



## **RapidOxy: Stability of Edible Oils**

Relevant for: food industry



### **1 Introduction**

The RapidOxy measures the stability of a product under accelerated oxidation conditions.

This report describes the determination of the oxidation stability of edible oils comparing RapidOxy results with results using the method EN 14112 at different test temperatures.

The determination of oxidation stability of vegetable oils and animal fats is the classical application for the RapidOxy. Moreover, they are major components of many other food samples which are therefore also prone to oxidation and sample degradation.

Oxidation of oils and fats cause a sample to become rancid, marked by the typical and unpleasant smell and taste.

One major advantage of the RapidOxy device is that it determines oxidation stability of solid oil- and fat-containing food samples without any preliminary treatment. Unlike the method EN 14112 where extraction steps prior to the determination are necessary.

The oxidation process can be suppressed by addition of antioxidants.

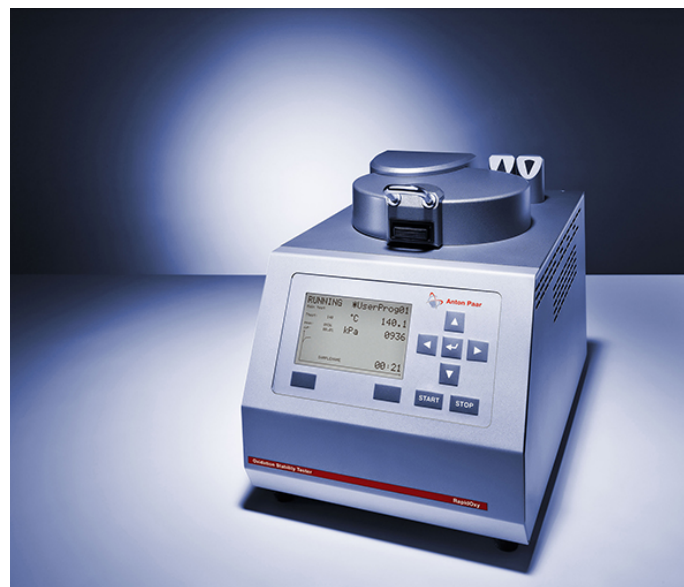
#### **Definition**

**Break Point:** Pressure drop in the test apparatus which is 10% below the maximum pressure of the current test run.

**Induction Period:** Time elapsed between starting the heating procedure of the test chamber and the break point measured in minutes.

### **2 Instrumentation**

#### **2.1 Instrument**



*Fig. 1 RapidOxy*

#### **2.2 Accessories**

O-ring set, Viton®, pack of 100 (107296)

Cleaning tissues, 150 sheets (107138)

Measuring pipettes, 5 mL, pack of 100 (107137)

Pressure line, > 8 bar, G 1/4, 150 cm (107084)

## 3 Sample and Instrument Preparation

### 3.1 Sample preparation and filling

The liquid sample is filled directly into the RapidOxy.

For fast sample exchange you can also use the PTFE dishes (107299) or glass dishes (106453 for small and 166746 for large sample volumes).

### 3.2 Instrument preparation

- The instrument must be located on a level, vibration free surface.
- Clean the test chamber and the screw cap carefully with the help of a soft tissue and ethanol.
- Make sure that the pressure line is connected to the oxygen inlet of the RapidOxy.
- Insert a new Viton® O-ring (107296) for every new test.
- Fill 5 mL of a sample into the test chamber.

### 3.3 Calibration

The calibration of pressure and temperature is possible.

For detailed information please refer to the manual.

If you want to calibrate the instrument, you should check with the verification fluid (107300) first.

### 3.4 Settings

Program:	Userprogram2
Test temperature:	140 °C and 120 °C
Filling pressure:	700 kPa
Pressure drop below $p_{\max}$ :	10 %
Sample amount:	5 mL

Keep in mind that - as an empirical formula - the induction time will double when the test temperature is decreased by 10 °C.

## 4 Measurement

- Reset the user- defined programs to the factory settings by selecting the menu "**Config&Service > Service > Reset > Reset Userprograms**".
- Select the program "**Userprogram2**".
- Check that test chamber and screw cap are clean.
- Select the menu "**Test Run**".
- To change the test temperature in the "**Userprogram2**" to 120 °C, press the key <Set> and move with the arrow keys ◀ and ▶ to the temperature values on the left side of the display and change them by using the arrow keys ▲ and ▼.
- Press <START>.
- Now the device will guide you through the starting process.
- Insert the O-ring.
- Insert 5 mL sample with a measuring pipette.
- Close the test chamber and the insulated safety hood.
- The test will be started automatically.
- The result is shown on the display.
- When the test is finished the instrument will guide you through the cleaning process.

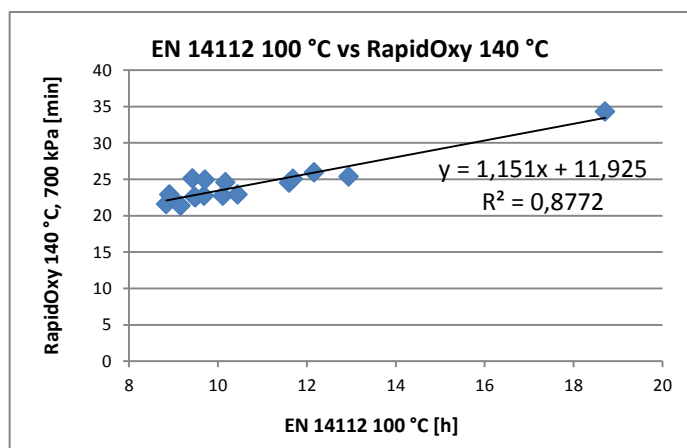
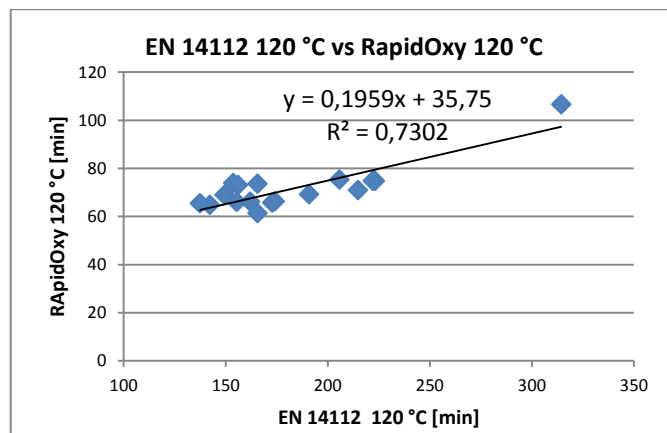
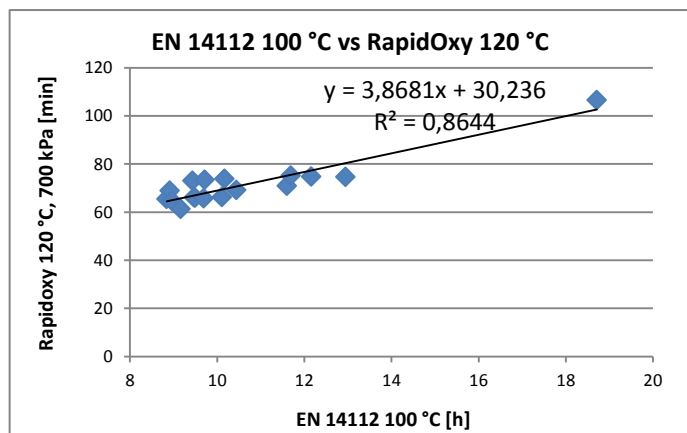
## 5 Cleaning

Wipe the test chamber and the screw cap with cleaning solvent e.g. ethanol and a soft tissue after each test.

## 6 Results

Seventeen edible oil samples were tested at 120 °C and 140 °C in the RapidOxy. The test results obtained were compared with test results for method EN 14112 at 100 °C and 120 °C.

Sample Name	RapidOxy		EN 14112	
	140 °C, 700 kPa	120 °C, 700 kPa	100 °C, 20 l/h	120 °C, 20 l/h
	t[min]		t[h]	
A1 Raw sunflower oil	24.58	73.83	10.17	2.56
A2 Neutral sunflower oil	22.48	64.70	8.96	2.37
A3 Winterized sunflower oil	21.61	65.46	8.84	2.29
A4 Winterized filtrated sunflower oil	22.71	66.26	10.11	2.90
A5 Deodorized sunflower oil	25.38	74.68	12.94	3.72
B1 Raw sunflower oil	25.10	73.00	9.43	2.60
B2 Neutral sunflower oil	22.91	68.92	8.91	2.49
B4 Winterized filtrated sunflower oil	22.50	65.93	9.49	2.59
C1 Raw sunflower oil	24.91	73.48	9.71	2.76
C4 Winterized sunflower oil	22.60	66.06	9.47	2.70
C5 Deodorized sunflower oil	25.06	75.23	11.69	3.43
1 Edible sunflower oil	24.53	70.86	11.60	3.58
2 Edible sunflower oil	24.45	69.20	10.44	3.18
3 Edible sunflower oil	25.93	74.81	12.16	3.70
4 Edible rapeseed oil	34.30	106.60	18.71	5.24
6 Edible sunflower oil (Co)	22.73	65.68	9.69	2.88
7 Edible sunflower oil (Co)	21.36	61.28	9.16	2.76



## 7 Discussion

A good correlation has been found for all test temperatures.

As the test times in the RapidOxy are very short at 140 °C, we recommend a test temperature of 120 °C to receive a better differentiation between the samples.

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