



PN4™ 1-STEP®

MALOLACTIC FERMENTATION UNDER CONTROL

Oenococcus oeni

Robust wine bacteria for a wide range of wine conditions



As a producer of wine lactic acid bacteria, Lallemand developed a specific 1-STEP™ production process to induce malolactic fermentation (MLF) of most red and white wines, in a wide range of oenological conditions. Highly efficient, the 1-STEP™ starter kit consists of a malolactic active freeze-dried *Oenococcus oeni* strain and specific activator. Excellent activity and high vitality of the 1-STEP™ starter culture are achieved during a short acclimatization step for a fast onset of malolactic fermentation.

DESCRIPTION

PN4™ was isolated from nature and selected by Fondazione Edmund Mach in Trentino, Italy. PN4 1-STEP™ is competitive and has a fast and effective implantation in wine.

Produced with our specific 1-STEP™ process and with its fast acclimatization protocol, PN4 1-STEP™ achieves malolactic fermentation for red and white wines in limiting conditions



BENEFITS & RESULTS

PN4 1-STEP™ is a robust and reliable wine bacteria for difficult wine conditions (up to 15.5% vol. of alcohol, pH > 3.1 or total SO₂ up to 60 mg/L).

Beyond bio-deacidification, PN4 1-STEP™ contributes to the wine sensory profile. In red wines, PN4 1-STEP™ is known to highlight spiciness and structure; in traditional white wines, it will contribute to buttery flavor and mouthfeel, which will support the integration of oak.

Structure Spiciness

Buttery impact (Diacetyl production):

- Moderate to high in Sequential inoculation
- Low in Co-inoculation

Banana and honey structure

Barrel fermented wines

Varietal aromas

Structure

Increases general perception of fruitiness

PN4 1-STEP™ is also a bio-protection tool to protect wines against *Brettanomyces* when inoculated as soon as possible to prevent the excessive development of the spoilage yeast.

PROPERTIES

- pH tolerance: > 3.1
- Alcohol tolerance: up to 15.5% vol.
- SO₂ tolerance: up to 60 mg/L total SO₂ (pay attention to molecular SO₂ at low pH)
- T° tolerance: > 16°C
- Moderate nutritional demand
- Good implantation
- MLF kinetic: fast
- Low volatile acidity production
- Bacteria cinnamoyl esterase negative: cannot produce precursors for ethylphenol production by *Brettanomyces*
- No production of biogenic amines
- Co-inoculation possible
- Fast degradation of citric acid: high production of diacetyl buttery or lactic notes



INSTRUCTIONS FOR OENOLOGICAL USE

Use one sachet for right quantity of hL indicated on label. Lowering the dosage or doing cross seeding or pitching methods will reduce the bacteria performance.

Co-inoculation (simultaneous alcoholic fermentation)

The 1-STEP™ activator and lactic acid bacteria can be used in co-inoculation without any acclimatization step.

- 1A.** Mix and dissolve content of the activator sachet in drinking water (temperature between 18 and 25 °C) according to the table below.

1-Step™ Kit	Volume of drinking water (L)
For 100 hL	10
For 250 hL	25
For 500 hL	50

- 1B.** Add content of the lactic acid bacteria sachet and dissolve carefully by gently stirring.
- 2.** Transfer immediately the rehydrated mix (activator and lactic acid bacteria) into the fermenting must/wine 24 hours after the yeast is added.
- 3.** Monitor malolactic fermentation activity (malic acid degradation) every 2 to 4 days, as well as volatile acidity.

In must, sulphite addition >8 g/hL, it is recommended to use the 1-STEP™ activator and lactic acid bacteria after alcoholic fermentation.

Recommended temperatures:

Carefully monitor must temperature, which must be below 30 °C at lactic acid bacteria inoculation (alcohol < 5% vol.) and below 27 °C when 10% of alcohol is reached.

Sequential inoculation (post-alcoholic fermentation)

- 1A.** Mix and dissolve content of the activator sachet in drinking water (temperature between 18 and 25 °C) according to the table below.

	1A	2
1-Step™ Kit	Volume of drinking water (L)	Volume of wine (L)
For 100 hL	10	10
For 250 hL	25	25
For 500 hL	50	50

- 1B.** Add content of the lactic acid bacteria sachet and dissolve carefully by gently stirring. Wait for 20 minutes.
- 2.** Add to this suspension the appropriate volume of wine (see table above) pH > 3.5, total SO₂ < 45 ppm, no free SO₂ (temperature between 18 and 25 °C). Wait for 18 to 24 hours. If malic acid content is < 1.2 g/L, wait only for 6 to 10 hours.
- 3.** Transfer the activated malolactic bacteria starter culture into the wine according to the volume indicated on the kit. Monitor malolactic fermentation activity (malic acid degradation) every 2 to 4 days.

Under more difficult conditions, add a specific bacteria nutrient.

Recommended temperature ranges:

- White wine / rosé wine: from 16 to 20 °C.
- Red wine:
 - › If alcohol < 14.5% vol.: from 17 to 25 °C, with an optimal range: 18-22 °C
 - › If alcohol > 14.5% vol.: from 18 to 20 °C

PACKAGING & STORAGE

- Product in powder form obtained by lyophilization.
- Available in sachet for inoculation of 100 hL (2,640 US gal.), 250 hL (6,600 US gal.), 500 hL (13,200 US gal.).
- Once opened, activator and lactic acid bacteria sachet must be used immediately.
- Activator and lactic acid bacteria sachet must not be used separately.
- This product can be stored for 18 months at 4 °C/40 °F or 36 months at -18 °C/0 °F in original sealed packaging.
- Sealed packets can be delivered and stored for 3 weeks at ambient temperature (<25 °C/77 °F) without significant loss of viability.

Distributed by:

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The information in this document is correct to the best of our knowledge. However, this data sheet should not be considered to be an express guarantee, nor does it have implications as to the sales condition of this product. April 2024.



WINE
YEASTS



WINE
BACTERIA



NUTRIENTS
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Original by culture