Wheel repair and refurbishment application manual

Contents

1. GENERAL DESCRIPTION ................................................................. 1
2. DIGITIZING ................................................................................... 2
   Purpose ......................................................................................... 2
   Using method ................................................................................ 2
   Digitizing operation ................................................................. 4
   Protection or limitations: ....................................................... 8
   Digitizing result checking ..................................................... 8
3. TOOL LENGTH SET AND MACHINING ........................................ 9
   Purpose ......................................................................................... 9
   Using method .............................................................................. 9
   Protection or limitations: ....................................................... 11
4. REVISION HISTORY ..................................................................... 13
1. General Description

This document is used to describe functions and usage of wheel repair and refurbishment machine.

Car rims surface might be scratched during operation. The main purpose of wheel repair and refurbishment machine is just to re-polish rim surface. This machine has the following characteristics:

1. The precision is not very important.
2. Finish cutting with cutting range 0.1mm ~ 1mm.
3. Machine is used only for repairing car rim surface.
4. The main cutting material is aluminum alloy.

This machine function can be divided into two parts: digitizing and machining. The digitizing process is used to capture part of the car rim contour. Normally four rims of a car are not damaged at the same time, so user needs to take a rim which has better surface in order to probe the rim surface, capture rim contour data (side or front) and generate a machining program.

The next part is machining including the probe replacement by cutting tool, fixing the damage rim, and using the machining program generated above. Standard operating procedure (SOP) is shown in Figure 1-1.
2. Digitizing

Purpose

Capture part of the car rim contour by taking a rim which has better surface (no crash) in order to probe the rim surface, capture rim contour data (side or front) and generate a machining program.

Using method

a. Make sure that probe is installed and pushed F6-digitizing to enter digitizing interface as shown figure 2-1.
Figure 2-1 Digitizing interface.

**Setting description**

1. **File Name**: Input the file name generated after digitizing car rim.
2. **Probing Angle**: Set the direction of probing front or side of the rim.
3. **Probing Type**: Set digitizing method for front or side of the rim (from in-to-out/out-to-in/ch-up-to-down/down-to-up).
4. **Step over (E)**: Probing step, set the distance between each detection point.
5. **Retract Point (P0)**: Move probe to retract point and hit F1 [Mech. Coor. Teach] to set the machine coordinate of retract point. Retract point must be selected to make sure probe does not collide the wheel when digitizing process started.
6. **Start Point (P1)**: Move probe to start point and hit F1 [Mech. Coor. Teach] to set the machine coordinate of start point.
7. **End Point (P2)**: Move probe to end point and hit F1 [Mech. Coor. Teach] to set the machine coordinate of end point.

b. Switch machine to AUTO or MDI mode, and Hit F2 [start digitizing] to start digitizing process. Another screen will pop-up to confirm whether users want to digitizing (avoid wrong operation).
Digitizing operation

Capture part of the car rim contour – Front, From Out to In

1. Probe moves to Lead-In Point (P0) with G00 speed (No matter where probe is). (Move probe to position to ensure that probe does not collide with the wheel before digitizing)

2. Probe moves to X coordinate of P1 with default 100inch/min speed
3. Probe moves (in Z direction) to the point 0.2inch from Z coordinate of P1 with default 100inch/min speed
4. Probe continuously moves in Z-axis negative direction (1inch detection distance) with default 16inch/min speed.
5. When the probe touches the car rim surface, detect signal is triggered, and probe moves in Z-axis positive direction until detect signal OFF with default 16inch/min speed.
6. Probe moves in X-axis negative direction with moving step E.
7. Repeat steps 5-7 until the probe end position (P2).
8. Probe moves to Z coordinate of Lead-In Point (P0) with F100 speed.
9. Probe moves to X coordinate of Lead-In Point (P0) with F100 speed.

Capture part of the car rim contour – Front, From In to Out

1. Probe moves to Lead-In Point (P0) with G00 speed (No matter where probe is). (Move probe to position to ensure that probe does not collide with the wheel before digitizing)
2. Probe moves to X coordinate of P1 with default 100inch/min speed
3. Probe moves (in Z direction) to the point 0.2inch from Z coordinate of P1 with default 100inch/min speed
4. Probe continuously moves in Z-axis negative direction (1inch detection distance) with default 16inch/min speed.
10. When the probe touches the car rim surface, detect signal is triggered, and probe moves in Z-axis positive until detect signal OFF with default 16inch/min speed.

<table>
<thead>
<tr>
<th>Name</th>
<th>Wheel repair and refurbishment machine</th>
<th>Date</th>
<th>Version</th>
<th>Author</th>
<th>Keyword</th>
<th>Reviser</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Wheel repair and</td>
<td></td>
<td>V0.4</td>
<td></td>
<td>Page 5</td>
<td></td>
</tr>
<tr>
<td></td>
<td>refurbishment machine</td>
<td>2015/8/22</td>
<td></td>
<td></td>
<td>13</td>
<td>Product</td>
</tr>
</tbody>
</table>
5. Prove moves in X-axis positive direction with moving step E.
6. Repeat steps 5-7 until the probe end position (P2).
7. Probe moves to Z coordinate of Lead-In Point (P0) with F100 speed.
8. Probe moves to X coordinate of Lead-In Point (P0) with F100 speed.

Capture part of the car rim contour – Side, From Up to Down

1. Probe moves to Lead-In Point (P0) with G00 speed (No matter where probe is). (Move probe to position to ensure that probe does not collide with the wheel before digitizing)
2. Probe moves to Z coordinate of P1 with default 100inch/min speed
3. Probe moves (in X direction) to the point 0.2inch from X coordinate of P1 with default 100inch/min speed
4. Probe continuously moves in X-axis negative direction (1inch detection distance) with default 16inch/min speed.
5. When the probe touches the car rim surface, detect signal is triggered, and probe moves in X-axis positive direction until detect signal OFF with default 16inch/min speed.
6. Prove moves in Z-axis negative direction with moving step E.
7. Repeat steps 5-7 until the probe end position (P2).
8. Probe moves to X coordinate of Lead-In Point (P0) with F100 speed.
8. Probe moves to Z coordinate of Lead-In Point (P0) with F100 speed.
**Capture part of the car rim contour – Side, From Down to Up**

1. Probe moves to Lead-In Point (P0) with G00 speed (No matter where probe is). (Move probe to position to ensure that probe does not collide with the wheel before digitizing)
2. Probe moves to Z coordinate of P1 with default 100inch/min speed
3. Probe moves (in X direction) to the point 0.2inch from X coordinate of P1 with default 100inch/min speed
4. Probe continuously moves in X-axis negative direction (1inch detection distance) with default 16inch/min speed.
12. When the probe touches the car rim surface, detect signal is triggered, and probe moves in X-axis positive direction until detect signal OFF with default 16inch/min speed.
5. Prove moves in Z-axis positive direction with moving step E.
6. Repeat steps 5-7 until the probe end position (P2).
7. Probe moves to X coordinate of Lead-In Point (P0) with F100 speed.
8. Probe moves to Z coordinate of Lead-In Point (P0) with F100 speed.

**During digitizing, system will generate machining program ordered as following:**
1. Reset offset value to 0
2. Enable HPCC function
3. Move to retract point (P0)
4. Move to X/Z coordinate of start point (P1) with G01 speed as 100inch/mm.
5. Move to Z/X coordinate of start point (P1) with G01 speed as 50inch/mm.
6. Spindle rotates and wait 3 seconds until it get the target speed.
7. The cutting profile will be generated according to digitizing result until end
point (P2) is reached.
8. Disable HPCC function
9. Move to Lead-In Point (P0) with F100 inch/min speed.
10. Spindle stop and finish machining process.

Protection or limitations:

a. [Mech. Coor. Teach] is only enabled when cursor is moved to (P0~P2)
b. Under the following conditions, system will send out alarm
   1. When file name is empty, system will display [Please Enter File Name].
   2. If users do not select probing angle, system will display [Please Choose the Probing Angle].
   3. If users do not select probing type, system will display [Please Choose the Probing Type].
   4. If step over is not set or equal to 0, system will display [The Stepover Shouldn't Be 0]. If step over is negative, system will change to positive value automatically.
   5. During digitizing process, if probe signal ON longer than 0.15sec, system will display [I8 probe signal abnormal (R44.4) PLC alarm]
   6. System will display [P0,X / P0,Z / P1,X / P1,Z / P2,X,Z has not yet set] alarm if users do not input (P0~P2) value.
   7. For font type, system will display [Z coordinate of P0 is is unreasonable] if Z coordinate of P0 is lower than Z coordinate of start point P1.
   8. For side type, system will display [X coordinate of P0 is unreasonable] if X coordinate of P0 is smaller than X coordinate of start point P1.
   9. During system executes digitizing function, users can not trigger cycle start function.
10. After digitizing, offset value will be set to 0 automatically.

Digitizing result checking

a. The path: F6 Program → F1 File manager → select the file name just generated
b. F4 simulation → F3 Zoom to zoom out cutting path. Comparing simulation result with the real profile of car rim, if cutting path and profile are not the same, check whether probe is fixed well.
3. Tool length set and machining

Purpose

- How to find out the tool length difference between cutting tool and probe, and then set on Syntec system.
- How to select program to machining.
- How to setup cutting tool and probe hardware

Using method

a. How to find out the tool length difference between cutting tool and probe, and then set on Syntec system?

- Change tool magazine to make sure cutting tool is ready, move cutting tool to the **P1 point (Start Point)** by MPG mode,
- [F8 Execute] → [F5 Relative pt. Teach], system will calculate the tool length difference between cutting tool and probe and set it on G55 (for side probing) / G54 (for front probing).
NOTE

- The process to set the tool length difference between cutting tool and probe must make sure that cutting tool is moved to the P1 exactly (start point). Otherwise, the result will be wrong.
- After digitizing process, User can modify the cutting feed through [Offset]. However, during digitizing process, system will reset [Offset] to zero automatically.
- When machining result is not good as expect, user can modify spindle speed via parameter 3424 - G96 constant linear speed, and machining federate via parameter 3423. The path to enter parameter screen: Next → F3 parameter → F5 Goto param → input parameter number → change value and hit enter key (password 520)
- The distance between starting point P1 and wheel surface (font or side) must be smaller than probing distant (defined by Pr3421).

b. **How to select program to machining?**

- [F7 Program] → [F1 File manager], move cursor to the desired machining program (in program list) and hit enter to import selected program.
Make sure current mode is AUTO mode, hit [cycle start] button to start machining process.

Protection or limitations:

a. [Cycle start] button is only effective in AUTO mode
b. System will display [X axis not yet return HOME (R40.2) PLC alarm] if X axis zero point is disappeared.
c. System will display [Z axis not yet return HOME (R41.2) PLC alarm] if Z axis zero point is disappeared.
d. System will display [Spindle overhead (R44.0) PLC alarm] if I3 is OFF
e. System will display [Spindle driver abnormal (R44.1) PLC alarm] if I1 is OFF
f. System will display [I5 release emergency stop button (R44.3) PLC alarm] if Emergency stop button is pressed.
g. During machining, system will display [I6 safe door open during machining (R44.5) PLC alarm] if safe door is opened
h. If battery of absolute encoder is low, system will display [Absolute encoder battery out of date (R44.6) PLC Alarm], please replaced by new battery (make sure that system power ON)
i. During digitizing process, if probe signal ON longer than 0.15sec, system will display [I8 probe signal abnormal (R44.4) PLC alarm]
j. System will display [Must be switched to AUTO mode before machining (R590.1)] if pushing cycle start butting when AUTO mode is not selected.
k. System will display [I2: shortage lubrication oil (R590.2)] if lubrication oil shortage.

l. System will display [I6 cannot machining since safe door opened (R590.3)] if safe door is opened before cycle start is pushed.

c. **How to setup cutting tool and probe hardware?**

   **For font type probing angle**

   ![Image of cutting tool and probe hardware]

   **For side probing angle**

<table>
<thead>
<tr>
<th>Name</th>
<th>Wheel repair and refurbishment machine</th>
<th>Date</th>
<th>2015/8/22</th>
<th>Version</th>
<th>V0.4</th>
<th>Author</th>
<th>Andyngo</th>
</tr>
</thead>
<tbody>
<tr>
<td>Keyword</td>
<td>Page</td>
<td>12 / 13</td>
<td>Department</td>
<td>產品組</td>
<td>Reviser</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
4. Revision History

<table>
<thead>
<tr>
<th>No.</th>
<th>Content</th>
<th>Date</th>
<th>Author</th>
<th>Reviser</th>
<th>Version</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>1st version</td>
<td>2015/03/31</td>
<td>Andyngo</td>
<td>-</td>
<td>V0.1</td>
</tr>
<tr>
<td>02</td>
<td>Modify setting screen content</td>
<td>2015/05/27</td>
<td>Andyngo</td>
<td>-</td>
<td>V0.2</td>
</tr>
<tr>
<td>03</td>
<td>Add G54P16 description Parameter modification</td>
<td>2015/06/04</td>
<td>Andyngo</td>
<td>-</td>
<td>V0.3</td>
</tr>
<tr>
<td>04</td>
<td>Modify all content according to new HMI</td>
<td>2015/08/22</td>
<td>Andyngo</td>
<td>-</td>
<td>V0.4</td>
</tr>
<tr>
<td>05</td>
<td>Modify all content according to new HMI</td>
<td>2015/09/08</td>
<td>Andyngo</td>
<td>-</td>
<td>V0.5</td>
</tr>
</tbody>
</table>

Name | Wheel repair and refurbishment machine | Date | Version | Author | Andyno |
-----|----------------------------------------|------|---------|--------|--------|
Keyword | Page 13 / 13 | 2015/8/22 | V0.4 | Andyno | Reviser |