

MINIFOR LABORATORY FERMENTER & BIOREACTOR

Quick overview of bioreactor vessels
with connections, probes & tubing lines



Supplementary user guide to the operation manual of LAMBDA MINIFOR fermentor-
bioreactor operation manual and installation tutorial videos

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PREFACE

Dear customer,

This supplementary user guide will give you an overview of the MINIFOR fermenter & bioreactor vessel types, ports and its connections. It will be helpful in quick setting up of the accessories (like pH, temperature and DO probes, glass outgas condenser, quadruple sampling and feeding, antifoam addition, cooling loop, pressure valve, etc.) on the side necks (ports) of the bioreactor working vessel during the installation of MINIFOR fermenter-bioreactor.

We would like to inform you that this user guide is a supplementary document and it will never replace the [operation manual of LAMBDA MINIFOR fermenter and bioreactor](#), concerning the whole installation and set-up of MINIFOR fermenter and bioreactor. The MINIFOR operation manual also provides useful tips and tricks in safe handling of the fermenter & bioreactor in the laboratory and troubleshooting techniques.

We hope that this supplementary user guide will make the setting up of the working vessel simple and easy.

Please do not hesitate to contact us, in case of questions. We will be glad to assist you.

LAMBDA Laboratory Instruments,
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OVERVIEW OF MINIFOR BIOREACTOR VESSELS

Types of bioreactor vessel

LAMBDA designed and created ports on the sides of the glass culture vessels.

The culture vessels have one central neck with large threads for fast and reliable fixing of the agitation and aeration system and additional threaded necks are distributed around the side of the vessel. The threaded side necks allow unhindered access to all ports and **handling the ports are as easy as screwing a cap on a bottle.**






The innovative form and design of the LAMBDA vessel eliminates the expensive head plate completely. **The time consuming preparation and mounting of traditional head plates has been eliminated!**

Multiple ports and additional solutions increase the effective port number of MINIFOR configuration equivalent to **16 to 22 classical ports**. It is also possible to increase the number of ports, according to the requirements of the project application.

LAMBDA MINIFOR fermenter and bioreactor can get delivered with **0.3 L, 0.4 L, 1 L, 3 L and 7 L vessel** type with the **working volume range from 35 ml to over 6 L.**

Overview of MINIFOR fermenter and bioreactor culture vessel types:

Table 1 Overview of MINIFOR culture vessels

Vessel type:	<u>0.3L</u>	<u>0.4L</u>	<u>1L</u>	<u>3L</u>	<u>7L</u>
					
Working volume [Litre]	0.035 – 0.4	0.15 – 0.45	0.3 – 1.7	0.5 – 3.0	1 – 6
Height [cm]	34	22	34	37	50
Diameter [cm]	22	23	25	34	30

The user guide will provide more information about the optional customization to increase the number of ports, setting up of quadruple sampling port and exact assembly of side necks and distribution of accessories on the culture vessels.

Quadruple sampling and feeding ports

The quadruple sampling and addition port assembly is mounted on the vessel side neck / **port with the largest diameter**.

The quadruple port assembly consists of **3 short cannulas and 1 long cannula** with **LAMBDA PEEK double-seal connection** for addition of acid, base, medium, nutrients, buffers, antifoam agent, sampling, etc. Double-seal connection ensures a tight connection and **no means of contamination** through the ports during the addition of the nutrients, etc. and even while sampling.

- Sterile sampling device is connected to the longest cannula of the assembly
- Special septum is used for inoculation
- Shortest cannula used for surface aeration
- Other short cannulas can be used for addition of acid, base, nutrients, media or antifoam agent

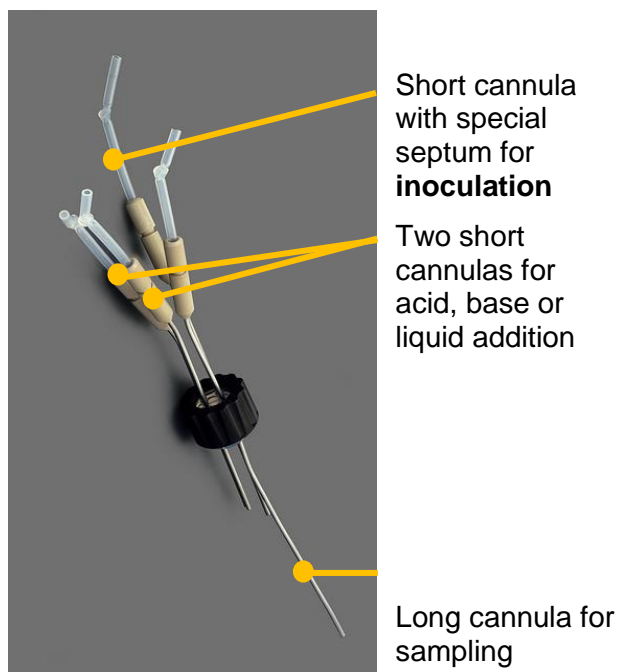


Figure 1 Quadruple sampling and addition port with stainless steel cannulas (Standard version; included in all MINIFOR fermentor-bioreactor kits)

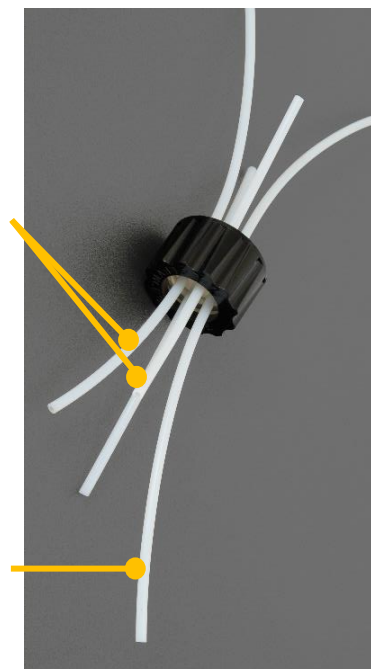


Figure 2 Quadruple sampling and addition port assembly with PTFE tubing (Customized version; on special request)

The cannulas used in the quadruple sampling and addition port can be of stainless steel or it can also be **customized with PTFE tubing** (instead of stainless steel cannulas).

The assembly of cannulas and connections of the quadruple sampling and addition port can be applied to all culture vessels.

Special customization to increase the number of ports

The standard quadruple sampling and addition port with cannulas are included in the MINIFOR start-up and advanced kit.

According to the project specification, the number of ports can be increased by the **special customization** with additional cannulas, septa and tubing connections to the MINIFOR vessels (0.3 L, 0.4 L, 1 L, 3 L and 7 L).

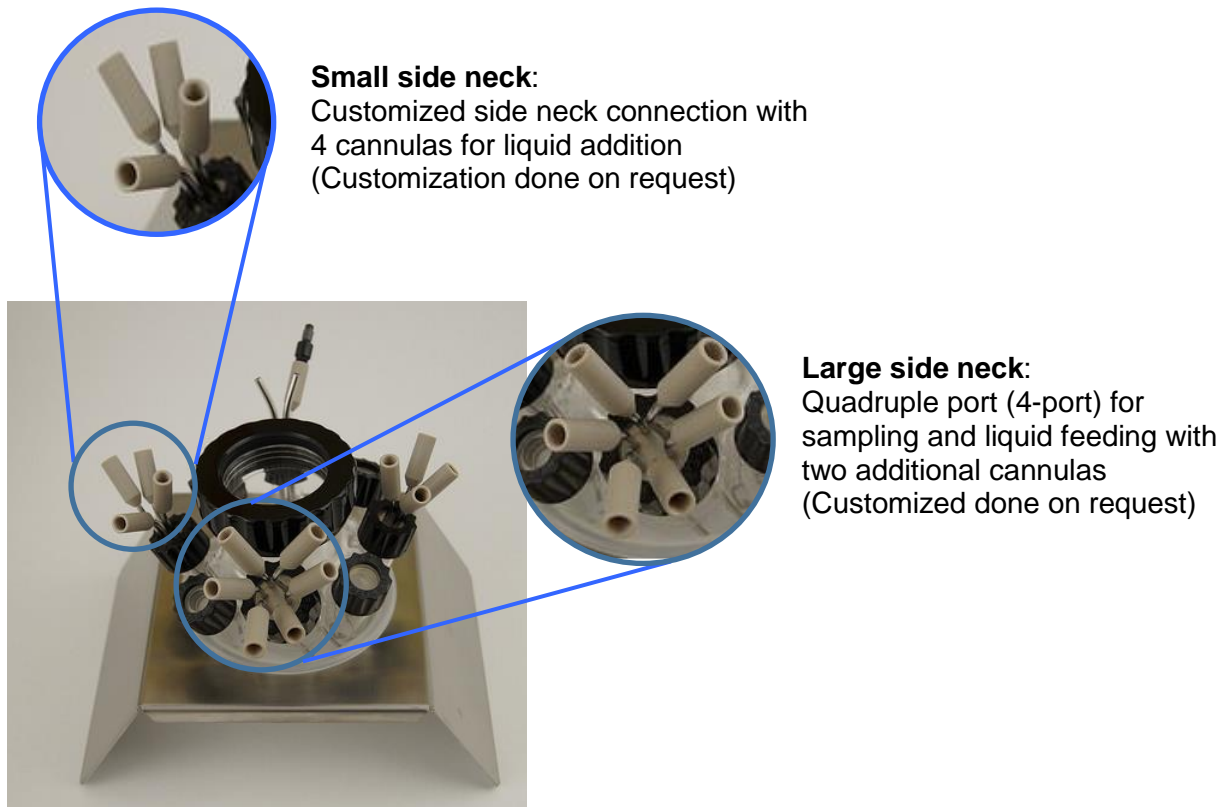


Figure 3 Customized cannula configuration to increase the number of ports on side necks of 0.4 L culture vessel

How to equip the MINIFOR bioreactor vessels?

The distribution of side necks on 0.4 L, 1 L and 3 L MINIFOR culture vessels are similar and are grouped together under one section in this supplementary user guide. Whereas, the side necks distribution of 0.3 L and 7 L culture vessels are different comparing 0.4 L, 1 L and 3 L vessels.

Please find the assembly of probes and tubing connections of [0.3L](#), [0.4L](#), [1L](#), [3L](#) and [7L](#) MINIFOR bioreactor vessels:

0.3L MINIFOR BIOREACTOR VESSEL

The 0.3 L MINIFOR culture vessel is the only jacketed (double glass walled) vessel offered by LAMBDA.

- The small jacketed 0.3 L vessels must be **used only with the vessel jacket completely filled with water**. The hose connectors of the jacket should be closed (e.g.) with silicone tubing.



Figure 4 MINIFOR fermentor - bioreactor: 0.3 L culture vessel



Figure 5 “Butterfly shaped” stirring disc for the minimal working volume of 0.3 L vessel

While working with **minimal volume of 35 ml**, a special “butterfly-shaped” stirrer (*Figure 5*) has to be used. The “butterfly-shaped” stirring disc allows the insertion of the probes into the minimal working volume. Care should be taken, when mounting the butterfly-shaped stirrer disc:

- To use surface aeration instead of the supplying air/O₂ by self-cleaning microsparger
- To clamp the air inlet tubing between air-inlet-filter and the fermenter head

The **adjustable lateral reactor holders** (*Figure 6 & Figure 7*) used to mount the 0.3 L bioreactor vessel on the MINIFOR base control unit:

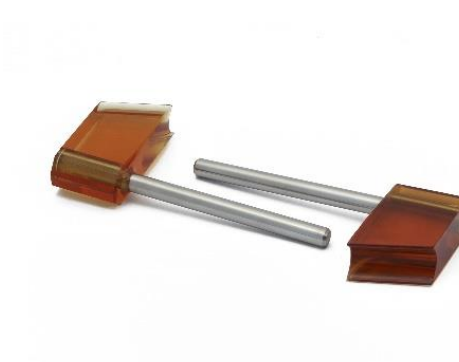


Figure 6 Adjustable lateral reactor holder for the 0.3 L culture vessel



Figure 7 Elastic silicone ring helps to affix the vessel to the adjustable lateral holder

Overview of the connections on the 0.3 L vessel

During the installation of 0.3 L culture vessel, please follow the connections on the side necks according to the *Figure 8*:

- **The largest diameter side neck** for the quadruple sampling and feeding port (surface aeration, liquid feeding, inoculation and sampling) has to be placed in the front for easy sterile handling.
- **pO₂ probe** is placed on the side neck besides the quadruple sampling and feeding port
- **Combined pH and temperature probe** is assigned to the side neck opposite pO₂ probe side neck
- Use **coloured open stopper for the pO₂ probe** and any open transparent stopper for the pH probe.
- Blind silicone stoppers can be placed on the unused side necks or ports

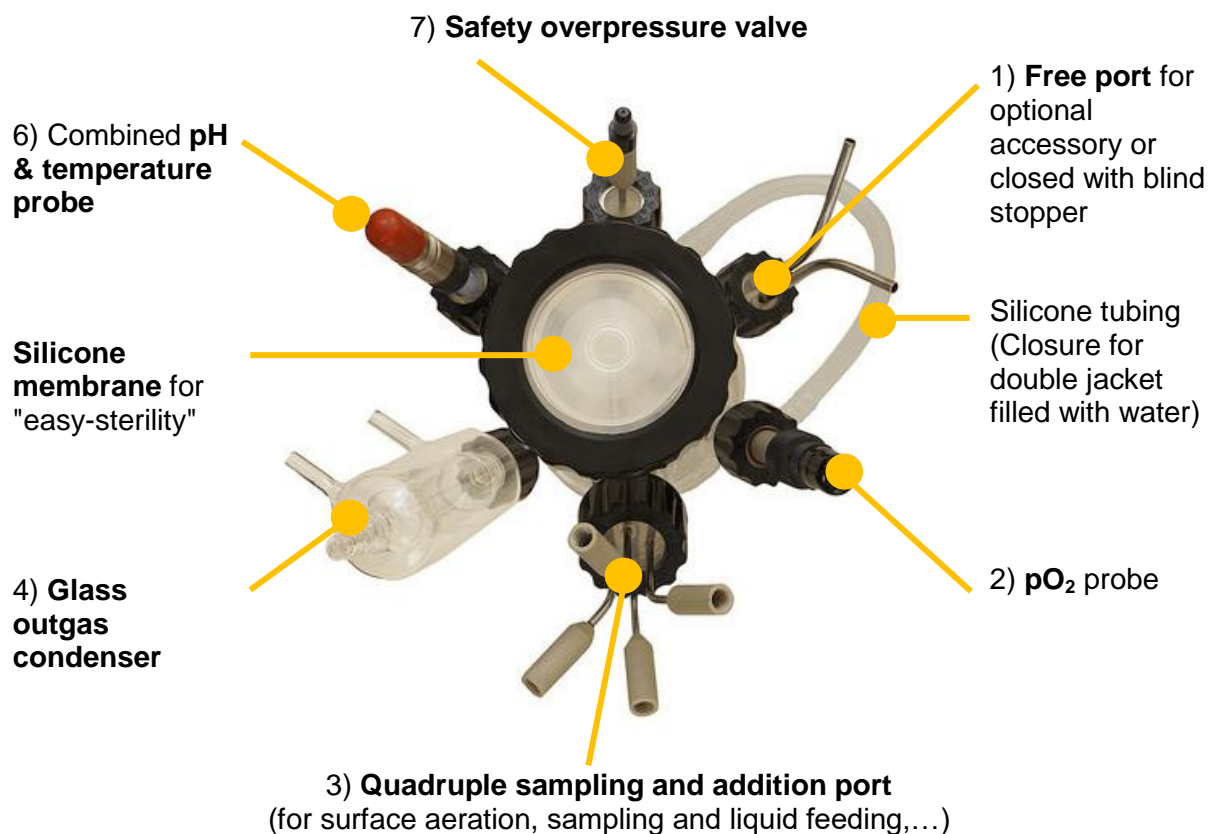


Figure 8 MINIFOR 0.3L culture vessel: Overview of connections

0.4L, 1L & 3L MINIFOR BIOREACTOR VESSELS

The distribution of side necks on 0.4 l, 1 l and 3 l MINIFOR culture vessels are similar:



Figure 9 LAMBDA MINIFOR 0.4 L culture vessel

Figure 10 LAMBDA MINIFOR 1 L culture vessel

Figure 11 LAMBDA MINIFOR 3 L culture vessel

The culture vessels have 8 side necks:

- 1 larger diameter side necks for the quadruple sampling and addition port
- 2 side necks at an angle of 60° for probes (combined **pH & temperature and pO₂ probes**)
- 1 side neck for the outgas / exit gas condenser
- 4 other side necks can be utilized according to the project requirements (additional input lines, pressure valve, cooling loop, probes,...)

For a detailed explanation of the side neck assembly and the connections (please refer the *Figure 12*):

Overview of the connections on 0.4L, 1L & 3L MINIFOR culture vessels

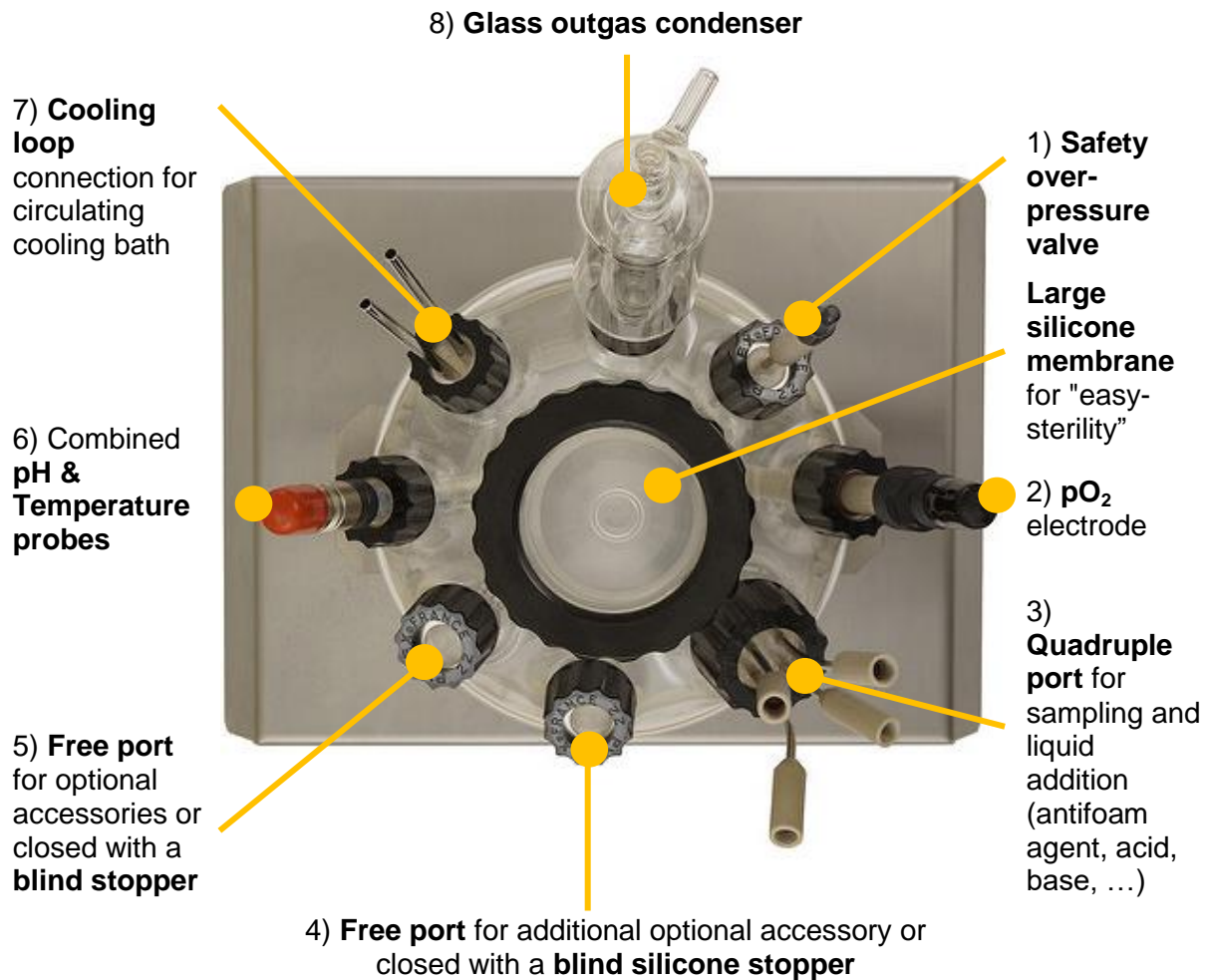


Figure 12 Overview of connections on MINIFOR 0.4 L, 1 L and 3 L culture vessels (using the 1 L vessel assembly as an example)

7L MINIFOR BIOREACTOR VESSEL

The 7 L culture vessel consists of **two glass parts**: lower glass vessel part and an upper part with the side necks / ports.

The two parts need to be fixed together with the **liquid O-ring** and the segmented fixation belt.

Please refer the [MINIFOR fermentor-bioreactor operation manual](#) to know about the preparation of liquid O-ring and fixation.



Figure 13 Installation of 7 L culture vessel



Figure 14 Lateral holders for the 7 L glass vessel

Two adjustable lateral reactor holders (Figure 14) are used to mount the 7 L culture vessels on the MINIFOR base control unit.

Overview of connections on the MINIFOR 7L culture vessel

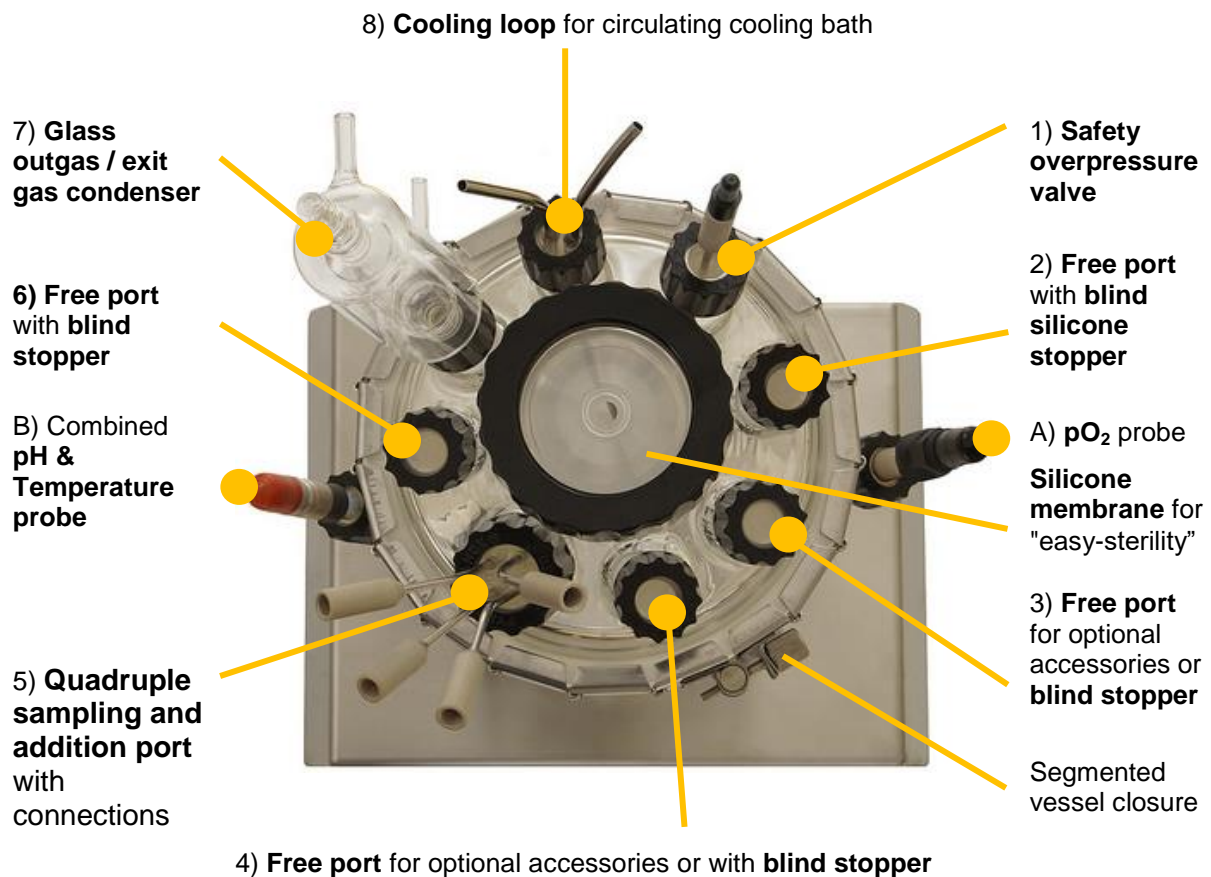


Figure 15 Overview of connections on MINIFOR 7 L culture vessel

The combine **pH and temperature probe** (Figure 15, B) and **pO₂ electrode** (Figure 15, A) are introduced on the small distinct side necks on the lower part of the 7 L culture vessel. These two side necks on the lower part of the vessel are used to affix the vessel to the adjustable reactor holder with the help of an elastic silicone ring.

The side necks / ports for all other connections are located on the upper part of the glass culture vessel (Figure 15, 1 - 8).

CONTACT MANUFACTURERS AND SUPPLIERS OF LABORATORY FERMENTORS - BIOREACTORS

LAMBDA Laboratory instruments, the manufacturer and supplier of bench-top bioreactors, laboratory fermentors and accessories (laboratory peristaltic pumps, LUMO light module for photobioreactors, MASSFLOW gas flow controller, MINI-4-GAS gas mixing module, ...):



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