

# Work Instruction

## ADSORPTION CAPACITY

### 420951



#### 1 Scope

To determine the Adsorption Capacity or Unit Adsorption Rate for moisture sorbent products.

#### 2 Purpose

This work instruction aims to describe the process for testing the Adsorption Capacity for sorbent products.

#### 3 Definitions

UAC- Unit Adsorption Capacity  
RM- Residual Moisture

#### 4 Responsibilities

Quality Control is responsible for all UAC testing.

#### 5 Description

5.1 The method to determine UAC is used for testing the moisture adsorption properties of desiccant material only. If the desiccant is packaged within a packet, canister, bag or any other material, the desiccant must be removed from the packaging. The UAC procedure is designed to accurately determine the adsorption capacity of the desiccant, not the desiccant and package combined.

5.1.1 Fill out the Adsorption Capacity Log Sheet (GMS 991972) with all appropriate information.

5.1.2 Weigh out at least 10 grams of material and place it into a tarred-out aluminum weigh pan.

5.1.3 Record this as the Initial Sample Weight on the log sheet.

5.1.4 Place the sample into the Thermotron Environmental chamber.

Standard Testing Conditions		
Product	Relative Humidity (RH)	Temp.
Pharmaceutical (Non Mil-D)	80%	25°C
Mil-D	40%	25°C

5.1.5 After 24 hours inside the chamber, remove the sample and weigh again. This weight is recorded as the Final Sample Weight.

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5.1.6 To calculate the %wt. adsorption use the following formulas:

$$\Delta \text{ weight (C)} = \text{Final Sample Weight (B)} - \text{Initial Sample Weight (A)}$$

$$\% \text{wt. Adsorption} = [\Delta \text{ weight (C)} \div \text{Initial Sample Weight (A)}] \times 100$$

5.1.7 If the grams per unit (g/u) is needed, then formula is as follows:

$$\text{g/unit} = [\Delta \text{ weight (C)} \div \text{Initial Sample Weight (A)}] \times \text{Dessicant Factor}$$

Dessicant Factors: Silica Gel= 26, Clay=33

- 5.2 For Mil-D products (Sorb-It or Desi-Pak) that have not reached at least 0.7 g/u after 24 hours, the sample may be returned to the chamber for an additional 2-5 hours to verify failure. Immediately begin retests with a new batch sample.
- 5.3 After the UAC calculations have been completed, enter the UAC results into SAP. Results for pharmaceutical products are reported as a percentage (%) results for Mil-D products are reported as grams per unit (g/u).
- 5.4 Materials that do not specify that the Adsorption Capacity is to be determined by ThermoTron environmental chamber will need the adsorption capacity determined using the following table:

PRODUCT GROUP	MATERIAL SPECIFICATION (<) RM%	MATERIAL SPECIFICATION (≥) ADSORPTION CAPACITY	CALCULATED CAPACITY (%)
Sorb-It® ≥ 1/4 gram	3.00	27.00	30.00 – TEST RM%
Sorb-It® (Customer specific)	3.00	16.00	30.00 – TEST RM%
Desi Pak® ≥ 1/4 gram	3.00	16.00	24.50 – TEST RM%
2-in-1™ ≥ 1/4 gram	4.00	14.00	(X% x Constant A) + (Y% x Constant B) – RM%
Tri-Sorb® ≥ 1/4 gram	4.50	16.00	20.50 – TEST RM%

Constant for Silica Gel=30  
Constant for Clay=24.5

Constant for Carbon =24  
Constant for Molecular Sieve=20.5

- 5.4.1 Determine RM% in accordance with the work instruction; Residual Moisture and Loss on Drying (GMS #420952).
- 5.4.2 Calculate the Adsorption Capacity for Silica Gel, Clay, Molecular Sieve and 2-In-1 products by subtracting the RM% from the constant value for each individual material.

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5.4.2.1 Desi Example: RM% is equal to 1.45, therefore subtract 1.45 from the constant for clay of 24.5.

$$UAC = 23.05\%, \text{ because } 24.5 - 1.45 = 23.05\%$$

5.4.2.2 2-In-1 60% SG/ 40% CB mix

Example: RM% is 1.25.

Determine the constant for the fill mix by multiplying the % of each fill by the constant then add to determine the sum.

$$30 \times 60\% = 18.00 \text{ (Constant for silica gel fill \%)}$$

$$24 \times 40\% = 9.6 \text{ (Constant for carbon fill \%)}$$

$$18.0 + 9.6 = 27.6$$

$$27.6 - 1.25 = 26.35$$

### 5.5 Unit Adsorption Rate Testing

All Unit Adsorption Rate Testing will be completed by the Metrology department. A Sample Analysis Submission form (GMS# 993753) will need to be filled out and given with sample to the Metrologist.

### 5.6 Acceptance Criteria

Refer to SAP for all specifications on Adsorption Capacities.

## 6 Documentation/Records

GMS 991972 Adsorption Capacity Log Sheet

GMS 993753 Sample Analysis Submission Form

## 7 References

GMS #420952 WI BU MB US BELEN Residual Moisture and Loss on Drying

## 8 Validity and Revision Cycle (including application date)

This document is valid until replacement by next review/version or its archiving.

## 9 Distribution

See "Distribution List" on metadata on GMS.

## 10 Attachments

N/A

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## 11 History

Revision	Date	Change	Motive	Approval
1	10/3/2012	Original Issue	Migration to GMS	
2	10/10/2013	Update format	Updated to Clariant format	
3	4/3/2014	Add section 5.2	Update to reflect current practice	
4	8/25/14	Update 5.2 and 5.4	Update to reflect current standard for Silica Gel	
5	9/25/14	Update 5.2 and 5.2.2.2	Update to reflect current process	
6	03/17/2016	Update to 5.2 through 5.6	Update to reflect current process	

*Note – Be sure that the revision n° / issue date of the document be the same of revision n° on GMS metadata. On GMS revision n° starts with “1”, so that the revision table must also starts with revision n° as “1”.*



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