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Instruction for Use
TPP TubeSpin® Bioreactor

The TubeSpin® Bioreactor is designed for high-throughput screening, cultivation, and optimization processes of prokaryotic (aerobic bacteria) and eukaryotic suspension cells (e.g., yeasts, algae, HEK, CHO, and Sf-9).

The TubeSpin® Bioreactor is available with a filter screw cap featuring either 5 or 10 openings positioned above a hydrophobic PTFE filter membrane.

The TubeSpin® Bioreactor is for single use only. Re-use disclaims all warranties.

Safety instructions

- Handling and Safety
  Handling of biological materials shall be performed in full compliance with all applicable national and international regulations. Activities must conform to the laboratory's assigned biological safety level, the relevant Safety Data Sheets (SDS), and the manufacturer's Instructions for Use (IFU).
  Appropriate personal protective equipment (PPE) shall be always worn during handling.
- Risk of Contamination
  All operations shall be conducted in accordance with aseptic techniques and established Good Laboratory Practices (GLP). Packaging shall be opened immediately prior to use. Only products that are visually intact and free from defects shall be utilized. Products exhibiting visible damage, contamination, or any other irregularities shall be disposed of in accordance with applicable regulations.
- Storage
  TPP products shall be stored under the following conditions:
  - Temperature: 10 °C to 30 °C (50 °F to 86 °F).
  - Light exposure: Products shall be protected from direct ultraviolet (UV) radiation.
  - Relative humidity: ≤ 60 %, with a recommended control range of 50–60 %.

  Storage conditions shall be monitored and recorded to ensure compliance with these requirements. Any deviations shall be documented, evaluated, and managed in accordance with the applicable quality.

Instructions

- Check the expiry date (EXP) on the label and packaging. Use only products with a valid EXP.
- Open the package in a sterile environment and remove a complete system for use.
- Open the bioreactor and fill it with the medium and inoculum according to your laboratory routine. Please refer to the optimal fill volume (see Technical Data).
- Close the filter screw cap. Continuous gas exchange occurs through the 0.22 µm hydrophobic PTFE membrane.
  - Note: If the PTFE membrane becomes wet, gas exchange may be temporarily reduced

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- If the gas exchange needs to be reduced, individual openings can be sealed with laboratory grade labels or tape (Fig. 1).

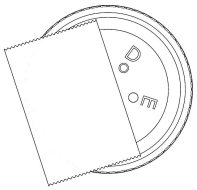


Figure 1. Cap sealed

- Shake the cells in an appropriate incubation shaker.

Incubator Shaker

- Always follow all safety instructions and the operating manual provided by the shaker manufacturer.
- Shaking speed (RPM) and fill volume (mL) are critical factors that influence cell growth and oxygen transfer. These parameters should be verified in advance to ensure optimal performance.
- The recommendations provided are not cell line specific. Optimal conditions must be determined through in-house testing.

Optimization of Suspension Cell Growth

For optimal proliferation and viability of suspension cultures, please adhere to the following guidelines:

- Cells shall be fully and gently resuspended to achieve a homogenous single-cell suspension. Residual aggregates (clumping) result in non-uniform nutrient distribution within the clusters and compromise process scalability and analytical reproducibility.
- Foam formation should be minimized during resuspension and seeding, as protein denaturation and the trapping of cells in foam bubbles lead to high shear stress and impair cell viability.
- Unlike adherent cultures, suspension cultures require continuous orbital agitation to prevent sedimentation. The shaking speed (RPM) shall be optimized to maintain cells in suspension while ensuring hydrodynamic shear forces remain below the threshold for cellular damage.
- Seeding density shall be selected according to validated, cell line specific protocols. Sub-optimal low densities may extend the lag phase due to insufficient autocrine factor concentrations, whereas excessively high densities lead to rapid substrate depletion, accumulation of inhibitory metabolites (e.g., lactate, ammonia), and oxygen transfer limitations.
- In high-density shaken bioreactor cultures, oxygen supply is frequently the rate-limiting factor. The Oxygen Transfer Rate (OTR) is significantly governed by the shaking diameter (throw, orbit) and shaking speed.
- Given the high volumetric cell densities in bioreactor systems, pH levels and critical substrate concentrations (e.g., glucose) shall be monitored to facilitate timely intervention, such as media exchange.
- While agitation is necessary for mass transfer, excessive mechanical shear shall be avoided.
- Cultures shall be maintained under controlled environmental conditions (temperature, humidity, and CO_2 concentration). Maintenance of high relative humidity is critical to prevent evaporative loss, which induces a detrimental increase in medium osmolarity.

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Centrifugation Safety and Performance

To ensure operational safety and optimal performance, strictly adhere to the centrifuge manufacturer's instructions and use appropriate rotors and adapters.

- Ensure the centrifuge load is correctly balanced. Tubes must be positioned symmetrically relative to the rotational center and axis to maintain a horizontal orientation. Improper loading may result in uneven separation, vibration, or tube damage.
- Several factors influence the structural integrity of the tubes during operation:
  - Tube shape and material composition.
  - Proper fit within the designated adapter.
  - Centrifugation parameters: Temperature, duration, Relative Centrifugal Force (RCF).
  - Sample properties (density and viscosity).
  - Rotor type (fixed-angle vs. swing-out).
- RCF (g-force) ratings are determined at room temperature using water-filled tubes in a horizontal rotor for 5 minutes. Use in fixed-angle rotors or with unsupported tubes may significantly reduce mechanical performance.
- Perform a test run with the specific sample and settings before routine use to verify suitability for the intended application.

Sub-Zero Storage

- Polypropylene (PP) tubes exhibit reduced mechanical strength at temperatures below 0 °C (32 °F).
- For samples that need to be frozen or stored at low temperatures for long periods of time, transferring the contents to TPP cryotubes. These are specially validated to ensure integrity and safety under extreme thermal conditions.
- Do not expose these consumables to liquid nitrogen (LN_2). Contact with LN_2 can cause embrittlement, structural damage, or bursting during thawing.

The following information is provided for guidance only:

- If freezing samples in standard PP tubes is considered, the following precautions should be taken:
  - The freezing process must be controlled and proceed evenly from bottom to top.
  - Ensure sufficient space for the volume expansion of the freezing liquid (e.g., by using suitable racks or boxes).
  - Do not use highly insulated containers. (e.g., Styrofoam). These lead to uneven freezing and significantly increase the risk of material failure and breakage.

General Handling and Limitations

- Graduations are for reference only and serve as approximate guidelines for fill volume. For precise measurements, use calibrated pipettes or volumetric instruments.
- Avoid exposing the white labeling area to 90% alcohol in combination with mechanical stress (e.g., rubbing or wiping), as this may cause the ink to dissolve or smear.

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Technical Data

Component	Material
Screw Cap	Polyethylene (PE)
Membrane	Polytetrafluoroethylene (PTFE)
Tube	Polypropylene (PP)

Measurements	87015	87017	87050	87056	87450	87600
Volume grad. mL	15	15	50	50	450	600
Length mm	120	120	115	115	145	183
Diameter mm	17.1	17.1	30	30	96	98
Max. RCF x *g*	15‘500	15‘500	15‘500	15‘500	3‘500	3‘500
Form	conical	round	conical	round	conical	conical
Optimal fill volume mL	1 – 10	1 – 10	5 – 35	5 – 35	>300	>400
Shaker: Recom. orbit / shaking diameter mm	50	50	50	50	50	50
Shaker: Recom. speed RPM	250	250	180	180	150	150

Accessories	87015	87017	87050	87056	87450	87600
Screw cap “solid”	--	--	--	--	87355	87355
Screw cap “filter”	--	--	--	--	87356	87356

Openings / Ø mm	87015 / 87017	87050 / 87056	87450 / 87600
A	0.4	0.4	-
B	0.6	0.6	-
C	1.0	1.0	-
D	1.25	1.5	-
E	1.5	2.0	-
10 x each	-	-	4.0

Additional Information

Instructions for use, chemical resistance lists, and quality certificates for individual products can be downloaded from the TPP website at www.tpp.ch.

Disclaimer

TPP products are intended for Research Use Only (RUO) and are not approved for clinical, diagnostic, or in vitro fertilization (IVF) applications. The full Terms & Conditions, including limitations of warranty and liability, intended use, and reseller obligations, are available at: https://www.tpp.ch/page/qualitaets_sicherung/index.php

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