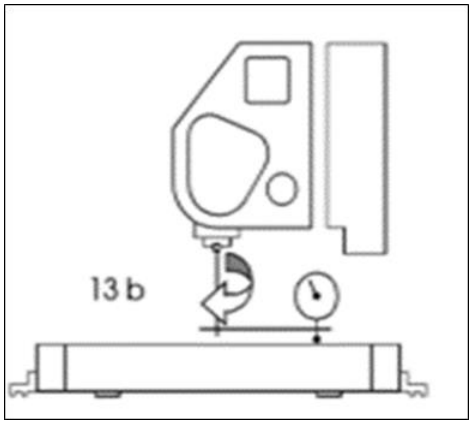


Fig.10 Axis measurement protocol A axis (B)

3.4 Axis Measurement Protocol C

Object measurement with a dial indicator attached to the pallet table with a straight line or longitudinal movement, where the measurement instructions that must be done is to move the dial indicator on the pallet side of the table to the length of the table or pallet, tolerable allowances are 0.02 mm or 0.002 microns.

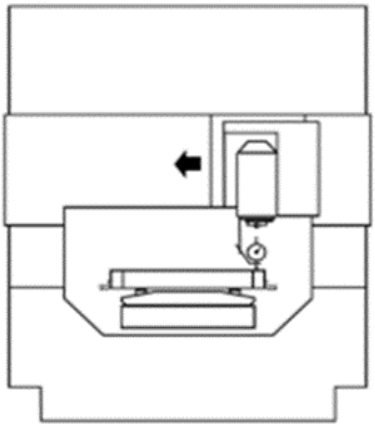


Fig.11 Measurement protocol C

IV. ANALYSIS AND RESULT

Data or images are obtained from parts that are declared rejecked at the bottom of the image, these parts indicate there are discrepancies when work in progress, there may also be trouble shooting from the machine working on it.

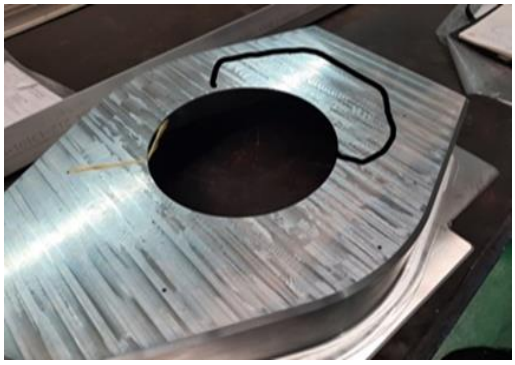


Fig.12 Rejeck Part

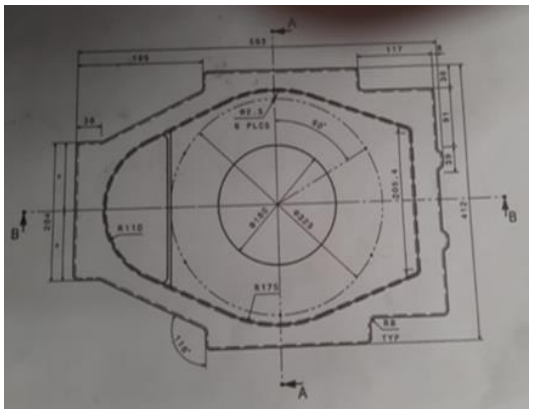
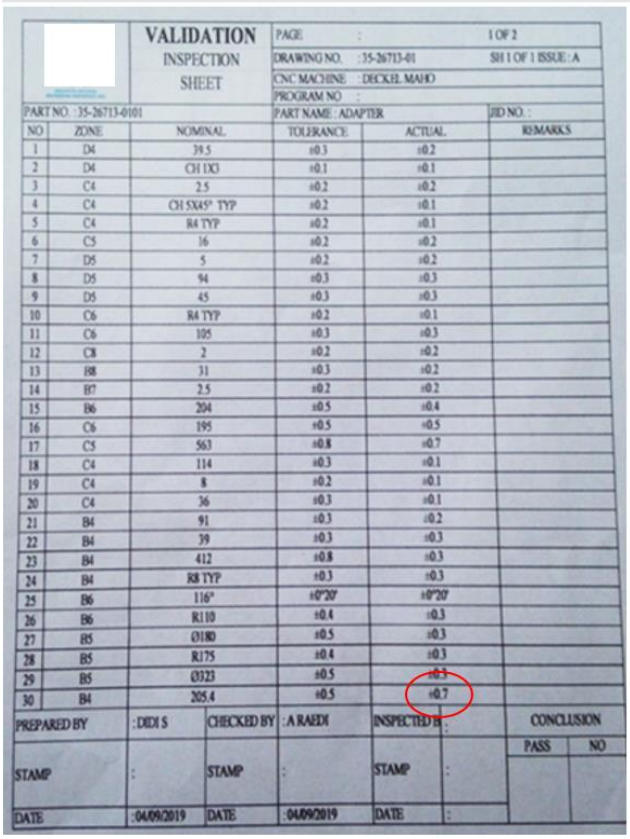


Fig.13 Dimensions of parts

From the results of the inspection part rejeck obtained: Data obtained when research in the image part (top view) shows that in zone number 30 there is a machine cut to the material not in tolerance of 0.5 microns but 0.7 microns



VALIDATION INSPECTION SHEET			PAGE : 1 OF 2		
			DRAWING NO. : 35-26713-01		SH 1 OF 1 ISSUE : A
			CNC MACHINE : DECKEL MAHO		
			PROGRAM NO :		
PART NO. : 35-26713-0101			PART NAME : ADAPTER		JID NO. :
NO	ZONE	NOMINAL	TOLERANCE	ACTUAL	REMARKS
1	D4	39.5	±0.3	±0.2	
2	D4	CH DO	±0.1	±0.1	
3	C4	2.5	±0.2	±0.2	
4	C4	CH 5X45° TYP	±0.2	±0.1	
5	C4	R4 TYP	±0.2	±0.1	
6	C5	16	±0.2	±0.2	
7	D5	5	±0.2	±0.2	
8	D5	94	±0.3	±0.3	
9	D5	45	±0.3	±0.3	
10	C6	R4 TYP	±0.2	±0.1	
11	C6	105	±0.3	±0.3	
12	C8	2	±0.2	±0.2	
13	B8	31	±0.3	±0.2	
14	B7	2.5	±0.2	±0.2	
15	B6	204	±0.5	±0.4	
16	C6	195	±0.5	±0.5	
17	C5	563	±0.8	±0.7	
18	C4	114	±0.3	±0.1	
19	C4	8	±0.2	±0.1	
20	C4	36	±0.3	±0.1	
21	B4	91	±0.3	±0.2	
22	B4	39	±0.3	±0.3	
23	B4	412	±0.8	±0.3	
24	B4	R8 TYP	±0.3	±0.3	
25	B6	116°	±0°20'	±0°20'	
26	B6	R110	±0.4	±0.3	
27	B5	Ø180	±0.5	±0.3	
28	B5	R175	±0.4	±0.3	
29	B5	Ø323	±0.5	±0.3	
30	B4	205.4	±0.5	±0.7	
PREPARED BY	: DIDI S	CHECKED BY	: A RAEDI	INSPECTED BY	:
STAMP	:	STAMP	:	STAMP	:
DATE	: 04/09/2019	DATE	: 04/09/2019	DATE	:

CONCLUSION	
PASS	NO

Fig.14 Inspection result (before)

The data obtained when the study in the picture above shows that in zone number 30 there is a machine cut to the material not 0.5 micron in tolerance but 0.7 micro

4.1 Analysis

Measurement analysis was carried out using the protocol method issued by the maker of Deckal Maho machines. The measurement mechanism is as follows:

1. Measurement on the Gentry Axis that attaches the dial indicator to the pallet table by moving the spindle in the direction of the x axis by 3 microns from the process carried out and entering the specified tolerance.

2. Axis A measurement to determine vertical motion is assisted by an arbor and dial indicator. This measurement stage by moving the spindle in the direction of the z axis with the initial measurement from the top of the arbor base to the bottom of the arbor. The results of measurements on the engine of 2 microns.

3. Axis Measurement A axis (B) determines vertical motion but the dial indicator needle is next to the side of the arbor. The dial indicator needle is attached to the base of the arbor and driven by the spindle in the direction of the z axis. The measurement results on axis A axis (B) of 8 microns.

4. Axis C measurement measures the smoothness and slope of the pallet table. The process is carried out when measuring this spindle moving in the direction of the X axis from the starting point of the pallet to the end of the pallet table. The results obtained for 24 microns so that the data obtained to explain axis deviations are in Axis C with a tolerance of 20 microns.

The results of caltces geometry measurements on the Deckal Maho DMC MORI 210 U machine were obtained as follows:

Table 1 Geometry Measurement Results

Meas.	Axis	Tol.	Result	Note
1	Axis Gentry	40mc	3 mc	ok
2	Axis A	20mc	2 mc	ok
3	Axis A (B)	20mc	8 mc	ok
4	Axi C	20mc	24 mc	no

To correct Axis C deviations, a calibration process performed on the Deckal Maho engine as follows:

The repair process is the process of returning a machine or object that is damaged due to normal usage again.

Axis C improvement formulations of 24 microns are as follows:

$$\frac{24}{2} = 12 \quad \text{micron}$$

Where:

24 = Out tolerance

2 = Precision dial indicator of 0.002 microns

12 = Out of tolerance

After repeating the measurement starting from 12 microns on the indicator dial there is a return of the needle to the 12 micron point.

After knowing the results of the out tolerance of 12 microns, an inspection is carried out on the pallet table by setting the zero dial indicator position.

Fig.15 Dial Indicator to Zero Point

Then the Axis C was taken back to the pallet table.

Axis C measurement results obtained the value of deviation of(-10) microns. This shows that deviations are still within tolerance.

Then the calibration data (-10 micron) is entered into the Deckal Maho machine monitor parameters with the following mechanism:

- The initial parameter of the Axis C before it is replaced is -95.6487
- The parameter value of -95.6487 is reduced by -10 to -95.6477
- The new parameter of -95.6477 then becomes the input parameter on the monitor screen.

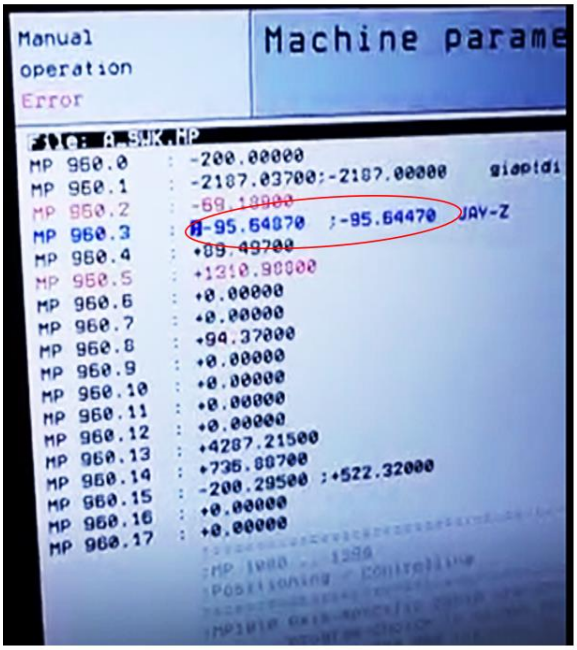


Fig.16 input parameter

The results on the screen, Axis C after entering the previous parameters.

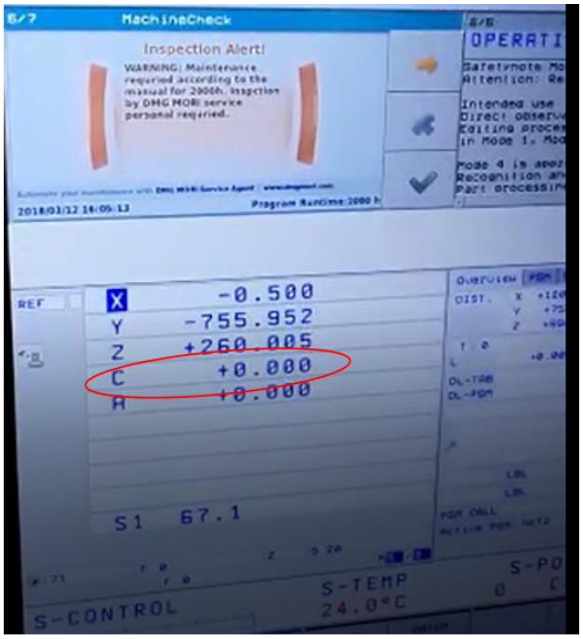


Fig.17 Parameter Results Axis c

Evaluation of the results of improvements obtained that the axis c deviation parameters of -10 microns. Then this parameter is entered into the parameters on the monitor and obtained 0.001 micron, this result is in accordance with the tolerance standard.

Parameters - deviation = Results

-95.6487

-95.6477 0.001

4.2 Results

Furthermore, to ensure the calibration parameters, the production process is carried out on the workpiece with the same adapter part.

The results of the examination on the Adapter part after the kelibrasi process was carried out, no reject parts were found

VALIDATION INSPECTION SHEET

PAGE : 1 OF 2
DRAWING NO. : 35-26713-01 SH 1 OF 1 ISSUE : A
CNC MACHINE : DECKEL MAHO
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PART NAME : ADAPTER JID NO. :
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NO	ZONE	NOMINAL	TOLERANCE	ACTUAL	REMARKS
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						CONCLUSION	
PREPARED BY	: DEDI S	CHECKED BY	A RAIDI	INSPECTED B	:	PASS	NO
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DATE	: 08/10/2019	DATE	08/10/2019	DATE	:		

Fig.18 Results Test data after the repair

V. CONCLUSION

The analysis shows that the part of the CN 235 Adapter Adapter (N70) of 0.7 microns is caused by a deviation in the Axis C of 24 microns. The repair mechanism is done by calibrating the Deckal Maho engine on Axis C.

VI. REFERENCES

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