



# McFarland BSS Turbidity Standards & Stock Solutions

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McFarland BSS Standards are the literature-based basis for turbidity comparisons with bacterial suspensions.

- BSS = Barium Sulphate Suspension  
Suspension of barium sulfate precipitated from barium chloride and sulfuric acid.

The McFarland BSS Turbidity Stock Solutions from Bioanalytic GmbH are stock solutions, produced according to the original McFarland process and comply with the specifications of the CLSI (Clinical and Laboratory Standard Institute).

This enables the user to produce McFarland standards with any desired MFU value correctly.

## Principle

The adjustment of a bacterial suspension to the turbidity of these standards results in a bacterial suspension in the expected density range <sup>\*1)</sup>.

## Reagents

The reagents consist of the stock solutions (A) and (B).

The shelf life in the original sealed condition is indicated on the label.

After opening, the shelf life is limited, depending on storage and contamination. As a rule, the shelf life is +2...8 °C for about 10 weeks. Note the opening date on the bottle.

Do not freeze, do not overheat.

Before use, the stock solutions must be brought to a temperature of 20.0 ± 0.5 °C.



## Product stability:

The product should not be used if any of the following occurs:

- There are signs of drying or volume reduction.
- The product is contaminated or contains precipitates.
- The colour has changed.
- The expiration date has expired.
- The bottles have reached the running time after opening.
- There are other signs of deterioration in quality.

## Risks and Safety

Please observe the necessary precautions for use of laboratory reagents and body fluids; as well as possibly also of microbiological samples. Applications should be performed by expert personnel only. Follow the national and laboratory internal guidelines for work safety and infection control. Wear suitable protective clothing and disposable gloves while handling.

It is important to ensure effective protection against infection according to laboratory guidelines.



www.sds-id.com



For additional safety information please refer to the information on the label and the corresponding Safety Data Sheet (SDS).

The safety settings were made according to legal guidelines. If there are differences in the labeling or the safety information between the label and SDS, the details of the SDS are valid.

Download by QR-Code or link:

- [www.sds-id.com/100184-1](http://www.sds-id.com/100184-1) McFarland BSS Turbidity Stock Solution (A)
- [www.sds-id.com/100185-0](http://www.sds-id.com/100185-0) McFarland BSS Turbidity Stock Solution (B)
- [www.sds-id.com/100115-4](http://www.sds-id.com/100115-4) McFarland BSS Turbidity Suspension • Ready to use.

## Contents/Main Components

050001-0010	McFarland BSS Turbidity Stock Solution (A) 0.048 mol/L Barium chloride BaCl <sub>2</sub> .
050002-0100	McFarland BSS Turbidity Stock Solution (B) 0.180 mol/L Sulfuric acid H <sub>2</sub> SO <sub>4</sub> .

## Additionally required or recommended materials

050005-...	Plain Tubes (⇒ ordering information). The tube size Ø 16.1 × 112.5 mm is suitable for most McFarland photometers for cell density determination and corresponds to common glass tubes used in microbiology.
050007-0001	Wickerham Card (⇒ ordering information).
Optional	Spectrophotometer or McFarland Photometer

## Preparation of the McFarland Standards

The McFarland Barium Sulphate Standards (BSS) are produced as described below:

## Calculation

$$x = \text{MFU}$$

$$x \text{ ml (A) + (100 ml - x ml) (B)}$$

The above formula is used to calculate the mixture for 100 ml standard suspension.  
The table below shows the mixture for 10 ml standard suspension.

MFU	Mischung für 10.00 ml
0.0 MFU	0.00 ml (A) + 10.00 ml (B)
0.5 MFU	0.05 ml (A) + 9.95 ml (B)
1.0 MFU	0.10 ml (A) + 9.90 ml (B)
2.0 MFU	0.20 ml (A) + 9.80 ml (B)
3.0 MFU	0.30 ml (A) + 9.70 ml (B)
4.0 MFU	0.40 ml (A) + 9.60 ml (B)
5.0 MFU	0.50 ml (A) + 9.50 ml (B)
6.0 MFU	0.60 ml (A) + 9.40 ml (B)
7.0 MFU	0.70 ml (A) + 9.30 ml (B)
8.0 MFU	0.80 ml (A) + 9.20 ml (B)

## Important:

Only use comparison tubes made of glass with the same wall thickness and the same diameter for comparison! The comparison tubes must have a tight-closing screw cap.

Only use new tubes and new caps for the production of the standards. Reconditioned tubes/caps can lead to incorrect results due to adhesions or changes in the glass surfaces.

## Beispiel:

050005-6001 1× 10St. McFarland Empty tubes (Glass)  
Specification: Ø 16.1 × 112.5 mm, Aluminium-cap with seal, autoclavable.

The McFarland BSS Turbidity Stock Solution (A) and (B) must be brought to a temperature of 20.0 ± 0.5 °C before use.

Intermediate values can also be calculated and produced according to the above formula. However, it should be noted that narrow intermediate values, especially in the low range, easily fall within the variation range of the feasible accuracy.

Produktinformation  
McFarland BSS Standards & Stock Solutions

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(en)

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### Manual pipetting of the McFarland Standards

- Place the intended reference tubes in a stand and label them in the upper area so that they cannot be confused.
- Pipette exactly 10.00 mL stock solution (B) into each tube. For pipetting, use an exact pipette with a maximum deviation of  $\leq 0.02$  mL. If you use glass pipettes, use a 10 mL bulb pipette with 2 graduations (!) and dose exactly the lower liquid meniscus between the upper and lower markings. This pipette also has a maximum deviation of  $\leq 0.02$  mL. Check this accuracy information on the pipette!
- Remove the indicated volume of (A) from the respective tubes using a reciprocating pipette and discard it. Pipette then stock solution (A) in the same volume with the reciprocating pipette.
- Follow the instructions under "⇒ Continued".

### (Semi-)automatic pipetting of the McFarland Standards

- Place the intended comparison tubes in a stand and label them in the upper area to avoid confusion.
- Using a programmable dilutor, pipette the volumes indicated in the table into the correspondingly labeled reference tubes.

#### Notice:

Please observe the instructions for use of your dilutor and the instructions for programming the dosing volumes. By using appropriate dilutors with 2 syringe system (1.00 mL syringe for McFarland BSS Turbidity Stock Solution (A) and 10.0 mL syringe for McFarland BSS Turbidity Stock Solution (B)) all mixtures indicated in the table can be pipetted exactly.

- Follow the instructions below under "⇒ Continued".

### Volumetric flask preparation of the McFarland Standards

- Use a dry volumetric flask with tolerance specification.
- Add the volume of the stock solution calculated for the batch.
- Fill the volumetric flask with solution to approx. 50 % at the specified reaction temperature. Mix it briefly by rotation and fill up to the mark. Add a stirring magnet and stir for 10 minutes.
- Dose the suspension into reference tubes immediately after preparation, stirring continuously.
- Follow the instructions given below under "⇒ Continued".

#### ⇒ Continued

- Close the reference tube immediately after pipetting and mix the tube by tilting it several times.
- The reaction time depends on the MFU value and is completely completed within 7 days if the reaction temperature is maintained.
- Excessive shaking or vortexing can lead to air bubbles being introduced, which must first rise before use.
- If stored correctly, the McFarland standard suspensions can be used for approx. 12 weeks.

## Specimen

The McFarland standards are commonly used to estimate the cell densities of bacterial, yeast or other cell suspensions.

## Procedure

### Visual comparison

- Mix the McFarland Standard to sufficiently suspend the barium sulfate particles.
- Compare the turbidity of a cell suspension from an 18 ... 24 h culture with the corresponding McFarland Standard. \*
- For visual comparison, compare the tubes against the "Wickerham Card" with the black and white contrast stripes in adequate light.
- Bacterial suspensions are standardized if the distortion/attenuation of the black lines is consistent with the McFarland standard.

Please note:

The bacterial suspension tubes should be of similar diameter as the McFarland standard tubes. Plain tubes are available.

### Spectrophotometric comparison

Please also refer to the operating manual of your spectrophotometer.

- Mix the McFarland Standard to sufficiently suspend the barium sulfate particles.
- Calibrate your measuring system with McFarland Standard.
- Compare the turbidity of a cell suspension from an 18 ... 24 h culture with the corresponding McFarland standard. \*

Please note:

The bacterial suspension tubes should be of similar diameter as the McFarland standard tubes. Plain tubes are available.

## Analysis

### McFarland BSS Standard

The table below refers to McFarland BSS Turbidity Standards (Barium Sulphate Suspension)

Wavelength: ..... 625 nm

Optical path length: ..... 10 mm

MFU	Ungefähre *1) Zellkonzentration
0.5 MFU	$1.5 \times 10^8$ Cells/ml
1.0 MFU	$3.0 \times 10^8$ Cells/ml
2.0 MFU	$6.0 \times 10^8$ Cells/ml
3.0 MFU	$9.0 \times 10^8$ Cells/ml
4.0 MFU	$12 \times 10^8$ Cells/ml
5.0 MFU	$15 \times 10^8$ Cells/ml
6.0 MFU	$18 \times 10^8$ Cells/ml
7.0 MFU	$21 \times 10^8$ Cells/ml
8.0 MFU	$24 \times 10^8$ Cells/ml

MFU = McFarland Units

\* Use the 600 nm or 625 nm wavelength depending on the standard literature method used [2, 3].

## Quality control and profiling test

Each LOT / batch number has been tested and passed the quality control.

## Capability Characteristics

### Limitations

For all McFarland Standards there are generally typically limitations known. Please note the literature of your method, normative documents or further available information.

When comparing with bacterial suspensions intrinsic color and in particular turbidity of the medium must be considered.

Visual comparing of McFarland PMS Standards and bacterial suspensions by use of blacklight illumination can result in incorrect densities.

McFarland PMS Standards are recommended when performing visual comparisons or when using an adjusted spectrometer at the correct wavelength.

## Notes

This product information exclusively relates to the product described in this leaflet. In particular, this product information cannot be applied to similar reagents from other manufacturers.

Periodically check for updates of this product information on our website.

### Instruction for Use

For professional use only.

To avoid errors, the use of qualified personnel is carried out. National guidelines for work safety and quality assurance must be followed.

The used equipment must comply with the state of technology and the laboratory requirements.

All samples and used tubes/vials must be marked clearly identifiable to exclude any confusion.

### Protection against infection

It is important to ensure effective protection against infection according to laboratory guidelines.

Laboratory personnel working with human samples should at a minimum be immunized against Hepatitis B (HBV).

### Classifications

EU: EDMA: 14 50 01 00 00; IVD Class A.

### Support / Information service

For methodological and technical support, please contact us by E-Mail at [support@bioanalytic.de](mailto:support@bioanalytic.de) (German, English).

Periodically check for updates of this product information on our website.

### Feedback

Information from users can be reported to [support@bioanalytic.de](mailto:support@bioanalytic.de) (German, English).

Suggestions for further developments will be considered. **Waste Management**

Please observe your national laws and regulations.

Used and expired solutions must be disposed of in accordance with your local regulations.

Inside the EU, national regulations apply that are based on the current, amended version of Council Directive 67/548/EEG on the approximation of the laws, regulations and administrative provisions relating to the classification, packaging and labelling of dangerous substances.

Decontaminated packaging can be disposed of as household waste or recycled, unless otherwise specified.

## Ordering Information

### Stock Solutions

<b>050003-6001</b>		<b>McFarland BSS Turbidity Stock Kit consisting of:</b>
050001-0010	Ⓐ	McFarland BSS Turbidity Stock Solution Ⓐ • 10 mL
050002-0100	Ⓑ	McFarland BSS Turbidity Stock Solution Ⓑ • 100 mL

### McFarland BSS Turbidity Standard (ready to use)\*

BSS = Barium Sulphate Suspension

050010-0010	0.0	MFU McFarland Turbidity Standard Zero
050011-0010	0.5	MFU McFarland BSS Turbidity Standard *
050012-0010	1.0	MFU McFarland BSS Turbidity Standard *
050013-0010	2.0	MFU McFarland BSS Turbidity Standard *
050014-0010	3.0	MFU McFarland BSS Turbidity Standard *
050015-0010	4.0	MFU McFarland BSS Turbidity Standard *
050016-0010	5.0	MFU McFarland BSS Turbidity Standard *
050017-0010	6.0	MFU McFarland BSS Turbidity Standard *
050018-0010	7.0	MFU McFarland BSS Turbidity Standard *
050019-0010	8.0	MFU McFarland BSS Turbidity Standard *

\* These ready-to-use standards are only available on request. Due to the reduced demand, we manufacture them exclusively on special orders. Accordingly, singly orders are not possible. As ready-to-use standards we recommend our McFarland PMS turbidity standards, which are available separately.

### Accessories:

050005-6001	1× 10 pcs	McFarland Empty tubes (Glass)
		Specification: Ø 16.1 × 112.5 mm, Aluminium-cap with seal, autoclavable.
050007-0001	1 pcs	Wickerham Card Bioanalytic.
		Laminated background comparison card with black and white stripes for visual turbidity assessment.

## Literature & Footnotes

Legends for the graphic symbols and tags used follow relevant norms or are available on our internet pages.

- [1] McFarland, J; 1907; JAMA. 14:1176-1178
- [2] CLSI / Clinical and Laboratory Standards Institute: Performance Standards for Antimicrobial Disk Susceptibility Tests; 2009; 10th ed. M2-A10. Wayne, PA.
- [3] Doern, G. V. and Jones, R. N.: Antimicrobial Agents Chemother; 1988; 32: 1747-1753.
- [4] Lorian, V.: Antibiotics in Laboratory Medicine; 1986; 2nd ed. ; Williams & Wilkins, Baltimore, MD
- [5] CLSI / Clinical and Laboratory Standards Institute: Performance Standards for Antimicrobial Disk Susceptibility Tests; 2012; vol32. M2-A11. Wayne, PA. (Replaces [2] M2-A10);

\*1) The cell density depends in principle on the type of cells and must be taken from the literature or determined by own calibration.