A Brief Introduction of Chinatron Rotor

The rotor used in the Chiantron was originally redesigned for long-vessel species to reduce or prevent effervescence caused by injection. The redesigned system has two cuvettes side-by-side on each side of the rotor: 4-cuvette rotor (Fig.1). However, the redesigned rotor would increase the difficulty in injecting water, compared to the traditional Cochard rotor. So, two kinds of lid for short-vessel species using only 2-cuvettes (Fig. 2).

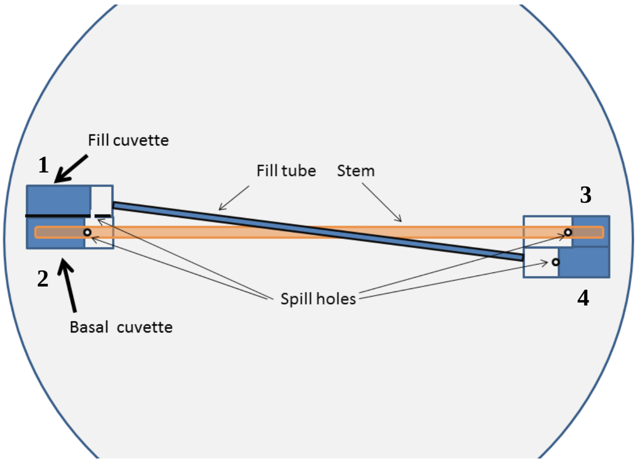


Fig. 1 The modified 4-cuvette rotor based on the Cochard rotor. This design will assure that the fill-water enters the No.2 cuvette from No.1 cuvette due to about 2 mm height difference of the spill holes. Subsequently, the water goes into No.3 cuvette through the stem with force because the hole in this cuvette is 4 mm lower than the meniscus level of the No.2 cuvette. Meanwhile, the excess water is spun out of the cuvette. The function of No.4 cuvette is to keep balance with No.1 cuvette. Cuvettes 1&2 and 3&4 are glued together using epoxy resin.

Fig. 2 The picture of two types of lids designed for 4-cuvette rotor. Upper is the lid for 4-cuvette system, through which the injected water goes into the fill cuvette with little effervescence. Lower is the lid for 2-cuvette system, through which the injected water goes directly into the basal cuvette.

Requirements for Samples and Cuvettes

Requirements for sample stem segments

The basic requirements for the sample are:

1) the stem segment need to be very straight,

2) the basal diameter of the segment has to be controlled ≤ 7.0 mm,

3) the nodes of the segment are better not contained in the cuvettes,

4) the diameter difference between the basal and distal of the segment has to be small, so that both of the two menisci could be clear and intact under the same magnification,

5) The length of the stem segment should better be controlled ≤ 27.3 cm.

If the sample is not straight enough, please make sure it bends in one direction with small curvature, so that the stem segment could be pressed to be straight under the lid of Chinatron. If you unfortunately collect a stem with two arcs bending in opposite directions, the segment should be discarded unless you can figure out how to keep it straight when mounted in the rotor.

Requirements for cuvettes

We recommend using the cuvettes made in Germany (BRAND GMBH + CO KG, Cat. No. 759170) because they are stronger and less likely to crack during measurements at high RPM.

Cuvettes directly out of the box are relatively hydrophobic making the meniscus flat. A curved meniscus results when the plastic surface is more hydrophilic making the water track up the sides as in a glass pipette. The cuvettes need to be soaked in strong acid (H_2SO_4 > 90 % by weight) to make the surface hydrophilic. Make an acid bath by mixing concentrated sulfuric acid with distilled water. The preparation process comprises the following steps:

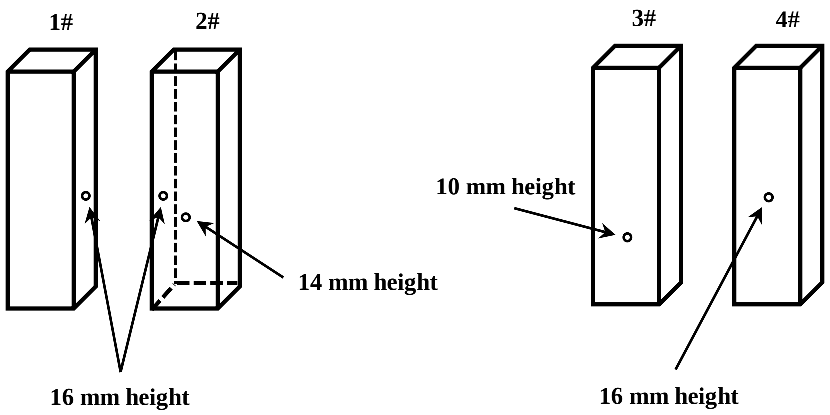
1) Dilute concentrated sulfuric acid-distilled water − solution at a mass-volume ratio of 1∶1. Warning: adding strong acid to water causes the release of a lot of heat, wait until the solution cools before step 2,

2) keep the cuvettes submerged in the H_2SO_4 solution overnight,

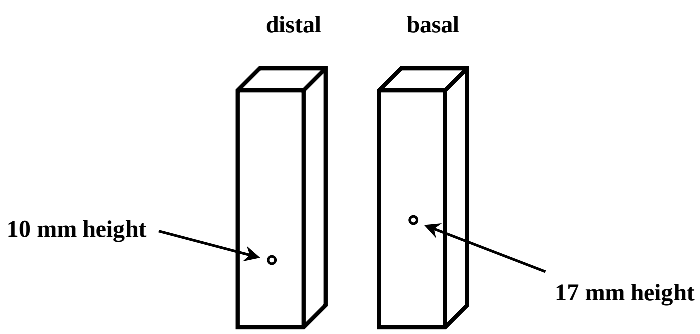
3) remove the cuvettes from the acid bath using stainless steel forceps, and use running water to wash away the acidic solution adhering to both of inner and outer surface of the cuvettes,

4) swab the inner wall of the cuvettes in order to remove the grease which adhered tightly on the surface of the inner wall using a cotton swab on the end of a ‘stick’ (buy laboratory swabs or ‘Q-tips’),

It is possible that the menisci would become weak after a few day's work. You can do the acid treatment in this case, in order to maintain clear menisci. However, excessive use of H_2SO_4 solution is likely to make the cuvettes weak. So, daily swabbing the inner wall of the cuvettes with H_2SO_4 solution could help sustain good menisci. If unused for a period of time, immerse the cuvettes into 50 % H_2SO_4 solution overnight again for use the next day.



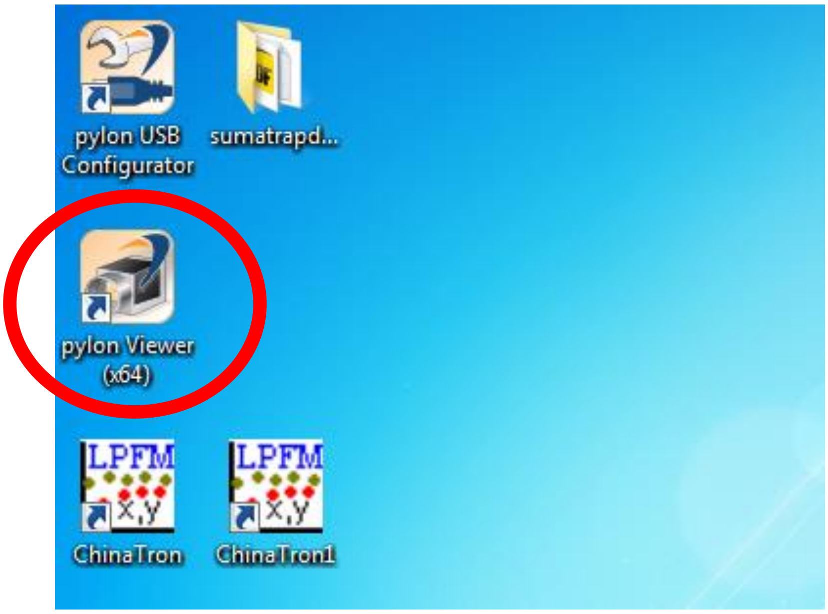
The position of holes in 4-cuvette system



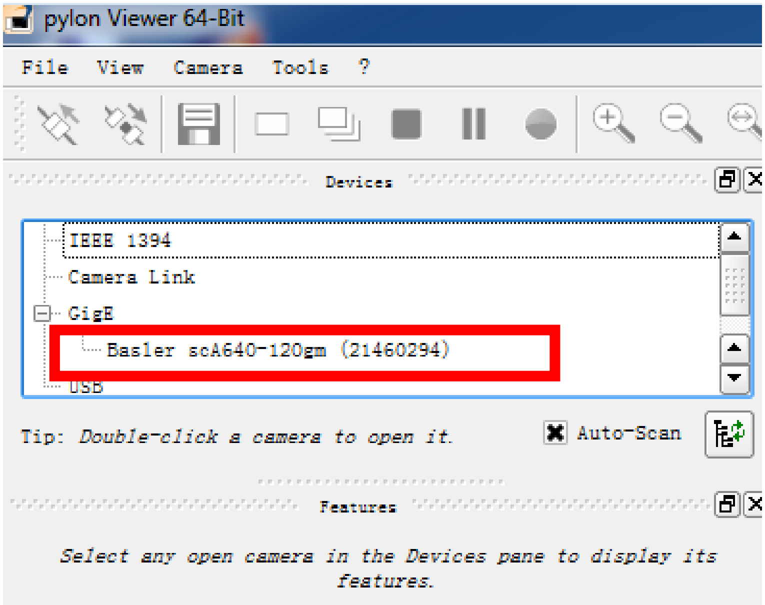
The position of holes in 2-cuvette system

Brief Software Instructions

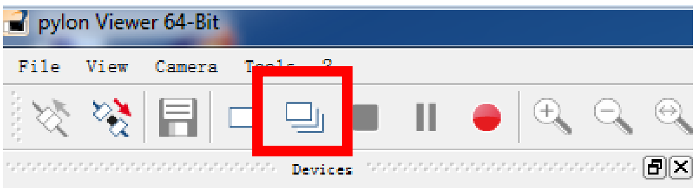
1. Start “pylon viewer (×64)” on the desktop.



2. Double-click the connected camera.

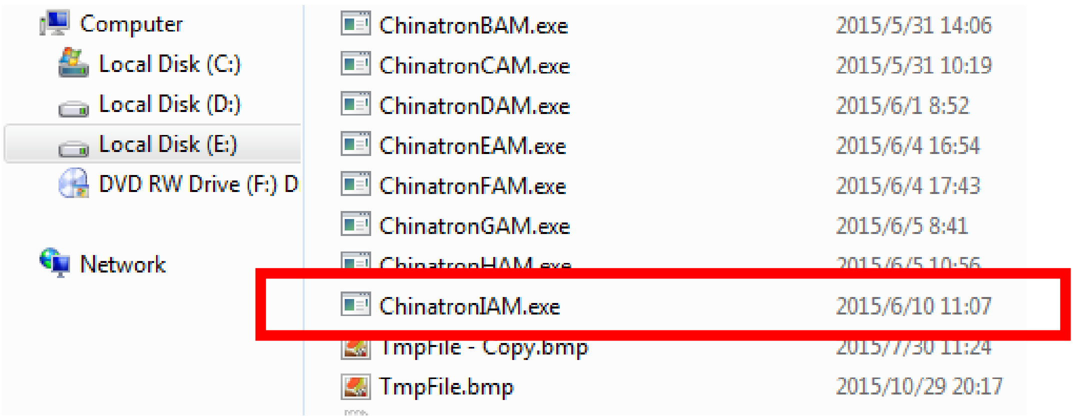


3. Click on the “continuous shot” button.

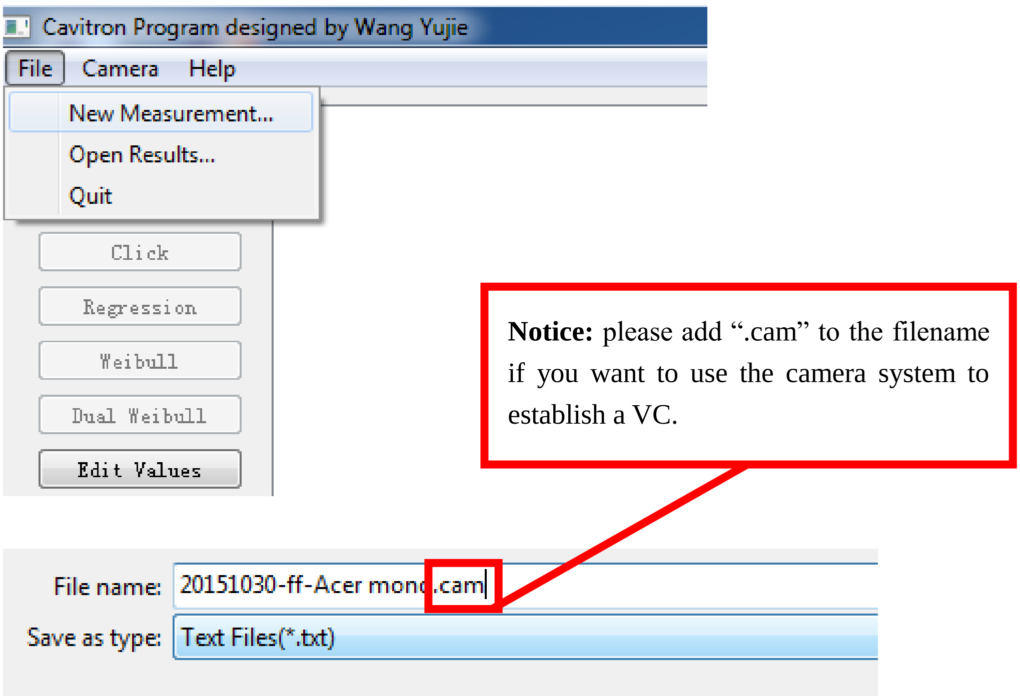


4. The two white and bright lines are the water menisci in the two cuvettes, respectively. Adjust the focus length and light level on the centrifuge (the 'zero line' is on the right side) to make the menisci brighter and clearer before close the "pylon viewer".

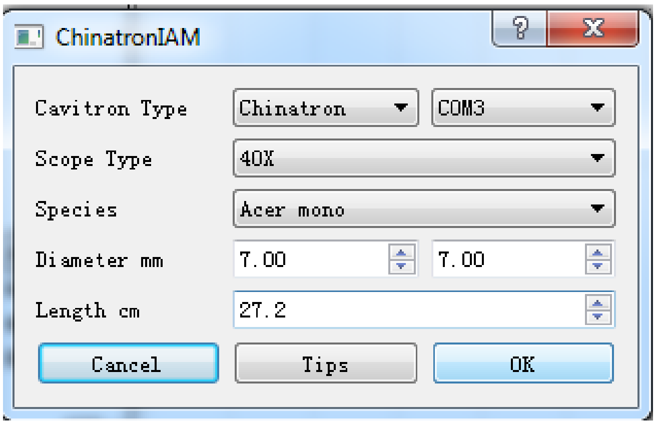
5. Open "ChinatronIAM.exe".



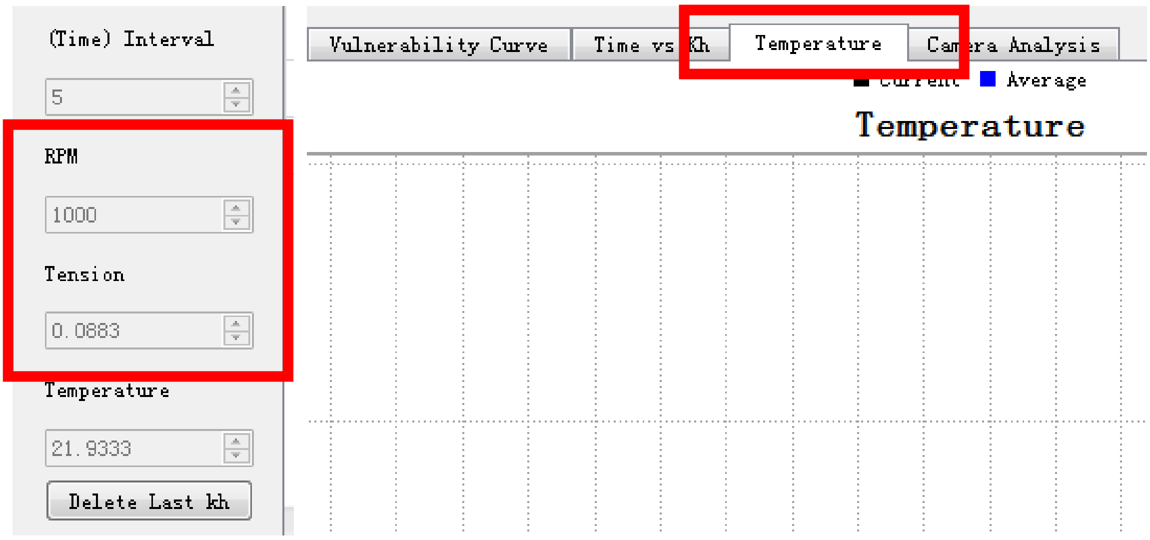
6. Name the file by clicking on "File – New measurement".



7. Fill out the information according to your experiment.

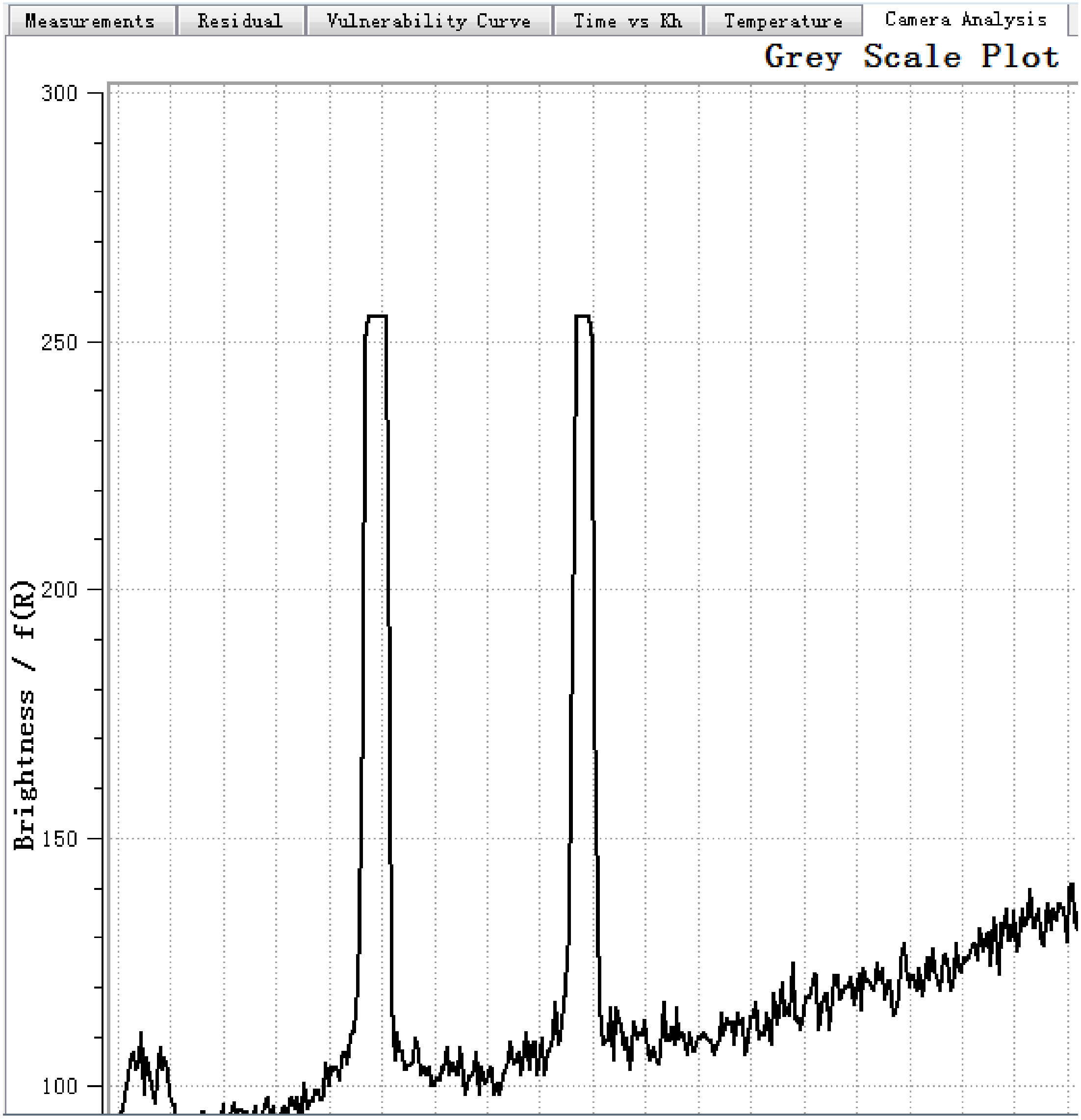


8. Please wait until rotate speed is stable and temperature interface begins displaying data.

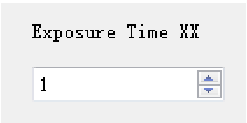


9. Start camera system following route “Camera – Initialize Camera”.

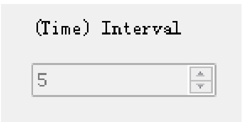
10. Please switch to "Camera Analysis" interface, you will see two peaks after 1 ~ 2 s. These two peaks are the two white and bright lines you saw under "pylon viewer", please see step 4.



11. The K_h could be automatically measured by clicking "Camera Regression" after adjusting the "exposure time" and "time interval" parameters, according to the requirements for your experiment.

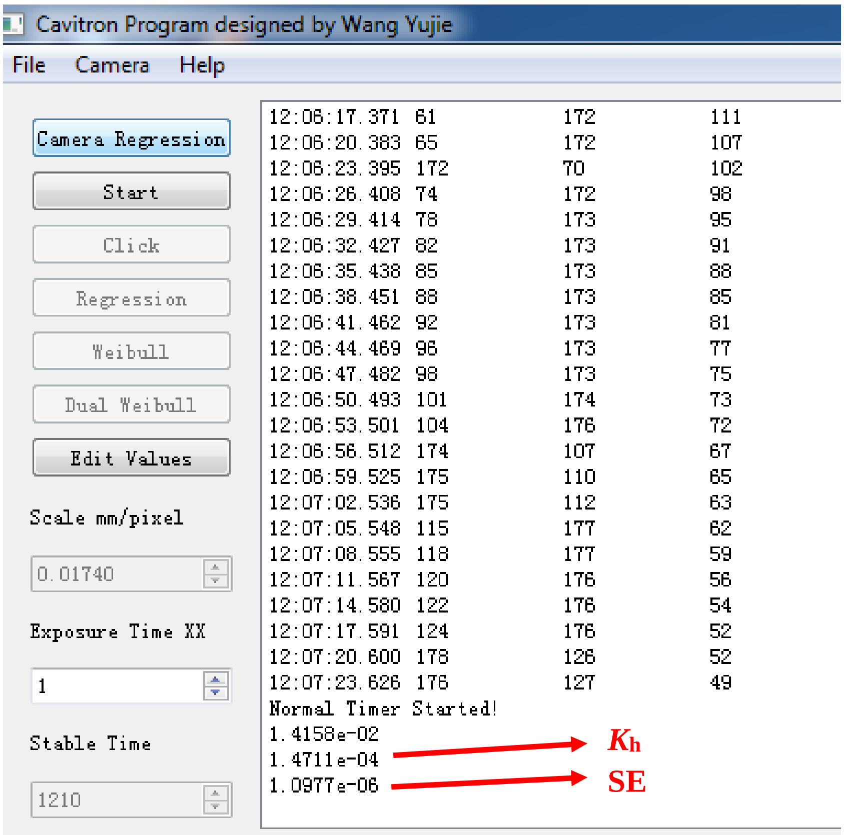


Change the Exposure Time as RPM increases, in order to make the white lines clearer.



Change the Interval from 1 to 10 s or more according to the movement of the wihte line through visual speculation.

12. The data which was obtained after a K_h measurement.



13. Keep measuring K_h while stepwise increasing the RPM, until a full VC is completed.

History: The first Cavitrons were designed by Herve Cochard, INRA, Clermont-Ferrand, France, the first camers systems were implimented by the research group in the INRA, Bordeaux, France, (Team leader Dr. Sylvan Delzon, softare engineer, Régis Burlett). The commercial version of the Cochard Cavitron was developed by XYCI, Changsha, with the assistance of Prof. Mel Tyree. The software for the semi-automatic digital camera system was writeen by WANG Yujie in Prof. Tyree's lab.

Written by FENG Feng

fengfeng12343@126.com

3-July-2018