YK Scientific Instrument Co.,Ltd

# Halogen Drying Method Moisture Analyzer

DSH-10A/DSH-100A-5/DSH-100A-10

# Instruction Manual

# 1. INTRODUCTION

## Safety Precautions

For safe and dependable operation of this moisture Analyzer, please comply with the following safety precautions:

Use the Analyzer exclusively for determination of moisture in samples. Improper operation of the Analyzer can endanger personnel and cause property damage.

If the Analyzer is used in a manner not specified in this manual, the protection provided may be impaired.

Verify that the input voltage printed on the voltage identification label information and the plug type matches the local AC power supply.

The Analyzer has a 3-pin power cable that includes a ground connection. Intentionally disabling the equipment grounding connection is prohibited.

Do not position the Analyzer so that it is difficult to disconnect the Power Plug from the local AC power supply.

Make sure that the power cord does not pose any obstacle or tripping hazard.

Do not operate the Analyzer in hazardous, wet or unstable environments.

Disconnect the Analyzer from the power supply when cleaning the Analyzer.

Ensure sufficient free space around the Analyzer as a safety zone. Allow at least 1 meter of free space above the Analyzer.

The Analyzer must be operated only by trained personnel who are familiar with the properties of the samples being tested and with the equipment operation.

Use appropriate personal safety equipment such as safety glasses, gloves, protective clothing and respirators.

Do not make any modifications to the Analyzer.

Service should be performed only by authorized personnel.

**The Moisture Analyzer works with heat!**

Never place flammable materials on, below or next to the Analyzer.

Use caution when removing a test sample. The sample, the sample chamber, the heating element and the surrounding areas may be very hot and can cause burns.

**Some samples require special care!**

Should there be any uncertainty regarding the safety of a substance, perform a careful risk analysis. In such cases, never leave the Analyzer unattended.

Fire or explosion: Substances which contain solvents or release flammable or explosive vapors when heated. With such samples, work at drying temperatures low enough to prevent the formation of flames or an explosion.

Poisoning or burning: Substances which contain toxic or caustic components should only be dried in a fume hood.

Corrosive: Substances which release corrosive vapors when heated should be tested in small amounts.

The user assumes responsibility for any damage caused by the use of these types of samples.

## Application Disclaimer

Moisture determination applications must be optimized and validated by the user according to local regulations. Application specific data provided by YOKE is for reference purposes only. YOKE waives all liability for applications based on this data.

# 2. INSTALLATION

## Package Contents

Moisture Analyzer
Draft Shield
Sample Pans
Pan Support
Power Cable
Scale Pliers
Weight Pliers
Weight (10g/50g/100g)
Instruction Manual

## Selecting the Location

Operate the Analyzer on a firm, level surface.
Select a location that is safe and with adequate ventilation. Fire, corrosive or toxic fumes and other hazards associated with the test samples will require specially prepared locations.
Ensure that the location has easy access to the local AC power supply.
Avoid locations with rapid temperature changes, excessive humidity, air currents, vibrations, electromagnetic fields, heat or direct sunlight.

## Installing Components

(1) Install and position Draft Shield

(2) Install Pan Support, turn until it engages into position

(3)Place a sample pan over the pan support.

## Connecting Power

Verify that the input voltage printed on the voltage identification label information and the plug type matches the locations AC power supply.

Connect the supplied power cable to the power input receptacle at the rear of the Analyzer and into a properly grounded power outlet.

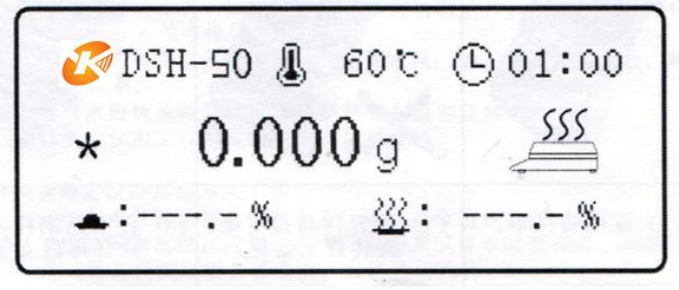
After connecting the Analyzer to the AC supply (standby mode), allow the Analyzer to warm up for at least 30 minutes for best results.

# 3. OPERATION

## Display

| | |
|---|---|
| * | Stable indicator |
| | Percent solids |
| | Percent moisture |
| g | grams |
| | Temperature setting or current chamber temperature (Celsius) |
| | Time setting (minutes : seconds) |
| | Heating |

## Controls




| Button: | Name: | Quick Functions: | Button: | Name: | Quick Functions: |
|---|---|---|---|---|---|
| | **Start / Stop** | **On** (short press) / **Off** (long press)<br>**Start/Stop** (short press)<br>**Back** (short press) | | **Set** | **Increase** value<br>(short or long press) |
| | **Tare** | **Tare** (short press)<br>**Enter / Accept value** (short press) | | **Set** | **Decrease** value<br>(short or long press) |
| | **Temp** | **Temperature Setting** (short press) | | **Print / Cal** | **Print** (short press)<br>**Calibrate** (long press) |
| | **Time** | **Time Setting** (short press) | | **Test** | **Start to test** (short press) |

There are also several modes of operation which affect how each button operates. Please refer to the following section.

## Operating Modes

### Standby Mode

When the Analyzer is connected to AC power and the display is off, the unit is in Standby mode.

**Start** (Short press) Turns on the display and enters Weigh mode.

**Print** (Long press) Displays the RS232 settings (see Section 6, RS232 Data Connection.). Thereafter, (Short press) Re-enters Standby mode (off).

### Weigh Mode

The display shows the weight of items placed on the pan support.

**Tare** (Short press) Sets the displayed weight value to zero

**Start** (Long press) Enters Standby mode (Off)

The following operations can be initiated:

**Temp** (Short press) Enters Edit mode for the temperature setting, the value will blink

**Time** (Short press) Enters Edit mode for the time setting, the value will blink

**Start** (Short press) Activates Run mode, initiates test with a sample greater than 0.5 g

**Cal** (Long press) Initiates weight or temperature Calibration (see Section 5, Maintenance)

### Temperature / Time Edit Mode (Preparing a Test)

Temperature editing: (50° to 160°C in 5° steps)

**Temp** (Short press) Enters Edit mode for the temperature setting, the value will blink.

**Set** (Short or long press) Increases the value of the temperature setting.
**Set** (Short or long press) Decreases the value of the temperature setting.
**Tare** (Short press) Accepts the blinking value and returns to Weigh mode.
**Start** (Short press) Exits Edit mode without saving changes.
Note: After 5 seconds of no activity the blinking setting is automatically saved and the mode returns to Weigh.

Time editing: (1 to 60 minutes in 30 second steps, 61 to 99 minutes in 1 minute steps)
The time parameter can be set to timed duration or AUTO (the test ends when the Analyzer detects the weight loss has ended). Selecting AUTO or timed duration:
**Time** (Short press) Enters Edit mode for the time setting, the value will blink.
**Time** (Short press) While the time setting is blinking, toggles between AUTO and a time value.
**Tare** Accepts the blinking setting.
If AUTO is selected Weigh mode is entered.
If time duration is selected:
**Set** (Short or long press) Increases the value of the time setting.
**Set** (Short or long press) Decreases the value of the time setting.
**Tare** (Short press) Accepts the blinking value and returns to Weigh mode.
**Start** (Short press) Exits Edit mode without saving changes.
Note: After 5 seconds of no activity the blinking setting is automatically saved and the mode returns to Weigh.

**Run Mode (Performing a Test)**
A moisture determination test is initiated. The results in progress are displayed.
**Start** (Short press) Activates Run mode, initiates test with a sample greater than 0.5 g.
**%g** Changes the unit of the displayed result: weight (grams) > % Moisture > % Solids.
**Stop** (Short press) Manually stops the test in progress.
**Print** Sends the current displayed value to the RS232.

**Result Mode**
At the end of the test (Run Mode), the display blinks the test result.
**%g** Changes the unit of the displayed result: weight (grams) > % Moisture > % Solids.
**Tare** Exits to Weigh mode.
**Print** Sends the current displayed value to the RS232.

## How to Prepare a Test

Moisture determinations can be made very simply. The three steps are:
(1) Setting the drying temperature (see Section 3).
(2) Setting the drying time, and (see Section 3).
(3) Preparing the sample to be tested:
Place the Pan Handler with empty test pan on the Pan Support (see Section 2).
Press **Tare** to zero out the pan weight.
Remove the test pan and place the test sample onto the test pan. The sample must be greater than 0.5g.
Spread the sample evenly across the test pan.
Place the test pan with the sample on the Pan Support. The weight value of the sample will be displayed.

Section 4. Test Optimization gives hints on determining optimal drying temperatures and times, sample sizes, and proper preparation of samples.

## How to Perform a Test

(1) Close the Heater Cover.
(2) Press **Start** to begin the test (press **Start** again to stop the test in progress).
(3) When the test is over the display will blink showing the final result.
(4) To change the displayed units, press **%g**.
(5) To print the current displayed value, press **Print**.
(6) Press **Tare** to exit to Weigh mode.

## Performing a Trial Test

Prior to actual testing, a test run can be performed with these suggested settings:
(1) Temperature = 120
(2) Time = AUTO
(3) Sample = 3g of water. Place a glass fiber pad (included with the Analyzer) on the test pan, place on Pan Support.

Press **Tare** to zero the pan weight. Add 3g of water to the fiber pad.

(4) Press **Start** to initiate the test. A perfect result on the trial test would be: 0g, 100% moisture or 0%solids.

Results may vary slightly due to weighing errors involved with a small sample, or other experimental errors. See also Section 4. Test Optimization.

# 4. TEST OPTIMIZATION

Moisture is determined from the weight loss of a sample dried by heating.

The speed and quality of the measurement process will rely on the following parameters. Experimentation will also help ascertain the optimal setup of these parameters:

Drying temperature
Drying time
Sample weight
Sample preparation
Type of sample

## Drying Temperature

The drying temperature exerts a controlling influence on the drying time (e.g., a low temperature can prolong the drying time unnecessarily).

Select a drying temperature that neither decomposes nor changes the chemical structure of the sample.

Some samples can give off different amounts of moisture at different drying temperatures. In these cases, deviations can be compensated by changing the drying temperature.

## Drying Time

This analyzer has three methods to establish the drying time.

Manual , where the user stops the test in progress by pressing the **Stop** button. The test must be longer than 30 seconds to be a valid test.

Automatic , which ends the drying process when detecting less than 1mg loss in 60 seconds. To keep the drying time short, select a small sample weight that still maintains the required measurement accuracy.

Timed duration , where the test ends when the pre-set drying time elapses.

## Sample Weight

The weight of a sample influences the measurement time and repeatability of the results. With large amounts of samples, more moisture must be vaporized and the process takes longer. Generally, the sample weight should be between 3g and 20g. 3g samples give fast results with some sacrifice in accuracy. 20g samples generally give more consistent results but require a longer test time.

Another way to determine the sample weight is to use the relation between sample weight and repeatability, as shown in the following table. If requiring repeatability results better than ±0.3%, for example, the table indicates that a sample weight of at least 2g will be needed.

| Sample Weight | Repeatability |
|---|---|
| 0.5g | ±1.0% |
| 1g | ±0.6% |
| 2g | ±0.3% |
| 5g | ±0.12% |
| 10g | ±0.06% |

## Sample Preparation

Samples must always be uniform and representative of the total amount to obtain accurate and reproducible results. When preparing samples, it is essential to ensure thin and uniform distribution of the sample on the test pan (i.e., avoid piling and excessive amounts).

## Types of Samples

**Pasty, fat containing and melting substances**

Use a glass fiber filter to increase the surface area of these types of samples (e.g., butter). The moisture in these substances is more uniformly distributed through the filter. The increased surface area results in faster and more complete vaporization of the moisture.

**Liquid substances**
Liquids (e.g., dispersions) tend to form drops on the test pan, which prevents rapid drying. Use of a glass fiber filter shortens the drying time significantly as the filter distributes the liquid sample over a larger surface area.

**Skin-forming and temperature sensitive substances**
Formation of a film on the surface of these samples can prevent complete determination of moisture. Using a glass fiber filter to cover the sample allow gentler and more beneficial heating, improving reproducitility.

**Sugar-containing substances**
Samples containing large amounts of sugar tend to caramelize. Ensure that a thin and uniform layer is applied and a moderate temperature selected. The sample can also be covered with a glass fiber filter that improves reproducitility.

The following substances present risk of fire, explosion, damage or injury.
Should there be any uncertainty regarding the safety of a substance, always perform a careful risk analysis. In such cases, never leave the Analyzer unattended.

**Volatile substances**
With volatile samples, rapid application of the sample on the test pan is advisable, to limit the moisture from escaping before the initial weight is recorded. These substances also include samples treated with solvents, and substances which contain solvents or release flammable or explosive vapors. Work at drying temperatures low enough to prevent the formation of flames or an explosion. Always work with small samples (maximum 1g).

**Poisonous and toxic substances**
Substances which contain toxic or caustic components should only be dried in a fume hood.

**Corrosive substances**
Substances which release corrosive vapors when heated (e.g. acids) should be tested in small amounts. The vapors can condense on the Analyzer parts causing corrosion.

# 5. MAINTENANCE

## Weight Calibration

Weight calibration is rarely required. Moisture analyzers use relative weight values to determine the results, so a minor offset from the absolute weight has little effect on accuracy. YOKE moisture analyzers have rugged, high quality temperature stabilized weighing modules that retain their calibration over long periods of time.
(1) Remove any load on the Pan Support including the sample pan.
(2) Press and hold Cal while in the Weigh mode. “CAL” will appear followed by “50.00g”.
(3) Place a 50g calibration mass on the Pan Support. The display will show “-----”.
(4) Remove the mass when “--0--” is shown on the display. The display will show “-----”.
(5) The Analyzer will return to Weigh mode when calibration is complete.
Note: Pressing **START** will cancel the calibration without saving the changes.

## Temperature Calibration

Temperature calibration is rarely required under normal use. If the heating elements become dirty, the usual setting may no longer produce the same results. A temperature calibration can correct for these changes.

Use only the YOKE Temperature Calibration Kit (accessory) to perform temperature calibration. Damage to the Analyzer can occur if using other methods.

(1) Remove the Pan Support. “Err8.4” must be shown on the display for the temperature calibration to start.
(2) Place the YOKE Temperature Calibration Kit into the temperature chamber (see Kit Instructions). Close Cover.
(3) Press and hold **Cal** until “Cal” is displayed. When **Cal** is released “TC100” will appear and the heater turns on.
(4) After 15 minutes, the unit will beep and blink “100” on the display.
(5) Read the thermometer on the Temperature Calibration Kit and press **Set** to change and match the displayed value to the thermometer reading.
(6) Press **Tare** to enter the value. The display will show “TC160” as the heater turns on again.
(7) After 15 minutes, the unit will beep and blink “160” on the display.
(8) Read the thermometer on the Temperature Calibration Kit and press **Set** to change and match the displayed value to the thermometer reading.
(9) Press **Tare** to enter the value. The Analyzer returns to Weigh mode.
(10) Temperature calibration is now complete.
**Note:** If **Tare** is not pressed within 10 minutes the calibration will be aborted.

## Troubleshooting

| Symptom / Display | Possible Cause | Remedy |
|---|---|---|
| Cannot turn on | No power to Analyzer | Verify connections and voltage |
| Weight value blinking | Sample weight less than 0.5g | Increase samle size |
| “Tare” shown | Pan weight needs set to zero | Press Tare |
| “Close Cover” shown | Cover needs to be closed before starting test | Close Cover |
| Poor accuracy | Improper calibration | Perform calibration |
| | Unstable environment | Move the Analyzer to suitable location |
| Cannot calibrate | Unstable environment | Move the Analyzer to suitable location |
| | Incorrect calibration masses | Use correct calibration masses |
| Err 7.0 | Time out | |
| Err 8.1 | Pan Support has load during power on | Remove weight from pan support |
| Err 8.2 | Pan Support was removed prior to power on | Install Pan Support |
| Err 8.3 | Weight on Pan Support exceeds capacity | Remove weight from the Pan Support |
| Err 8.4 | Pan Support was removed during weighing | Re-install Pan Support |
| Err 9.5 | Factory calibration data corrupted | Contact the authorized dealer |
| Err 53 | EEPROM Checksum error | Contact the authorized dealer |

# 6. TECHNICAL DATA

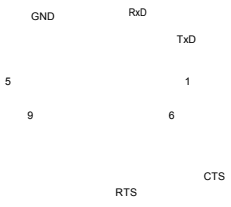
Admissible Ambient Conditions
Location: Indoor use only
Temperature: 10°C to 40°C
Relative humidity: 15 % to 80 % at 30°C non-condensing
Warm up time: At least 30 minutes after connecting the Analyzer to the AC supply;
when switched from standby mode the Analyzer is ready for immediate use.
Height above sea level: Up to 2000 m
Power Input: 100VAC - 120VAC, 3A, 50/60Hz or 200VAC -240VAC, 3A, 50/60Hz
Voltage fluctuations: -15% +10%
Power load: 250W(Maximum during drying process)
Power line fuse: 1 piece, 5 x 20mm, 8A 250V
Protected against dust and water, Pollution degree: 2, Installation category: Class II

**Specifications:**

| **Model** | **DSH-10A** | **DSH-50A-5** | **DSH-50A-1** | **DSH-50A-10** | **DSH-100A-5** | **DSH-100A-10** |
|---|---|---|---|---|---|---|
| Weighing Range | 10g | 50g | 50g | 50g | 100g | 100g |
| Readability | 10mg | 5mg | 1mg | 10mg | 5mg | 10mg |
| Repeatability (3g samples) | 0.50% | 0.30% | 0.20% | 0.50% | 0.30% | 0.50% |
| Minimum Sample Amount | 0.5 | | | | | |
| Advised Sample Amount | 3-10g | | | | | |
| Heat up time | 1-99ninutes,1 minutes interval | | | | | |
| Temperature Program | Standard | | | | | |
| Terminal Control | Timing, Automatic | | | | | |
| Heating Temperature Range | 50-180 degrees | | | | | |
| Showing Content | Moisture%, Solid%, Weight, Time, Data etc | | | | | |
| Pan Size | 100mm | | | | | |
| Dimension | 265x160x150 | | | | | |
| Net Weight | 5kg | | | | | |
| Heating Source | Halide Torch | | | | | |

## Communication

### RS232 Pin Connections




Female DB9 connector

Pin 2: Analyzer transmit line (TxD)
Pin 3: Analyzer receive line (RxD)
Pin 5: Ground signal (GND)

**RS232 Data Settings** (default)
Baud Rate: **9600** Data Bits: **7** Parity: **N** Stop Bits: **2**