ATC Run-Out Detection System
(Discrete type : AT50339)
Q&A collections

TOSEI ENGINEERING CORP
Contents

1 What is ATC run-out detection system? ................................................................. 9
Q1.1) What are features of ATC run-out detection system? ........................................ 9
Q1.2) Why can ATC run-out detection system detect entering of chips? ....................... 9
Q1.3) Is it possible to measure workpiece run-out in "sizing instrument" and "inspection
device" used in grinding machine and automatic measurement instrument? .............. 10
Q1.4) Is it possible to measure a run-out of edge? .................................................. 10
2 Installation effect ....................................................................................................... 11
Q2.1) There are too many entering of chips in machining center. ................................ 11
Q2.2) How often does the entering of chips generate? .............................................. 11
Q2.3) Is it possible to detect the entering in two-face restraint tool, specially entering of
chips to the edge face of it? ................................................................................... 12
Q2.4) Is there any reference data comparing the run-out measurement result in ATC run-out
detection system with the actual run-out amount of the edge? ............................... 13
3 The difference from other run-out detection/eddy-current sensor ............................ 14
Q3.1) What types of measures have been done conventionally for entering of chips? ...... 14
Q3.2) What is different from general eddy-current sensor? ........................................ 15
Q3.3) What is different from a laser tool run-out measuring machine? ....................... 15
Q3.4) What is different from a run-out measuring machine using vibration sensor? ....... 15
4 For installation of ATC run-out detection system .................................................... 16
Q4.1) Please tell us the manufacturers of the machining center on which ATC run-out
system has been mounted? ..................................................................................... 16
Q4.2) Is it possible to install ACT run-out detection system in a machine manufactured by
suppliers which don’t have on-board record? ...................................................... 16
Q4.3) What operations are required to install run-out detection system for a machining
center manufacturer? ......................................................................................... 17
Q4.4) Is it possible to perform a simplified test? .......................................................... 18
Q4.5) How can run-out measurement be done by setting the sensor in other place than in
main axis? ............................................................................................................... 33
Q4.6) Tell me the way to save the measurement result to PC ...................................... 34
Q4.7) How can the correlation between the measurement result of ATC run-out detection
system and the actual run-out of the edge be evaluated? ......................................... 36
5 Configuration and specification of product ................................................................ 37
Q5.1) Tell me the configuration of the product. .......................................................... 37
Q5.2) Tell me the measuring accuracy. ......................................................................... 37
Q5.3) What are the standard accessories? .................................................................... 38
Q5.4) What are the optional accessories? ..................................................................... 38
Q5.5) Is RS232C cable included in standards? .................................................................38

6 Tool holder .......................................................................................................................39

Q6.1) Tell me the types of tool holders to be measured? ......................................................39

Q6.2) It cannot select the tool holder type to be used from the Windows application attached.
Is it possible to use the tool holder? ....................................................................................39

Q6.3) Why is the measurement performed at the tool holder flange? ....................................39

Q6.4) There are notches in the flange part of the tool holder. Why can run-out measurement
be done despite the existence of notch? ..............................................................................39

Q6.5) There are more than three notched parts in the flange part of the tool holder. Is it
possible to perform run-out measurement? .......................................................................40

Q6.6) Is it possible to measure the tool holder with balance hole in the flange part? ..........40

Q6.7) I want to perform measurement at the site near edge as much as possible? .............40

Q6.8) How can measurement be done by setting the sensor in other place than in main
axis? .....................................................................................................................................41

Q6.9) Is it possible to measure a part not having a notch? ......................................................41

Q6.10) The flange part of the tool holder is eccentric. Is it possible to measure it? ..........41

Q6.11) Are the shape and magnetism of the tool holder unaffected anything? ......................42

Q6.12) I want to detect a run-out of long tool edge. Is it possible to measure it in the run-out
measurement of the flange part? ........................................................................................42

Q6.13) There is a scratch on the flange part (measuring site) of the tool holder. Does it
need to register the tool again? ...........................................................................................43

Q6.14) Despite the scratch on the flange part (measuring site) of the tool holder, it continued
to use the system without registering the tool again. What is the effect of it? .................43

Q6.15) Tell me the correlation between the run-outs of the tool holder flange part and the
edge. .....................................................................................................................................44

Q6.16) If the types of the tool holders are different, how affect the measurement result? ....44

Q6.17) Why does it need to select the types of tool holders? ..............................................46

Q6.18) What kinds of effect does notch (key groove) part have on the measurement result?
.............................................................................................................................................46

Q6.19) What happens if the chips are stuck between the sensor head and the tool holder?
.............................................................................................................................................47

Q6.20) Tell me about tightening torque of sensor head. ..........................................................47

7 Sensor head........................................................................................................................48

Q7.1) What kinds of sensor heads do you have? .................................................................48

Q7.2) How much gap does it need between the sensor head and the tool holder? ...........48

Q7.3) Tell me an example of changing the use of Φ 5 sensor head and Φ 10 sensor head.
...............................................................................................................................................48
Q7.4) Is there any effect to run-out measurement value if coolant adheres to the sensor head? ...........................................................................................................................................49
Q7.5) Does the sensor head have durability to coolant? .........................................................................................................................................................49
Q7.6) Can the sensor head resist vibration and shock? ..........................................................................................................................................................49
Q7.7) The tool holder and chips may bump into the sensor head. Are there any good measures to protect the sensor head? ..........................................................................................................................................................49
Q7.8) What happens if chips enter into between the sensor head and the tool holder flange surface? ........................................................................................................................................................................50
Q7.9) What is the material of the sensor head? ..................................................................................................................................................................................50
Q7.10) Is it possible to arrange metal just near the sensor head? .....................................................................................................................................................50
Q7.11) The sensor head is damaged. Is it possible to replace the sensor head only? ......51
Q7.12) Why is it possible to replace the sensor head only? ..........................................................................................................................................................51
Q7.13) Is it possible to connect and use another type of sensor head instead of the sensor head which has been used until now? ..................................................................................................................................................................51
Q7.14) Is it possible to use by connecting a sensor head other than eddy-current type sensor head? ..................................................................................................................................................................................52
Q7.15) Is it possible to use by connecting eddy-current sensor head made in other companies? ..................................................................................................................................................................................52
Q7.16) I want to use a sensor head by connecting multiple sensor heads. .......................52
Q7.17) Tell me an example of changing the use of Φ 5 sensor head and Φ 10 sensor head in await measurement ........................................................................................................................................................................................................52
Q7.18) Why the controller installation part of the sensor cable does not have a connector? (Why it is a bare wire?) ........................................................................................................................................................................53
Q7.19) What happens if the chips are stuck between the sensor head and the tool holder? ..................................................................................................................................................................................................54

8 Controller ...........................................................................................................................................................................................................................................................................55
Q8.1) Why a controller is needed? ..................................................................................................................................................................................................................................................55
Q8.2) How does ATC run-out detection system communicate with controllers of machine tool (NC controller)? ..................................................................................................................................................................................................................55
Q8.3) What is a “tool registration”? ..................................................................................................................................................................................................................................................56
Q8.4) Why does “tool registration” need? ..................................................................................................................................................................................................................................................57
Q8.5) Tell me the rotation number of the tool which is capable of measuring. ........................................................................................................................................................................................................57
Q8.6) What is the breakdown of measuring time 0.3 sec? ..................................................................................................................................................................................................................................57
Q8.7) It seems too little to register 32 tool holders in a tool registration ........................................58
Q8.8) Is it possible to have other than 0.5μm resolution? ..................................................................................................................................................................................................................................58
Q8.9) I heard that the controller was improved. Tell me the improved point. ........................58
Q8.10) I heard that the controller was improved. Does a design change need to be made at machining center side? ........................................................................................................................................................................................................60
Q8.11) I heard that the controller was improved. Is it possible to connect the sensor head which has been used until now to the improved controller and to use?

Q8.12) I heard that the controller was improved. Can it be recognized from the conventional controller easily?

Q8.13) I heard that the controller was improved. Is the Windows application attached also changed?

Q8.14) Is it possible to set OK/NG grading threshold value to each tool?

Q8.15) How to set the run-out grading threshold value?

Q8.16) At least what μm or more of run-out grading threshold value is required for the setting?

Q8.17) Is the controller waterproofed?

Q8.18) What happens to waterproof property of the controller when using an optional protective case?

Q9.1) What is the Windows application attached for?

Q9.2) Is it necessary to always connect a personal computer to controller?

Q9.3) Tell me the condition of personal computer for installing the Windows application attached.

Q9.4) Is it possible to install the Windows application attached in a computer with Windows OS other than XP for use?

Q9.5) Is it possible to use a computer which does not have RS232C port?

Q9.6) Although a computer does not have a RS232C port, it has an USB port.

Q9.7) Is it possible to use a computer in which an OS other than Windows is installed?

Q9.8) Is it possible to install the Windows application attached from the same CD to multiple computers?

Q9.9) An old Windows application is installed in a computer. Is it possible to keep using it?

Q9.10) Is it possible to execute and use “ATC_RUNOUT.exe” in the accompanying CD by double clicking it?

Q9.11) The old Windows application is installed in a computer. Is it possible to use a new Windows application by installing it without uninstalling the old application?

Q9.12) Tell me a method to check the version of the Windows application installed in a computer.

Q9.13) Is it possible to store run-out measurement data in a computer?

Q9.14) How many number of run-out measurement data can be stored in a computer?

Q9.15) Is it possible to store the tool registration data in a computer?

Q9.16) Is it possible to store measurement conditions such as run-out threshold value in a computer?
Q9.17) Is it possible to install Windows application for English OS version in an OS other than English for use? .................................................................67
Q9.18) It could install Windows application for English OS version in the OS other than English. Is there any problem for operating? .................................68
Q9.19) Is it possible to install Windows application for English OS version in other than English OS by forcibly setting the language to be English? ...................68
Q9.20) Tell me the way to save the measurement result to PC ..........................................................69
Q9.21) Tell me the communication specification of computer and controller. .................................71
Q9.22) Is it possible to copy a file from a PC in which the Windows application is installed to another PC and use? ................................................71
Q9.23) There are two computers which installed the Windows application attached. Is it possible to transfer/overwrite the data from one computer to the other computer? ......72
Q9.24) Is it possible to acquire data by connecting multiple controllers to one computer?  
   However only one controller operate at the same instance. .................................72
Q9.25) Is it possible to acquire data by connecting multiple controllers to one computer? .73
Q9.26) What is the difference between “AUTO” and “MANUAL”? .................................................73
10 Principle .........................................................................................................................75
Q10.1) Tell me the principle of run-out measurement .................................................................75
Q10.2) Tell me the principle of eddy-current sensor .................................................................77
Q10.3) The tool holder is magnetized. Is it possible to use it? ....................................................78
Q10.4) What happens if a sudden vibration was occurred at run-out measurement? ..........78
Q10.5) Why is the entering of chips determined “run-out amount”? ...........................................79
Q10.6) What is a tool presence detection function? ........................................................................80
Q10.7) Tell me the principle of tool presence detection function (Φ 5 sensor system) .............80
Q10.8) Tell me the principle of tool presence detection function (Φ 10 sensor system) ..........82
Q10.9) Why is the principle of the tool presence detection function different depending on the types of the sensor heads? ........................................83
Q10.10) What timing does the tool presence detection function perform detection? ..............84
Q10.11) If the types of the tool holders are different, how affect the measurement result? ....85
Q10.12) Why does it need to select the types of tool holders? ....................................................86
Q10.13) What kinds of effect does notch (key groove) part have on the measurement result? ........................................................................................................87
Q10.14) What is the difference between “run-out amount” and “eccentricity”? ..................88
Q10.15) There are notches in the flange of the tool holder. Why can run-out measurement be done despite the existence of notch? ........................................89
Q10.16) How does the controller determine the presence of the notch? .................................89
Q10.17) What are “notch upper limit”, “notch lower limit”, and “invalid angle” of the parameter? ........................................................................................................91
Q10.18) If the rotating speed is slightly deviated from “the number of rotation notification”,
what effect happens to the measurement accuracy? ..................................................... 92
Q10.19) When it measures run-out amount repeatedly, a discrete data with gap wider than
the measurement resolution capability (0.5μm) is obtained. ...................................... 93
Q10.20) Is there any reference data comparing the run-out measurement result in ATC
run-out detection system with the actual run-out amount of the edge? .................... 94
11  Design ..................................................................................................................... 95
Q11.1) Is the length of the sensor cable fixed at 3.5m? Is it possible to extend or cut the
sensor cable? ................................................................................................................. 95
Q11.2) What is the minimum bending radius for wiring the sensor cable by bending it in the
process? ......................................................................................................................... 95
Q11.3) Is there a good measure for protecting the sensor cable? ..................................... 95
Q11.4) Is it possible to remove the "protective cap" equipped in the sensor head for use? 95
Q11.5) Is it possible to install the controller in vibrating place? .................................... 95
Q11.6) Does the controller have a coolant-resistance? ................................................... 95
Q11.7) What is “Open Drain Output”? ........................................................................... 96
Q11.8) What is “Active Low”? ....................................................................................... 97
Q11.9) Is it possible to cut the I/O cable or to patch up another for use? ......................... 97
Q11.10) What is the minimum bending radius for wiring the I/O cable by bending it in the
process? ......................................................................................................................... 98
Q11.11) Is it possible to connect the controller and NC at TTL or CMOS levels? .............. 98
Q11.12) There is another 24V power source input machine. Is it possible to share the
machine? ......................................................................................................................... 98
Q11.13) The power source capacity is almost same as the controller specification value.
Is it OK? ......................................................................................................................... 98
Q11.14) Tell me the communication flow between the controller and machining center..... 99
Q11.15) Is it possible to prevent "silent stop (stop of machining center at silent state)"? . 103
Q11.16) When the entering of chips occurs often, the availability of machining center falls.
Are there any good measures? ................................................................................... 104
Q11.17) Want to display each alarm transmitted from the controller on the NC in the
machining center. .......................................................................................................... 105
Q11.18) Tell me each diameter of sensor cable, I/O cable, and power cable. .................. 106
Q11.19) Tell me the types, roles, and meanings of I/O signal line.................................. 107
Q11.20) What timing does the tool presence detection function perform detection? ...... 110
Q11.21) Tell me the setting method of tool presence detection parameter “invalid level”. .111
Q11.22) How to switch over from connection to the I/O sink to connection to the source, and vice
versa? ............................................................................................................................. 113
Q11.23) Tell me the specification of I/O cable................................................................. 114
Q11.24) Tell me the specification of power cable.                        115
Q11.25) If the rotating speed is slightly moved from “the number of rotation notification”,
what effect happens to the measurement accuracy?                     117

12  Installation/adjustment/setting ........................................... 118
Q12.1) How to adjust the installation position of the sensor?........... 118
Q12.2) Does it need to adjust the sensor magnification?................... 118
Q12.3) How to set the run-out grading threshold value?.................... 119
Q12.4) At least what μm or more of run-out grading threshold value is required for the
setting?................................................................................... 119
Q12.5) How to confirm the connection of I/O cable?........................... 120
Q12.6) Why is the entering of chips determined “run-out amount”?......... 123
Q12.7) What is the difference between “run-out amount” and “eccentricity”? 124
Q12.8) Tell me about tightening torque of sensor head...................... 124
Q12.9) What is the difference between “AUTO ” and “MANUAL”?........... 124

13  Maintenance ............................................................................. 126
Q13.1) When the sensor is broken, is it possible to replace the sensor only?.. 126
Q13.2) When is it needed to register the tools?................................. 126
Q13.3) How often is it needed to register the tools?........................... 126
Q13.4) It removed the tool holder from the spindle and clamped again to the spindle. Then,
it attached in 180-degree opposite direction to the original direction. Is it needed to
register the tools again?.................................................................. 127
Q13.5) Tell me the way to save the measurement result to PC............. 127
Q13.6) How to mount a protective cap?........................................... 130

14  Await measurement .................................................................... 131
Q14.1) How can run-out measurement be done by setting the sensor in other place than
in main axis?.................................................................................. 131
Q14.2) What is a “await measurement”? .......................................... 131
Q14.3) I want to perform a run-out measurement near edge as possible......... 132
Q14.4) What diameter is suitable for the run-out measurement near edge as possible?.. 132
Q14.5) If a run-out measurement is performed by providing a cylindrical measuring surface
near edge, what is the degree of the measurement accuracy?................ 132
Q14.6) I want to make a slit for tool presence detection in cylindrical surface provided near
edge. How to determine the dimension?........................................ 132
Q14.7) Tell me an example of changing the use of Φ 5 sensor head and Φ 10 sensor head
when a cylindrical surface is provided near edge and run-out measurement is
performed.................................................................................... 133
Q14.8) Is it possible to measure the vibration of edge?....................... 133

15  Others ......................................................................................... 134
Q15.1) I want to use ATC run-out detection system abroad. ................................. 134
Q15.2) Does ATC run-out detection system confor to CE Marking? ......................... 134
Q15.3) Is it possible to detect presence of tool? .................................................. 134

16  Troubleshooting ............................................................................................. 135
Q16.1) “Sensor error” alarm is generated. What is the cause? ................................. 135
Q16.2) “No tool” alarm is generated. What is the cause? ......................................... 137
Q16.3) “Data mismatch” alarm is generated. What is the cause? ............................... 138
Q16.4) “Silent stop” (stop of the machining center in silent state) rarely occurs. What is the possible cause? .................................................................................. 139
Q16.5) How to confirm the connection of I/O cable? ........................................... 140
Q16.6) The screen of Windows application is incompletely displayed, i.e partially displayed.

What is the cause?................................................................................................. 143
Q16.7) There is no fluctuations in run-out waveform data at all. What is the cause? ...... 144

17  Attached drawings ............................................................................................. 145
17.1) Tool Registration Timing Chart ...................................................................... 145
17.2) Run-out Measurement Timing Chart ............................................................... 146
17.3) Controller outside drawing ............................................................................. 147
17.4) Φ 5 sensor head outside drawing ................................................................. 148
17.5) Φ 10 sensor head outside drawing ................................................................. 149
17.6) I/O cable outside drawing ............................................................................ 150
17.7) Power cable outside drawing ....................................................................... 151
17.8) Protective case outside drawing .................................................................... 152
17.9) Casing tube outside drawing ....................................................................... 153
1 What is ATC run-out detection system?

Q1.1) What are features of ATC run-out detection system?
A) In an ATC machining center, unexpected defects may happen during ATC when chips enter the gap between the tool taper and the main spindle. For years, engineers have had no solution to this problem, which is particularly prevalent during high-speed cutting of aluminum. ATC run-out detection system is used to detect abnormal run-out of the tool caused by chips entering the tool taper and to prevent machining defects.

Q1.2) Why can ATC run-out detection system detect entering of chips?
A) “True run-out quantity” is calculated by storing the shape of the tool flange without run-out state and comparing it with the shape of the run-out which is measured just before machining. More highly accurate run-out measurement is achieved in comparison with the simple run-out measurement (repeatability: 30 μm, compared with other our company models) by using general eddy-current sensors.
Q1.3) Is it possible to measure workpiece run-out in “sizing instrument” and “inspection device” used in grinding machine and automatic measurement instrument?
A) “Tool registration” is essential in ATC run-out detection system.
In the master gauge which is “same shape” and used in “sizing instrument” and “inspection device”, the magnetic characteristics such as surface magnetizations are different from it on the actual workpiece. Accurate run-out detection by using this master gauge for “tool registration” is difficult.

Q1.4) Is it possible to measure a run-out of edge?
A) There is a way to provide a cylindrical measuring surface near the edge of the tool and measure the run-out of the part with sensor.
Meanwhile, it is difficult to measure the shape of the edge itself with an eddy-current sensor. Thus, the eddy-current sensor is not suitable for measuring the run-out of the edge itself.
2 Installation effect

Q2.1) There are too many enterings of chips in machining center.
A) For the resolution of this problem, ATC run-out detection system is most suitable.
In ATC processing machine, entering of chips can be generated between the tool holder and the spindle during ATC, and it significantly affects the machining accuracy such as boring and hole processing.
ATC run-out detection system is used to detect abnormal run-out of the tool caused by chips entering the tool taper and to prevent machining defects.

Q2.2) How often does the entering of chips generate?
A) The case examples of the entering of chips are as follows.
<Example of entering of chips>
A Company : Aluminum workpiece cutting
The frequency of the entering by visual verification and that by the pallet seating are once per 800 times, once per several thousands, respectively.
B Company : Aluminum workpiece (automobile parts) cutting
It can be generated at a rate of twice / 1836 times. 20μm of edge run-out was confirmed.
Q2.3) Is it possible to detect the foreign substances entering in two-face restraint tool, specially entering of chips to the edge face of it?
A) Yes, it’s possible. There are too many measurement results in the two-face restraint tool.
Q2.4) Is there any reference data comparing the run-out measurement result in ATC run-out detection system with the actual run-out amount of the edge?

A) It shows the evaluation example in HSK63A tool below. The results vary depending on the type of the tool holder, the tool length, and the state of the spindle. Thus, please consider to evaluate the results in the actual usage environment.

<table>
<thead>
<tr>
<th>Shim thickness</th>
<th>Run-out detection</th>
<th>Dial</th>
</tr>
</thead>
<tbody>
<tr>
<td>No entering</td>
<td>0.0</td>
<td>5</td>
</tr>
<tr>
<td>10μm</td>
<td>3.0</td>
<td>5</td>
</tr>
<tr>
<td>20μm</td>
<td>7.0</td>
<td>20</td>
</tr>
<tr>
<td>30μm</td>
<td>14</td>
<td>30</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Shim thickness</th>
<th>Run-out detection</th>
<th>Dial</th>
</tr>
</thead>
<tbody>
<tr>
<td>No entering</td>
<td>0.0</td>
<td>5</td>
</tr>
<tr>
<td>10μm</td>
<td>3.5</td>
<td>20</td>
</tr>
<tr>
<td>20μm</td>
<td>8.0</td>
<td>40</td>
</tr>
<tr>
<td>30μm</td>
<td>13.5</td>
<td>60</td>
</tr>
</tbody>
</table>
### 3 The difference from other run-out detection/eddy-current sensor

Q3.1) What types of measures have been done conventionally for entering of chips?

A) In conventional measuring method, there are problems in the measurement accuracy, price, and measuring time, thus only the prevention (air blow, coolant blow) has been performed.

<table>
<thead>
<tr>
<th>Method</th>
<th>Preventive measure</th>
<th>Measuring method</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Air blow</td>
<td>Eddy-current</td>
</tr>
<tr>
<td></td>
<td>Coolant blow</td>
<td>Laser</td>
</tr>
<tr>
<td></td>
<td></td>
<td>ATC run-out detection system</td>
</tr>
<tr>
<td>Features</td>
<td>High-pressure air</td>
<td>Measure run-out (simple P-P using eddy-current sensor)</td>
</tr>
<tr>
<td></td>
<td>is blown down to</td>
<td>Measure run-out of tool edge with laser</td>
</tr>
<tr>
<td></td>
<td>taper surface at</td>
<td></td>
</tr>
<tr>
<td></td>
<td>replacing time</td>
<td></td>
</tr>
<tr>
<td>Accuracy</td>
<td>-</td>
<td>20μm or more</td>
</tr>
<tr>
<td></td>
<td></td>
<td>○</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3μm or less</td>
</tr>
<tr>
<td>Measuring</td>
<td>A few secs.</td>
<td>0.3sec.</td>
</tr>
<tr>
<td>time</td>
<td></td>
<td>10sec. or more</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.3sec.</td>
</tr>
<tr>
<td>Reliability</td>
<td>△</td>
<td>△</td>
</tr>
<tr>
<td></td>
<td></td>
<td>×</td>
</tr>
<tr>
<td>Remarks</td>
<td>There is no</td>
<td>Not available in measurement accuracy.</td>
</tr>
<tr>
<td></td>
<td>evidence of “no</td>
<td></td>
</tr>
<tr>
<td></td>
<td>entering”.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>There is no</td>
<td>A lot of measuring time.</td>
</tr>
<tr>
<td></td>
<td>evidence of “no</td>
<td></td>
</tr>
<tr>
<td></td>
<td>entering”.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Damage is</td>
<td></td>
</tr>
<tr>
<td></td>
<td>accumulated on</td>
<td></td>
</tr>
<tr>
<td></td>
<td>clamping</td>
<td></td>
</tr>
<tr>
<td></td>
<td>mechanism by</td>
<td></td>
</tr>
<tr>
<td></td>
<td>high-pressure</td>
<td></td>
</tr>
<tr>
<td></td>
<td>coolant.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Most suitable for detection of entering of chips</td>
</tr>
</tbody>
</table>
Q3.2) What is different from general eddy-current sensor?  
A) In simple run-out measurement (P-P measurement) with general eddy-current sensor, 20μm of repeat accuracy is the limit (in general, it is 30μm or more). 
In ATC run-out detection system, “true run-out quantity” is calculated by “tool registration method” (the method which stores the shape of tool flange in the controller without run-out state and compares it with the shape of the run-out which is measured just before machining). In addition, 3μm of repeat accuracy is achieved by adopting the reliability of the run-out measurement is improved by interpolating the notched part, that is a factor to decrease the measurement accuracy, with the ACCRETECH’ proprietary algorithm in “Interpolation of notched parts” and “Oversampling Method”.

Q3.3) What is different from a laser tool run-out measuring machine?  
A) Our understanding is a tool measuring machine with laser mainly seemed to be used for detecting breakage of cutting tool. Our understanding is the maximum accuracy for measuring run-out and wearing of edge is 0.01mm. As for the measuring time, in comparison with ATC run-out detection system with measuring time of 0.3 sec, it will need longer time. In addition, it is presumed that oil film and adherence of chips will become error factor.

Q3.4) What is different from a run-out measuring machine using vibration sensor?  
A) Generally, as for a run-out measurement using vibration sensor, “a method which measures ‘no entering state’ and the vibration immediately after ATC and compares them, and “presume” the run-out amount of tool holder” is adopted. Various noise-like vibrations exist on the spindle. Thus, in comparison with the method which actually “directly measures” the run-out of the tool holder like ATC run-out detection system, there is a problem in the reliability.