Technical Data Sheet

BONDERITE® M-MN 5103

February 2026

Product description

BONDERITE® M-MN 5103 provides the following product characteristics:

Technology	Metal pretreatment
Product Type	Manganese phosphating
Application	Immersion

Application areas

BONDERITE® M-MN 5103 is a nitrate accelerated phosphating process, which produces dark grey to black manganese phosphate layers on iron and steel. The conversion layers reduce the frictional resistance and shorten the running-in period of machine parts.

BONDERITE® M-MN 5103 is especially suited for the treatment of low alloy steel. Combined with anticorrosive oils (slushing oils) or waxes, the decorative phosphate layers provide excellent corrosion protection. Depending on the previous processing steps the coating weight can vary between 5 - 40 g / m².

Technical data (as supplied)

Appearance	Green solution
pH-value	< 2
Density (g/cm³ at 20°C)	1.23

Direction of use

Preliminary statement

Prior to use it is necessary to read the **Safety Data Sheet** for information about precautionary measures and safety recommendations. Also, for chemical products exempt from compulsory labeling, the relevant precautions should always be observed. Please also refer to the local safety instructions and contact Henkel for analytical support.

Bath make-up

Fill 3/4 of the bath with water and add BONDERITE® M-MN 5103 during continuous pump circulation:

BONDERITE® M-MN 5103	250 kg = 201 L

The phosphating bath is heated to 50 - 60°C and 3 kg of steel wool is incorporated. After one hour the residual steel wool is removed and the bath is heated to operating temperature.

Steel wool	3 kg

Operating data

Total acid, points	75 - 85
Free acid, points	10 - 12
Acid ratio	6.5 - 8
Iron (II) points	max. 12.5
Temperature, °C	80 - 95
Treatment time, min	5 - 20

Process description

1. Cleaning

The type of cleaning compound has a strong influence on the coating formation in the phosphating bath. Strong alkaline cleaners produce thick crystalline phosphate coatings and fine crystalline coatings are obtained when mild alkaline degreasing agents are used. We recommend the use of suitable cleaner products from our BONDERITE range. For application details see the respective Technical Data Sheet.

2. Rinsing

The rinsing bath must be continuously fed with fresh water and be equipped with an overflow device.

3. Hot rinsing or Activation

To avoid strong temperature losses in the phosphating bath we recommended a hot water rinse prior to phosphating. The negative effect on coating formation caused by strong alkaline cleaning and pickling can be prevented by an activation with BONDERITE M-AC products. For application details of BONDERITE M-AC see the respective Technical Data Sheet.

4. Phosphating with BONDERITE M-MN 5103

It is important not to fall below the specified bath temperature. Please follow the specified technical data. Too low temperatures will cause non-compact (permeable) coatings due to a too strong pickling effect. The anticorrosive effect of the manganese iron phosphate layers is distinctly decreased if the iron content in the phosphating bath exceeds 7 g/l. Optimum results are achieved with an iron concentration of 2 to 4 g/l.

5. Rinsing

The rinsing bath must be continuously fed with fresh water and be equipped with an overflow device.

6. Passivation

We recommend the addition of suitable BONDERITE passivation products to the final rinsing bath. Also, soft or demineralized water should be used for the bath make-up. Depending on the given plant conditions bath temperatures can vary between 25 and 70°C. For details of application see the respective Technical Data Sheet.

7. Drying

The treated material should be dried as quickly as possible or oiled in an anticorrosive emulsion.

Bath control
The working bath is run through periodic controls of Total Acidity, Free Acidity and Iron (II) content as described below.

Total Acid
1. Pipette 5 ml of the cooled bath solution into a 300 ml Erlenmeyer flask
2. Dilute with approx. 50 ml of distilled water and add 4 - 5 drops of phenolphthalein indicator
3. Fill 0.1 N sodium hydroxide up to the zero line of a burette
4. While softly rotating the flask, slowly add the 0.1 N sodium hydroxide from the burette until the solution turns slightly red
5. The consumed ml of 0.1 N sodium hydroxide, multiplied by a factor of 2 corresponds to the total acid points

Specified range:	75 to 85

Correction of total acid pointage:
Total acid (corrected) = titration of the total acid – titration of the iron points
Bath replenishment:
For 1000 l of phosphating solution the following amount is added for each missing total acid point:

BONDERITE® M-MN 5103	2.9 kg = 2.4 L

Free Acid
1. Pipette 10 ml of the cooled bath solution into a 300 ml Erlenmeyer flask
2. Dilute with approx. 50 ml of distilled water and add 1 - 2 drops of phenolphthalein indicator
3. Fill 0.1 N sodium hydroxide up to the zero line of a burette
4. While softly rotating the flask, slowly add the 0.1 N sodium hydroxide from the burette until the solution turns slightly red
5. The consumed ml of 0.1 N sodium hydroxide corresponds to the free acid points

Specified range:	10 - 12 points

Calculation of the acid ratio:
The acid concentration is calculated using the following equation:

$$\text{Acid ratio} = \frac{\text{Total acid points}}{\text{Free acid points}}$$

Iron (II)
1. Pipette 10 ml of the cooled bath solution into an Erlenmeyer flask and add 10 ml of sulphuric acid (25%)
2. Immediately afterwards slowly add 0.1 N potassium permanganate solution from a burette while softly rotating the flask
3. The end of the titration is indicated by a color change to pink which must remain for at least 15 seconds.
4. The consumed ml of 0.1 N potassium permanganate solution corresponds to the iron(II)-points
5. The iron(II)-content is calculated by multiplying the points with a factor of 0.56

Iron precipitation

To remove 1 g of iron (II) per liter phosphating bath, slowly add a mixture of 1.4 l BONDERITE M-AD 160 with 5 l water per 1,000 l of bath solution to the hot bath (92 and 98 °C) After thorough mixing of the solutions, the excess iron must be allowed for some time of precipitation. As the addition of BONDERITE M-AD 160 lowers the acid concentration, it may be necessary to add BONDERITE M-AD MN-4 afterwards.

To neutralize the free acid by 1 point, add 0.6 kg of BONDERITE M-AD MN-4, slurred in water, for every 1.000 l of bath solution slowly by good mixing. After that the bath temperature must be kept at 95 °C for one hour. The precipitation of iron should be carried out at the end of the working day so that the precipitation can settle completely overnight. BONDERITE M-AD 160 must not be added while phosphating because the phosphate coatings might turn dusty.

Sludge removal

The sludge produced while operating the phosphating bath must be removed in regular intervals (e.g. at the weekend) to avoid deposits on the phosphated material. Desludging is indispensable at the latest when the treated material dips into the sludge deposits at the bottom of the tank. For sludge removal the bath solution is first allowed to settle, then the clear solution is pumped into a separate tank or into an adjacent empty rinsing bath. After removal of the remaining sludge the tank must be cleaned thoroughly.

General remarks
The tanks for the BONDERITE® M-MN 5103 baths must have an acid- and heat proof rubber coating or adequate steel quality. The wastewater must be treated according to the discharge regulations of the local authorities.

Classification
Please refer to the corresponding **Safety Data Sheet** for details on:
Hazards identification
Transport information
Regulatory information

Storage

Recommended storage temperature, °C	-2 to 40
Shelf-life (in unopened original packaging), months	36

Product may show slight caking in time, this can easily be reverted and does not impact material performance.

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Reference 1

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