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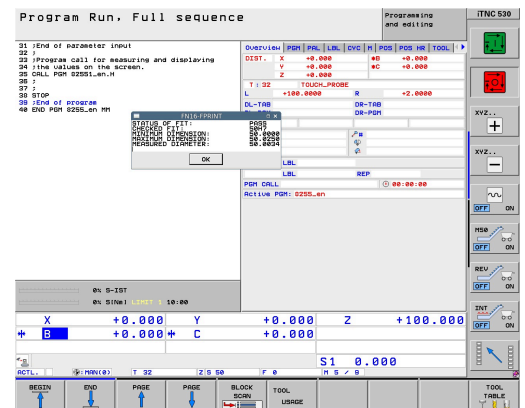
NC Solutions

Description of NC program 8255

English (en)
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1 Description of NC program 8255_en.h

NC program for measuring a fit that is dimensioned with a standard tolerance. Then you display the dimensions of the fit and the measurement result on the screen. In addition, the status of the fit should be shown (pass, rework, or scrap).



Prerequisite:

Use a 3-D touch probe to measure a fit that is defined with a standard tolerance. The control is to calculate the tolerance dimensions, and then determine the status of the fit based on the measurement result. The information derived is to be displayed by the control on the screen.

Solution:

The values of the tolerance tables for the uniform hole and uniform shaft systems were transferred into two freely definable tables. In the NC program, you define the nominal dimension, the tolerance, and the measuring position. The control uses these data to determine the tolerance values, and calculates the maximum dimension and the minimum dimension. The control transfers the determined values to a standard measuring cycle. The measuring cycle allows the control to determine the actual diameter. The control determines the status of the fit based the measurement result. The control then displays all of this information in a pop-up window on the screen.



The NC program is operable on iTNC 530 with NC software number 340 49x 07 and 606 42x 02 or later.

NC program 8255_en.h

In NC program 8255_en.h, you define the fit to be measured by using a Q parameter for the size of the fit and a string parameter for the tolerance. In addition, you define several Q parameters for the measurement. Then the control calls the NC program 82551_en.h. If you do not save both NC programs in the same directory, you must adjust the file path in the program call. After running the NC program 82551_en.h, the control returns to the main program. In order to interrupt program run at this point, a stop is programmed in the example program. The control then ends the NC program.

In order to have the control check the fit at a certain point, simply copy the content of this NC program to the desired point in your machining program.

Parameter	Name	Meaning
Q1	SIZE OF FIT	Nominal dimension of the hole or shaft
QS1	TOLERANCE	Tolerance specification in the uniform hole or uniform shaft systems
Q11	MEASURING CENTER IN X	X coordinate of the center of the fit
Q21	MEASURING CENTER IN Y	Y coordinate of the center of the fit
Q31	MEASURING HEIGHT IN Z	Z coordinate of the measurement
Q41	ANGLE OF 1ST MEASUREMENT	Angle relative to the positive X axis for the first measuring point. The other three measurements are performed at incremental angles of 90°.
Q51	LATERAL SAFETY CLEARANCE	Distance between the ball tip and the measuring point that is approached during prepositioning. The value from machine parameter 6140 is added to the value defined here.

NC program 82551_en.h

In NC program 82551_en.h, the control first determines the dimensions of the fit defined in NC program 8255_en.h. From these dimensions, the control calculates the maximum dimension and the minimum dimension. Then the control uses these values for a measuring cycle. This cycle allows the control to define the ACTUAL diameter of the fit. Finally, the control displays the determined values on the screen.

First, the control defines the lowercase letter a in parameter QS2. In the next step, the control checks whether the letter of the defined fit is alphabetically before or after the lowercase letter a. The control saves the result to parameter Q2.

Depending on how you have defined the fit, the control proceeds as follows:

- You have defined a uniform hole with an uppercase letter. The uppercase letters come before the lowercase letter a in the alphabet. The control saves the value -1 to the parameter Q2
- You have defined a uniform shaft with a lowercase letter. This letter alphabetically comes after the lowercase letter a or is at the same position. The control saves the value +1 or 0 to Q2

Then the control uses the **FN26 TABOPEN** function to open the table 82553_hole.tab in which the dimensions for the uniform hole system are defined. Based on the value that is saved in Q2, the control then checks whether the fit has been defined in the uniform hole system.

- If the value saved in Q2 is -1, you have defined a fit in the uniform hole system. The control then jumps to the **LBL 1** jump label
- If the value saved in Q2 is 0 or +1, you have defined a fit in the uniform shaft system. In this case, the NC program is continued without a jump.

Then the control uses the **FN26 TABOPEN** function to open the 82553_shaft.tab table. This table contains the dimensions for tolerances in the uniform shaft system. The **LBL 1** jump label is defined next.

Then the control saves the value 0 to parameter Q22. Starting from this position, this parameter serves as a counter for the table row. Using the **FN 28 TABREAD** function, the control reads the value from the **BEREICH** column in row 0 of the table.

The **LBL 11** jump label is defined next.

Then the control checks whether the defined fit size is greater than the value read from the table:

- If the size of the fit is greater than the table value, the control jumps to the **LBL 12** jump label
- If the size of the fit is not greater than the table value, the NC program is continued without a jump

Then the control uses the function **FN 28 TABREAD** to read from the table. It reads the value from the column of the fit defined in QS1 and from the row defined in Q22. The value read is saved by the control to parameter Q4.

Then the control increments the value in the row counter Q22 by one. From the table, it then reads again the value of the re-calculated row and of the column with the name corresponding to QS1. The control saves this value to parameter Q5. In the next NC block, the control jumps to the **LBL 99** jump label.

In the NC program, the jump label **LBL 12** is defined next. Then the control increments the value in the counter Q22 by two. From the table, it then reads the value that is given in the **Bereich** column and in the row saved in counter Q22. The control saves this value to parameter Q3. The control subsequently jumps to the **LBL 11** jump label.

The next step in the NC program is the **LBL 99** jump label. Then the control calculates the maximum dimension of the fit. For this purpose, it adds one thousandth of the upper dimension saved in parameter Q4 to the size of the fit in parameter Q1. The control saves the result to parameter Q23. Then it calculates the minimum dimension. For this purpose, it adds one thousandth of the lower dimension in Q5 to the size of the fit in Q1. The control saves the minimum dimension to parameter Q33.

The control subsequently uses a **TOOL CALL** to call the 3-D touch probe. Then it pre-positions the touch probe to the defined measuring position.

The control subsequently performs a jump depending on whether you have defined a hole or a shaft.

- If you have defined a fit in the uniform hole system, the control will jump to the **LBL 14** jump label.
- If you have defined a fit in the uniform shaft system, the control will jump to the **LBL 15** jump label.

The **LBL 14** jump label is defined next. The measuring cycle 421 **MEASURE HOLE** follows. In this cycle, the control uses the parameters you have defined for the measuring position, the diameter, the angle of the first measurement, and the lateral safety clearance. In addition, the values calculated for the maximum dimension and the minimum dimension of the fit are defined so that the cycle directly calculates the workpiece status. After executing the cycle, the control retracts the tool. The control then jumps to the **LBL 16** jump label.

The **LBL 15** jump label and the measuring cycle 422 **MEAS. CIRCLE OUTSIDE** follow. This cycle also uses the defined and calculated parameters. After executing the cycle, the control retracts the tool in the tool axis. The control subsequently jumps to the **LBL 16** jump label.

The **LBL 16** jump label is defined in the next NC block.

Here, the control checks the workpiece status determined by the measuring cycle and performs the corresponding jump.

- If the status of the fit is "Pass," then the cycle saves the value +1 to the Q parameter Q180. In this case, the control will jump to the **LBL 20** jump label.
- If the status of the fit is "Rework," then the cycle saves the value +1 to the Q parameter Q181. In this case, the control will jump to the **LBL 21** jump label.
- If the status of the fit is "Scrap," then the cycle saves the value +1 to the Q parameter Q182. In this case, the control will jump to the **LBL 22** jump label.

After this, the three jump labels for the status of the fit are defined. In **LBL 20**, the control assigns the text "Pass" to the string parameter QS3 and jumps to **LBL 23**. In the following **LBL 21**, the control assigns "Rework" to QS3, and in **LBL 22** it assigns the value "Scrap." After each assignment, the control jumps to **LBL 23**.

The last program section starts with the **LBL 23** jump label. Here, the control combines the size of the fit and the tolerance into a text variable. For this purpose, it converts the value of the fit size in Q1 into a text variable and appends the text variable for the tolerance in QS1. The control saves the resulting text to QS2.

Then the control uses the FN 16 F-PRINT function to display the contents of the mask file 82552_en.a on the screen. The control then ends the NC program and returns to the main program.

Mask file 82552_en.a

In order to display texts and values on the screen, the output format must be defined with a mask file. The file 82552_en.a specifies the texts and placeholders that are filled with the values of the QS3, QS2, Q33, Q23, and Q153 parameters upon output.

```
"STATUS OF FIT: %S",QS3
```

```
"CHECKED FIT: %S",QS2;
```

```
"MINIMUM DIMENSION:%9.4LF",Q33;
```

```
"MAXIMUM DIMENSION:%9.4LF",Q23;
```

```
"MEASURED DIAMETER:%9.4LF",Q153;
```

```
M_CLOSE;
```

Table 82553_hole.tab

In the table 82553_hole.tab, the dimensions for the general tolerances in accordance with ISO 286 are defined in the uniform hole system. The diameter defined ranges from 0 mm to 400 mm. In this table, you can overwrite the columns that you do not need with tolerances that are relevant to your production.

The following tolerances are defined:

- D10
- E9
- F7
- F8
- G7
- G9
- H6
- H7
- H8
- H9
- H11
- H12
- H13
- JS7
- JS9
- K6
- K7
- M6
- M7
- N7
- N9
- P7
- P9
- R7

Table 82553_shaft.tab

In the table 82553_shaft.tab , the dimensions for the general tolerances in accordance with ISO 286 are defined in the uniform shaft system. The diameter defined ranges from 0 mm to 400 mm. In this table, you can overwrite the columns that you do not need with tolerances that are relevant to your production.

The following tolerances are defined:

- d9
- e8
- f7
- g6
- h5
- h6
- h7
- h8
- h9
- h11
- js5
- js6
- js13
- js14
- k5
- k6
- m5
- m6
- n6
- p6
- r6
- s6
- s7