

## Thermogravimetric Analyzer TGA 3000

# TGA 3000 Thermogravimetric Analyzer

Orbit's TGA 3000 is an automated instrument which determines Moisture content, Ash content, Volatile content, Loss on Ignition (LOI) and Fixed Carbon content in a wide range of Organic, Inorganic and Synthetic materials.

Thermogravimetric analysis replaces the traditional analytical techniques that are slow, labour intensive and involve several steps with multiple laboratory equipment such as Muffle furnaces, Ovens and Balances. The TGA 3000 with integrated balance combines drying, ashing and weighing processes. This improves the efficiency, precision and provides high sample throughput.

The TGA 3000 is applicable in various industries and applications, including coal, coke, ores, cement, lime, foodstuffs, feeds and many more.

## Typical Sample Materials

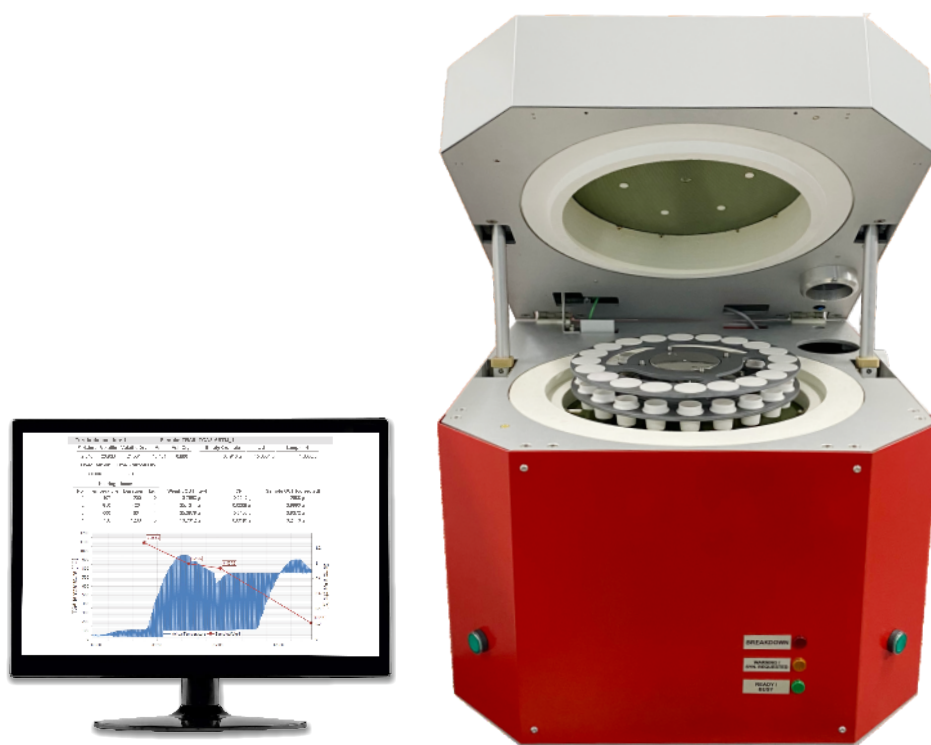


The TGA 3000 comes with a PC software that is easy to use and intuitively provides the user with control of the instrument, tracking of samples and measurement data throughout the analysis process.

Typical analysis is performed in air, other gases such as nitrogen and oxygen can also be used to achieve a specific test atmosphere. Samples can be heated and cooled to specified method settings.

Orbit's TGA 3000 is used to analyze samples in accordance with several international standards such as ASTM, ISO, DIN, EN and more.

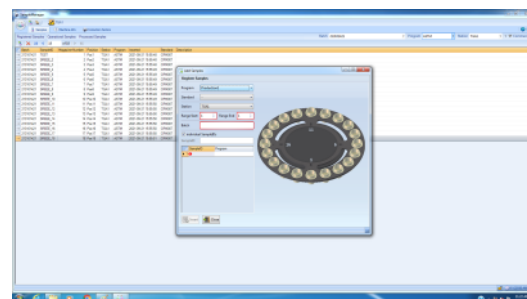
## Reliable and fast proximate analysis by TGA 3000 Thermogravimetric Analyzer



TGA 3000 provides multi-constituent analysis for upto 19 samples at a time. Typical coal analysis method consists of determination of moisture, volatile matter and ash content. The software allows for customization of the analysis steps such as temperature ramping, start temperature & end temperature, programmable gas flows, placement/removal of crucible lids and mass constancy criteria for a fully flexible instrument optimized for every users unique needs.

### Maximum Efficiency & Enhanced Precision

- High performance Thermogravimetric Analyzer
- Automated Analysis of upto 19 samples
- Capable to accept maximum sample weight up to 5 grams, higher range can be offered on request
- Programmable heating ramp rates as per test methods
- Automatic placement & removal of crucible lids
- Windows based control software for operation of the analyzer
- Integrated balance with 0.1 mg readability for robust and accurate mass determination

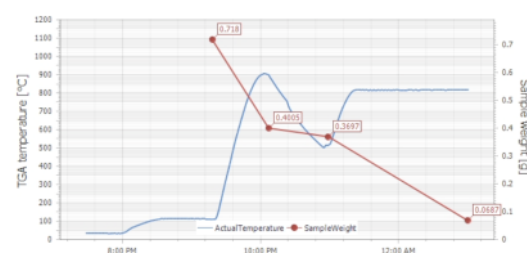


| Turntable position: 3 |           | Sample: 1-09-2020_3 |          |        |       |         |              |                  |         |
|-----------------------|-----------|---------------------|----------|--------|-------|---------|--------------|------------------|---------|
| Empty Crucible        | Lid       | Sample IN           |          |        |       |         |              |                  |         |
| 22.4363 g             | 20.9136 g | 1.0141 g            |          |        |       |         |              |                  |         |
|                       |           | Moisture            | Volatile | Dry    | Ash   | Ash Dry | Fixed Carbon | Fixed Carbon Dry | LOI750  |
| Raw data [%]          |           | 29.198              | 31.309   | 44.220 | 6.775 | 9.568   | 32.718       | 46.212           | 93.2255 |
| - [%]                 |           | 0.000               | 0.000    | 0.000  | 0.000 | 0.000   | 0.000        | 0.000            | 0.000   |
| Corrected [%]         |           | 29.198              | 31.309   | 44.220 | 6.775 | 9.568   | 32.718       | 46.212           | 93.2255 |

|    |             | Heating phase: |     | Weight OUT (raw) |  | CF        | Sample OUT (corrected) |
|----|-------------|----------------|-----|------------------|--|-----------|------------------------|
| No | Temperature | Duration       | Lid |                  |  |           |                        |
| 1  | 108         | 2000           | 0   | 23.1555 g        |  | -0.0012 g | 0.7180 g               |
| 2  | 900         | 420            | 1   | 43.7595 g        |  | -0.0091 g | 0.4005 g               |
| 3  | 500         | 60             | 1   | 43.7196 g        |  | 0.0000 g  | 0.3897 g               |
| 4  | 815         | 3600           | 0   | 22.5084 g        |  | -0.0034 g | 0.0687 g               |

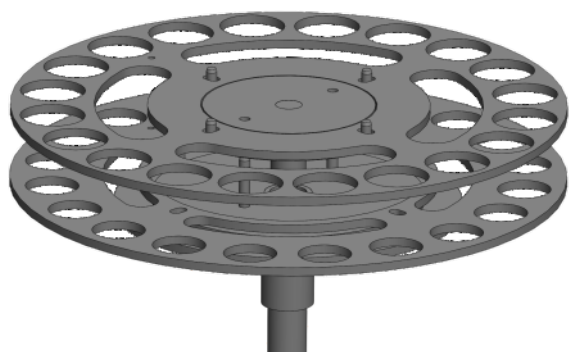
### Windows Based Software

- Ensures precise control and operation of the analyzer
- Tracks the samples and measurement data throughout the analysis process
- Graphic display of temperature vs. weight loss measurements
- Retrieval of sample related information at any given time during analysis
- 16 Editable programs and data transmission to LIMS
- During analytical cycle, display of current parameters such as the real time furnace temperature, sample status and time remaining



## Maximum Productivity

- 19 position carousel allows for high sample throughput rates
- Two TGA 3000's can be controlled from a single PC, thereby boosting productivity and reducing costs



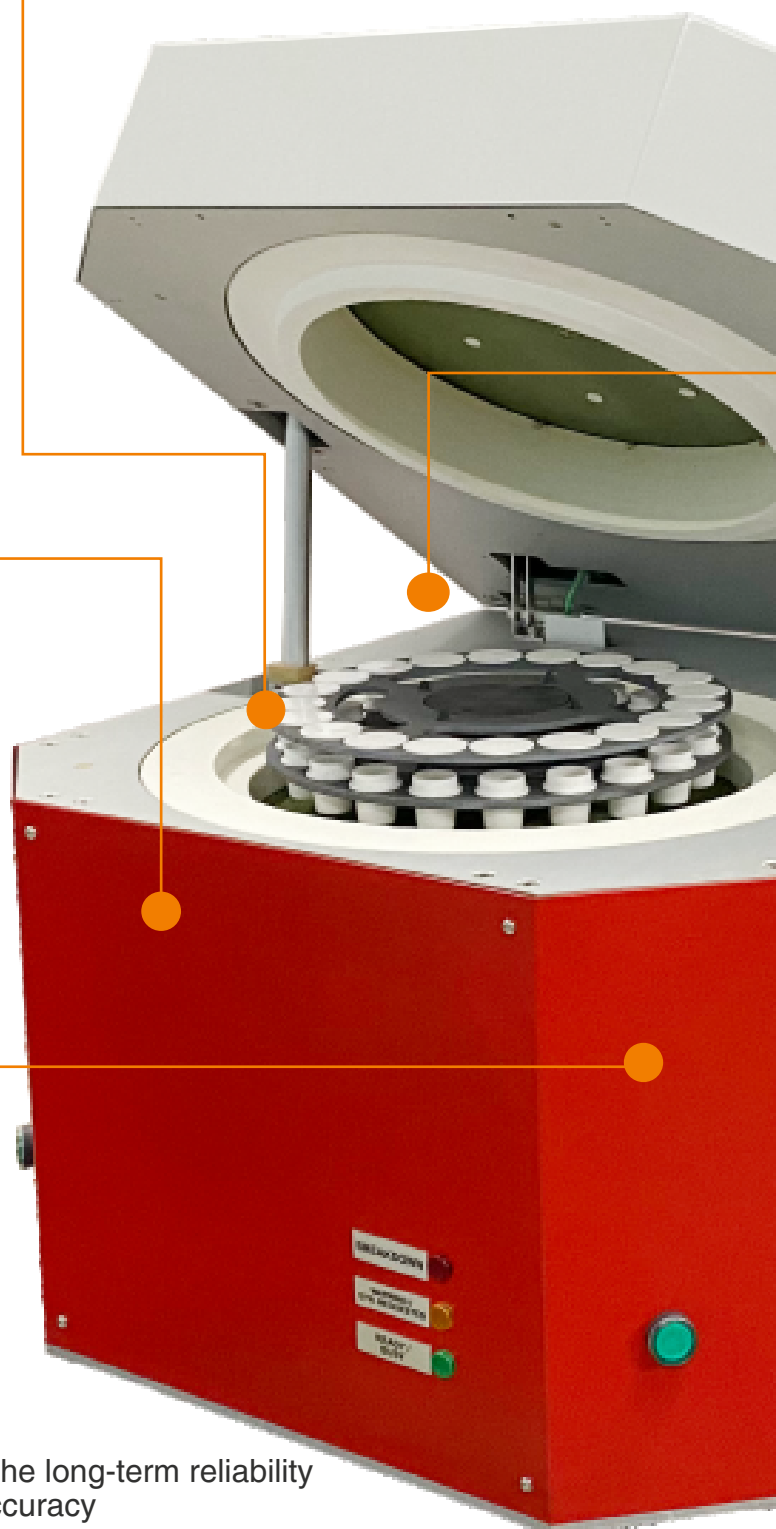
Dual Carousel

## Furnace Cooling

After completion of analysis, cooling process is automatically started with user programmable furnace lid opening, to improve the cool down time.

## Exceptional Performance

- Pneumatic carousel control mechanism increases the long-term reliability by eliminating oscillation and increasing position accuracy
- Automatic control of furnace atmosphere and programmable gas flow rates (Air, Nitrogen or Oxygen)

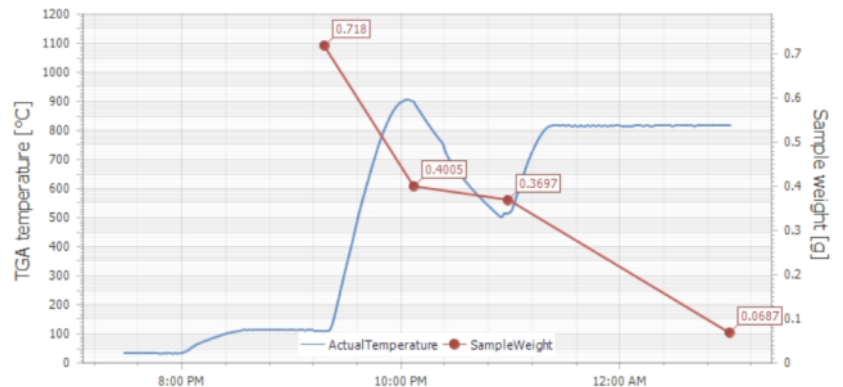


## Powerful Heating Elements

- High power heating elements provide fast temperature ramping and excellent temperature stability
- Embedded multi-element design ensures that temperatures are uniform throughout the furnace chamber

## Automatic Analysis

- Dual Carousel design provides automatic placement/removal of crucible lids inside the furnace
- Automatic end point recognition, user programmable method settings, skipping of empty crucibles allow for optimized analysis time

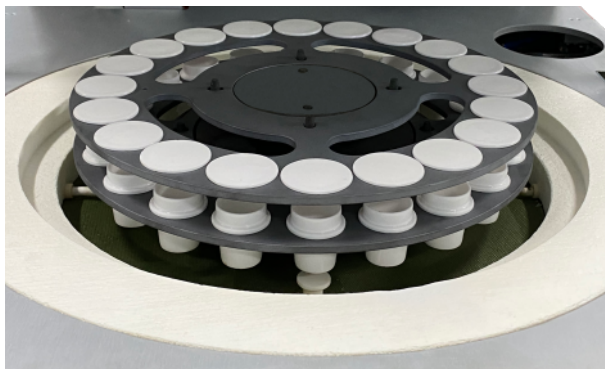


Graphical representation of results

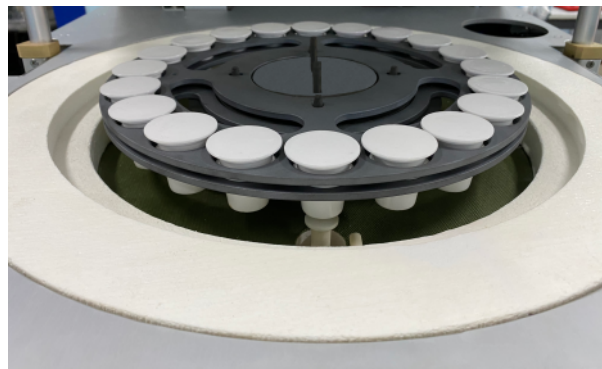
## Integrated Precision Balance

- Insulated balance that is isolated from the heat and ambient atmosphere for stable and precise measurements
- High precision balance accurate to 0.1mg for precise weight measurements

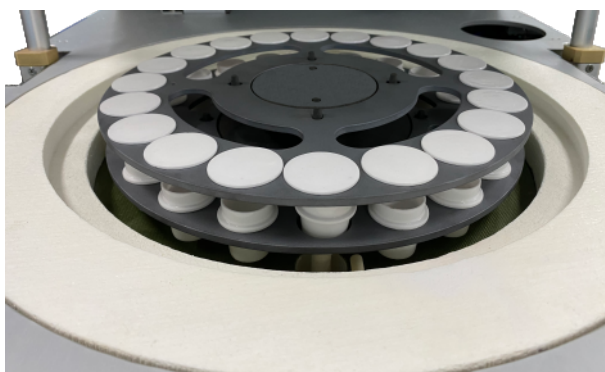




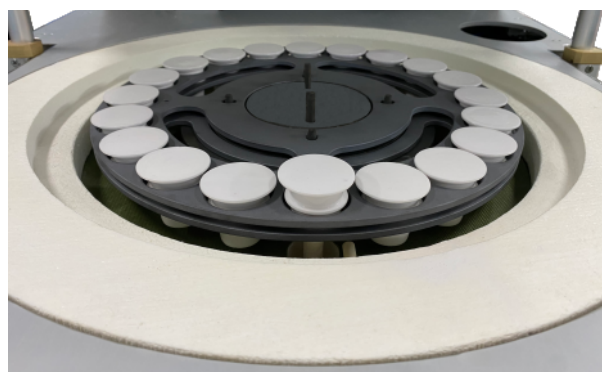
*Crucible lids open*



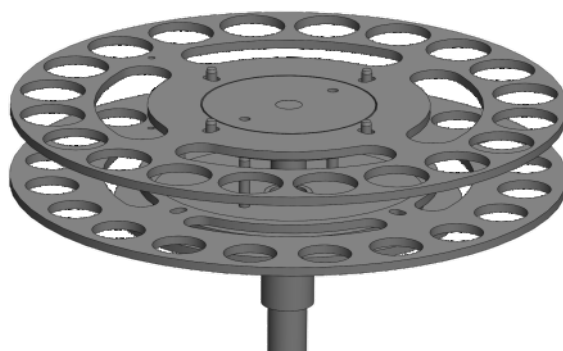
*Crucible lids closed*



*Weighing with crucible lids open*



*Weighing with crucible lids closed*



*Dual Carousel*

### Dual Carousel Configuration:

- TGA 3000 uses High Strength, Corrosion Resistance Dual carousel Configuration – one for holding crucibles and one for holding crucible lids
- The carousels are made of special material which are not susceptible to warping under High temperature stress
- Second carousel allows for automatic placement and removal of crucible lids inside the furnace without opening the furnace lid
- This provides superior volatile matter accuracy in addition to automation & avoids sample oxidization
- Eliminates the risk of operator burns at elevated temperature (600 deg C)
- Avoids the risk of the operator dropping crucible lids into the furnace
- Crucibles and crucible lids can be pre-weighed using an external balance to accelerate the changeover between runs
- Can be used as a standard single carousel TGA without the second carousel when required

## Superior Performance and Accuracy

- The TGA 3000 is a powerful thermogravimetric analyzer that combines best-in-class hardware with an intuitive software housed in a rugged design providing the best analytical performance.
- The carousels are made of special material which are not susceptible to warping under High temperature stress.
- TGA 3000 is also available in a dual furnace package (TGA 3000D) which allows for two TGA's to be operated from a single PC for laboratories that require the highest sample throughput.

The TGA 3000 complies with the following international standards, among others:

| Standard      | Material to be analysed   | Title of the standard   |
|---------------|---------------------------|---|
| ASTM D7582-15 | Coal and Coke             | Standard Test Methods for Proximate Analysis by Macro Thermogravimetric Analysis                |
| ASTM D5142    | Coal and Coke             | Standard Test Methods for Proximate Analysis by Instrumental Procedures                         |
| ISO 562       | Hard Coal and Coke        | Determination of volatile matter  |
| ASTM D7348    | Solid Combustion Residues | Standard Test Methods for Loss on Ignition (LOI) of Solid Combustion Residues                   |
| DIN 51718     | Solid Fuels               | Determination of the water content and the moisture of analysis sample                          |
| ASTM E1755    | Biomass                   | Standard Test Method for Ash in Biomass   |
| DIN 51719     | Solid fuels               | Solid mineral fuels - Determination of ash content  |
| ISO11722      | Solid mineral fuels       | Hard coal - Determination of moisture in the general analysis test sample by drying in nitrogen |
| ISO1171       | Solid mineral fuels       | Determination of Ash  |
| EN 15148      | Biomass                   | Solid biofuels - Determination of the content of volatile matter                                |
| EN 14775      | Biomass                   | Solid biofuels - Determination of Ash content   |
| AS1038        | Coal & Coke               | Proximate analysis & Testing  |
| BS1016        | Coal & Coke               | Proximate analysis  |

# Technical Specification Sheet

## TGA 3000 Thermogravimetric Analyzer

| <i>Furnace Temperature</i>           |   |
|--------------------------------------|---|
| Minimum Temperature                  | Ambient   |
| Max Temperature                      | 1100 deg C  |
| Temperature Control Precision        | ±2% (or) ±2 deg C   |
| Temperature Stability                | ±2% (or) ±2 deg C   |
| <i>Programmable Ramp Rate</i>        |   |
| Ramp Rate                            | 10 deg C /minute to 50 deg C /minute  |
| Balance                              | Integrated Balance  |
| Balance Resolution                   | 0.0001g (0.1mg)   |
| Balance Readability                  | 0.0001g (0.1mg)   |
| Weight Loss                          | 0 -100%   |
| Sample Size                          | up to 5 grams (Higher range can be offered on request)  |
| Number of Samples                    | 19 Samples +1 Reference   |
| Number of Carousels                  | Two (one for Crucibles, one for crucible lids)  |
| Carousel Material                    | The carousels are made of special material which are not susceptible to warping under High temperature stress |
| Weighing Precision                   | 0.02% RSD (on inert Samples)  |
| <i>Electrical Power Requirements</i> |   |
| TGA 3000                             | 230V ( ± 10%) / single phase / 50/60Hz / 15A  |
| Computer                             | 230V (± 10%) / single phase / 50/60Hz / 2A  |

### Ordering Information:

**22-100000:** TGA 3000, Thermogravimetric Analyzer with Dual Carousel, Single furnace package

**22-200000:** TGA 3000D, Thermogravimetric Analyzer with Dual Carousel, Dual furnace package

**22-100146:** Ceramic Crucible, PK/1

**22-100046:** Ceramic Crucible lid, PK/1

**22-107321:** Ceramic Carousel, 20 Positions, Upper

**22-107373:** Ceramic Carousel, 20 Positions, Lower

**22-112254:** Metal Carousel, 20 Positions, Upper

**22-112255:** Metal Carousel, 20 Positions, Lower



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