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# *my-Control* for the AppliFlex ST Single Use Reactor 3L



## HARDWARE MANUAL

Hardware Version 3; Document Version 1.4

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# 1 SAFETY

## 1.1 SAFETY SYMBOLS

The following symbols are used on the equipment and in this manual.

**WARNING**

Important issue concerning personnel health and device safety. Refer to this manual

**WARNING**

Risk of electrical shock hazard

**WARNING**

Hot surface.



Additional information



Disposal instructions

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## 1.2 SAFETY WARNINGS



### GENERAL

- This set of equipment has been designed in accordance with EN61010-1 "Safety Requirements for Electrical Equipment for Measurement, Control and Laboratory Use", and has been supplied in a safe condition.
- The Hardware manual contains information and warnings, which have to be followed by the user to ensure safe installation, operation and to retain the equipment in safe condition. Carefully read this manual before putting the *my-Control* into operation.
- Before switching-on the equipment, make sure that the fuse rating is appropriate for the line voltage (for fuse details, refer to [section 3.2](#)).
- This equipment has been designed for bioprocess control; it must not be used for other purposes!



### WARNING

Risk of electrical shock hazard.

- The colored metal front panel (with any mounted pumps or micro valves) of the *my-Control* cabinet can be replaced by a panel with a different color. However, removing the metal panel will make hazardous parts accessible and must therefore be performed by qualified personnel. The *my-Control* must not be switched on or used when the colored metal front panel is not properly in place.
- Any interruption of the protective conductor inside or outside the *my-Control* or disconnection of the protective conductor terminal will make the device hazardous. Intentional interruption is prohibited.
- Capacitors inside the apparatus may still be charged, even if the apparatus has been disconnected from all voltage sources.
- It is not allowed to perform maintenance and/or repair on the opened device under voltage. Before removing the metal front panel or the rear panel, the power cord must be removed from the power entry socket of the *my-Control*.
- Make sure that only fuses with the required rated current and of the specified type (International Standard IEC 127) are used for replacement. The use of makeshift fuses and the short-circuiting of fuse holders are prohibited.
- It is not permitted to connect equipment to the *my-Control* or the bioreactor without the qualification of double isolation or without the SELV (Safety Extra Low Voltage) qualification.



### WARNING

The rear of the *my-Control* cabinet must be accessible.

- The power switch of the *my-Control* is located at the rear of the cabinet. Make sure that the *my-Control* is installed in such a way that, in case of emergency, the power switch can be easily reached!



### WARNING

Risk of damaging the equipment.

- In most cases, one or more pumps are installed in the *my-Control*.
- Application of damaged tubes may result in fluid leaking into the pump drive.
- Verify the tube quality inside the pump head before every fermentation run.
- Do not use the tubing pump drives for other purposes than displacement of fluids (or gas).
- Advised pump tubing (pharmed) has its limitation in physical and chemical resistance. Make sure that the pump tubing and the selected reagent type are compatible.

**WARNING**

Hot surface.

- A Heating Blanket may be used around the bioreactor as an actuator for temperature control. During heating up the bioreactor, the outer surface of this Heating Blanket will be hot.

**WARNING**

Make sure to use a proper power cord.

- The *my*-Control comes with a detachable power cord with 3 x 1.0mm<sup>2</sup> wires (for the USA, the power cord complies with 18AWG which is equal to 3 x 0.82mm<sup>2</sup> wires).
- When the original power cord needs to be replaced by another one, make sure that the replacement cable has the same (or better) specifications than the original.

**WARNING**Do not use flammable substances in the vicinity of the *my*-Control while in operation.

- The *my*-Control is an electr(on)ic control device that contains relays for switching power and actuator signals. These relays may generate sparks during operation. It is therefore not allowed to use flammable substances in the vicinity of the *my*-Control while this device is in operation.

**Additional information**

- Although the *my*-Control as a whole is not UL-certified, all used components have been selected based on conformance with the standard UL 60950 (Underwriters Laboratories Inc. Standard for Safety of Information Technology Equipment).

**Disposal instructions**

- This product must not be disposed of together with domestic waste.
- All users are obliged to hand in all electrical or electronic devices, regardless of whether or not they contain toxic substances, at a municipal or commercial collection point so that they can be disposed of in an environmentally acceptable manner.
- Consult your local authority or your supplier for information about disposal.

**Standard Operating Procedures**

- Preparing and operating the AppliFlex ST Single Use Bioreactor requires aseptic procedures: working in a Laminar Air Flow (LAF) cabinet, use of Luer Lock couplings or C-Flex tubing plus welding equipment, etc.
- For specific information concerning this subject, refer to the Operator Manual that comes with the equipment and to the Standard Operation Procedures that are applicable in your lab.

**WARNING**

Sensor is fragile. **Handle with care!**

- For measuring the dissolved oxygen concentration in the bioreactor, the LumiSens Optical dO<sub>2</sub> sensor is used. This sensor is fragile; the replaceable LumiSens sensor tip is made of glass and can break easily.

**CAUTION**

Single Use Bioreactor

- The AppliFlex ST Single Use Bioreactor is intended for “single use” only. Applikon is not liable in case of damage caused by multiple use of the reactor!

### 1.3 EU DECLARATION OF CONFORMITY

The company Applikon Biotechnology B.V., residing in Delft, The Netherlands, hereby certifies that the design of the instrument:

***my*-Control**  
for the  
**AppliFlex ST Single Use Bioreactor 3L**

meets the requirements of the following Directives of the European Union:

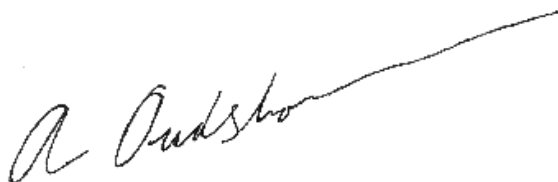
- ✓ Directive 2006/42/EC on Machinery
- ✓ Directive 2014/30/EU on Electromagnetic Compatibility (EMC)
- ✓ Directive 2011/65/EU and 2015/863/EU on Restriction of Hazardous Substances (RoHS)
- ✓ Regulation (EC) No 1907/2006 on Restriction of Chemicals (REACH)

The compliance of the *my*-Control has been based on the following harmonized standards:

Directive	Harmonized Standard
2006/42/EC (Machinery)	EN 60204-1:2006 / EN 12100:2010
2014/35/EU (Low Voltage)	EN 61010-1:2010 / EN 62311:2008
2014/30/EU (EMC)	EN 61326-1:2013 / EN 61000-3-2:2014 / EN 61000-3-3:2013

\*For the *my*-Control, the Machinery Directive includes the requirements of the Low Voltage Directive.

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Managing Director



May 24<sup>th</sup>, 2017

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## 2 GENERAL

### 2.1 INTRODUCTION

The AppliFlex ST Single Use 3L Bioreactor Systems basically consist of the following parts:

- An AppliFlex Stirred Tank Single Use Bioreactor with the appropriate auxiliaries such as a stirrer assembly, gas inlet and sample pipes, a temperature sensor pocket, etc.
- A controller for measurement and control of process variables (such as pH, temperature, dO<sub>2</sub> and stirrer speed) with corresponding controller outputs in order to keep process conditions at set point.

The *my-Control* combines and supports actuators like pumps, mass flow controllers and valves in order to optimize the use of limited bench space.

Typical characteristics of the *my-Control* with the 3L Single Use Bioreactor Systems:

- Easy setup and operation,
- Cultivation with a small foot print,
- Generation of scalable results,
- Easy data handling.

### 2.2 THE USER INTERFACE

Through a network that is connected to the *my-Control* (TCP/IP communication), different kind of devices can be used as a User Interface (UI). Since the *my-Control* is addressed by using its IP address, the User Interface is also called the Web UI. Examples:

Web UI Device Type	Connecting Network
PC	LAN / WAN or Peer-to-Peer
Tablet	Wireless connection with WIFI-Router
Smartphone	Wireless connection with WIFI-Router

The *my-Control* is addressed by using its IP-address.

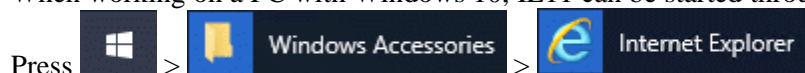
Start the Internet Browser at the WebUI-device and surf to the following address: [http://IP-address\\*/](http://IP-address*/). The *my-Control* WebUI will be displayed.

**\*The IP-address of the *my-Control*. The *my-Control* comes with a preset IP-address. This address can easily be customized. Refer to section 1.3 and Appendix A of the Software Reference Manual.**

**Refer to Appendix D of the software manual in order to prevent instabilities in the network connection when the *my-Control* is the only controller directly connected to its controlling PC.**



Internet Explorer IE11 and Google Chrome are supported as Internet browsers.  
When working on a PC with Windows 10, IE11 can be started through the Accessories.

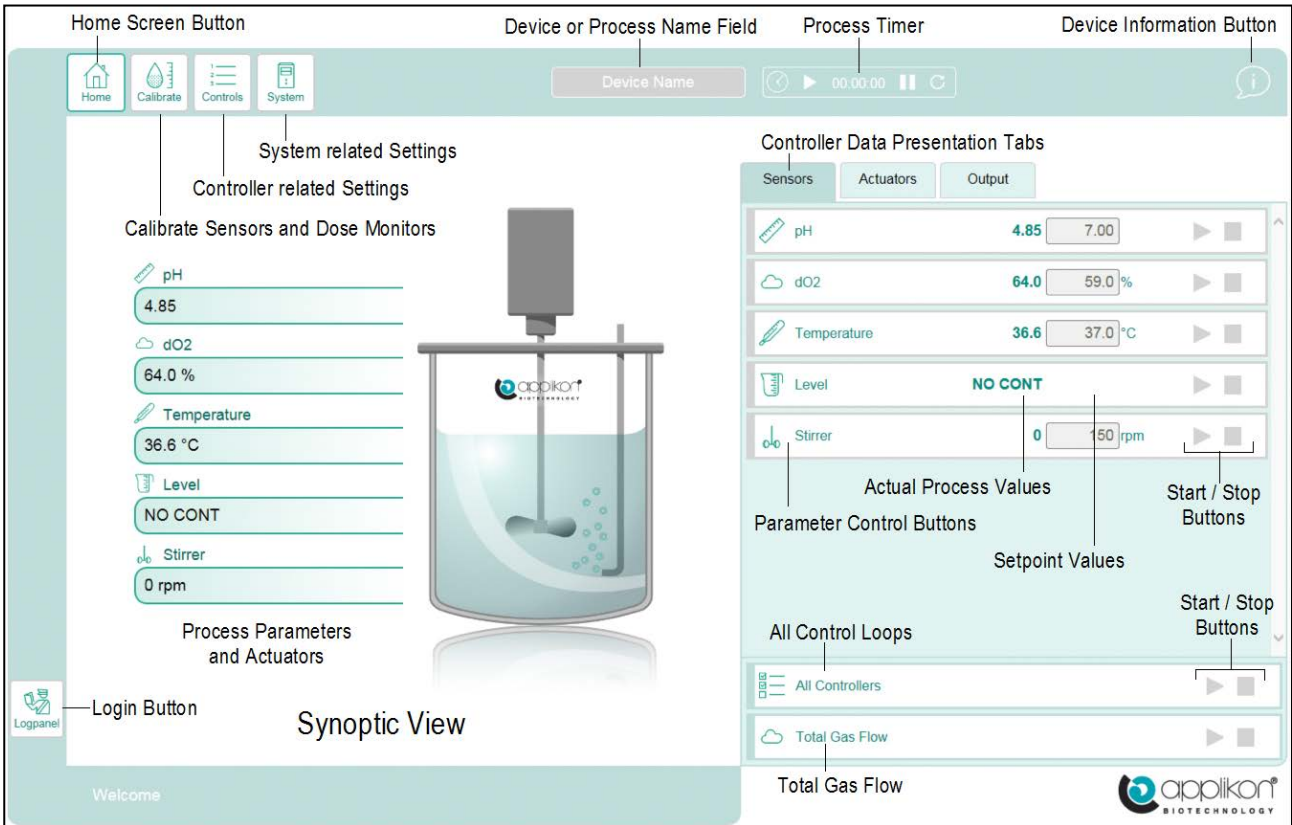


After switching on the power of the *my-Control* and invoking the Web Interface through the Internet browser on the PC, the *my-Control* displays its Home Screen (see next page).

In the Hardware, Operator and Software Reference Manual, it is assumed that a PC is used as HMI (*my-Control* is operated with mouse-clicks).

After switching on the power of the *my-Control* and invoking the Web UI with the Internet browser, the *my-Control* displays its Home Screen.

Example of the Home Screen in View mode (no user is logged in, control loops are “Idle”):



Use the mouse pointer to press the virtual buttons at the Web UI of the *my-Control*.

## 2.3 RELATED MANUALS

Also refer to the following manuals:

- Operator Manual *my-Control* with AppliFlex ST Single Use Bioreactor
- Software Reference Manual *my-Control* for Autoclavable and Single Use Bioreactors
- PID Control Manual

## 3 THE *my*-CONTROL

The *my*-Control is a full-size biocontroller that is dedicated to the process in a bioreactor. It contains:

- Fixed and adaptive PID control for pH, dO<sub>2</sub> and Temperature
- Stirrer Speed control
- Foam and/or Level control
- Up to 12 additional (freely configurable) measuring channels / PID control loops, such as:
  - (max. 4) Analog Inputs for sensors / measuring devices
  - (max. 4) Scales (USB) for Feed Control
  - Optical Sensors (USB) for pH and dO<sub>2</sub>
  - Biomass Monitor (USB)

Inside the *my*-Control, the following actuators are supported:

- Variable speed tubing pumps (max. four mounting positions)
- Gas Solenoid Valves with Tuning Valve for aeration (max. four internal mounting positions)
- Three channel Mass Flow Controller for aeration (internal mounting)
- Power Supply for heating (Heating Blanket or Thermo-Electric element) and cooling (Thermo-Electric element or connection of external cooling valve)

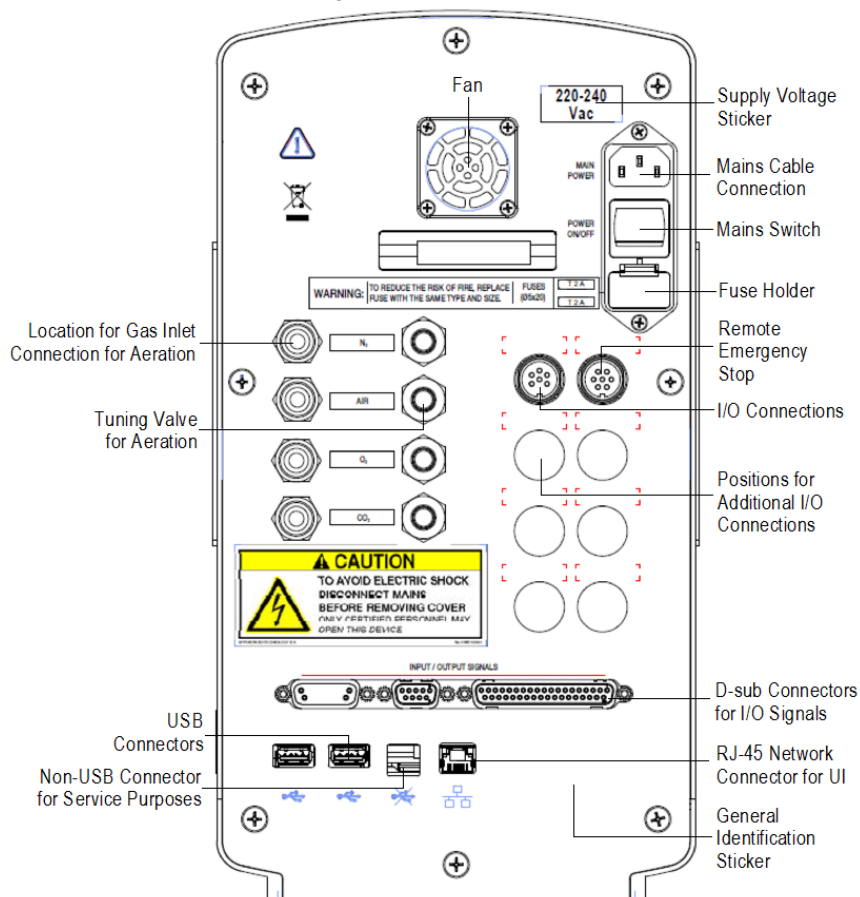
### 3.1 FRONT VIEW OF THE *my*-CONTROL



The rear view of the *my*-Control is presented at next page.

## 3.2 REAR VIEW OF THE *my*-CONTROL

At the rear of the control cabinet, the following connections can be found:



### Power Supply section

The Power Supply Section of the *my*-Control contains:

- Mains Cable Connector for for:  
220-240 VAC / 50 Hz or  
100-120 VAC / 60 Hz.
- Power Switch
- Fuse holders; fuses must comply with IEC 127 (International Standard):  
230 VAC: 2 x T 2A (5 x 20 mm)  
115 VAC: 2 x T 4A (5 x 20 mm)



The power switch of the *my*-Control is located at the rear of the cabinet. Make sure that the *my*-Control is installed in such a way that, in case of emergency, the power switch can be easily reached!

### Optional Remote E-Stop Connector

Optional connector for the external Emergency Stop circuit (button).

By default, this connection is internally jumpered. A connector for an external button is available as an option. Opening the external Emergency Stop circuit will power down all actuators. Resetting the Emergency Stop status is achieved by closing the circuit again. A “Normally Closed” relay can be used as an external Emergency Stop button.

Z510330500 Generic Emergency Stop Assembly

## Positions for Optional I/O Connections and Devices

- **Thermo Electric Condenser Connection**

Connection for condenser with Thermo Electric cooler.

- **Connection for Temperature Control Actuators**

Actuator connection for heating and cooling: Thermo-Electric element or heating blanket and cooling valve.

- **Analog Inputs 0-10V**

The four analog inputs can be used as inputs for additional control loops.

A resistor of 500Ω (parallel with the input) can be used to convert a 0-20mA signal to 0-10V.

- **D-sub Connectors for I/O Signals**

For lay-out specification of the 37 pins D-sub connector, refer to [section 3.8](#) (Analog and Digital I/O Connections) of this Hardware Manual.

## Gas Inlets for aeration

The gas inlets (carbon dioxide, oxygen, air and nitrogen) are Quick Connectors for tubing OD = 6 mm.

For information and specifications of the available gas supply hardware, refer to [section 4.1](#) (Solenoid Valve with Tuning Valve) and [section 4.2](#) (Mass Flow Controllers).



Required inlet pressure for the gasses: 2 barg.

Required quality of the gasses: Instrument grade (dry and free of particles or oil).

## USB-Connectors

Can be used to connect:

- A USB-memory stick, to be used for customizing the IP-address (refer to the Software Reference Manual, section 1.3) or to export / import data or configuration files (refer to the Software Reference Manual, section 3.3.3).
- External devices such as scales, biomass monitors, optical sensors, etc. In case more than 2 USB inputs need to be connected, a USB-Hub is required.

## Non-USB-Connectors

A non-USB connector is used for service purposes.

## Network Connector for the Web User Interface

The RJ-45 network connector is used for connection to the Web User Interface / SCADA-application.



In order to comply with the European EMC Standards for “emission” and “immunity”, the maximum length of the Ethernet cable is 30 meters!

## 3.3 MODULES TO BE MOUNTED INSIDE THE *my*-CONTROL

The following modules can be mounted inside the *my*-Control:

Part #	Description	Remarks
Z310211020*	Heating Control Module	Supply for Heating Blanket
Z310213010*	Stepper Stirrer Control Module	Supply for Stepper Stirrer Motor
Z310216020*	Control Module for Pumps	Control Module for 2 Variable Speed Pumps
Z310211040*	Condenser Control Module	Control Module for the Thermo Electric Condenser
Z310217050*	Redox Control Module	Amplifier Board for a Redox Sensor

\*Additional Modules must be installed by a certified Service Engineer.

### 3.4 COLORS OF THE FRONT PANEL

By default, the *my*-Control comes with a silver front panel. Other front panel colors are available on demand.



Ordering numbers of *my*-Controls with different colors:

Part #	Description	Part #	Description
Z310210130	Front Panel Silver V2	Z310210135	Front Panel Light Blue V2
Z310210131	Front Panel Yellow V2	Z310210136	Front Panel Green V2
Z310210132	Front Panel Orange V2	Z310210137	Front Panel Marine Blue V2
Z310210133	Front Panel Red V2	Z310210138	Front Panel Pink V2
Z310210134	Front Panel Purple V2		



#### WARNING

Risk of electrical shock hazard.

- The colored metal front panel (with any mounted pumps or micro valves) of the *my*-Control cabinet can be replaced by a panel with a different color. However, removing the metal panel will make hazardous parts accessible and must therefore be performed by qualified personnel. The *my*-Control must not be switched on or used when the colored metal front panel is not properly in place.

### 3.5 FRONT PANEL ILLUMINATION



The front panel of the *my*-Control is illuminated from the rear by LED-array.

The color of the LED's indicate the status of the *my*-Control.

Color LED-array	Status of the <i>my</i> -Control.
White	Booting
Blue	Ready (controllers are idle)
Green	Controller(s) are running (no alarms)
Red	Controllers are idle: System Alarm Controller(s) running: Process Alarm
Orange	Update available: - Web User Interface software, - Control software or - Licenses

### 3.6 ACTUATOR CONTROL

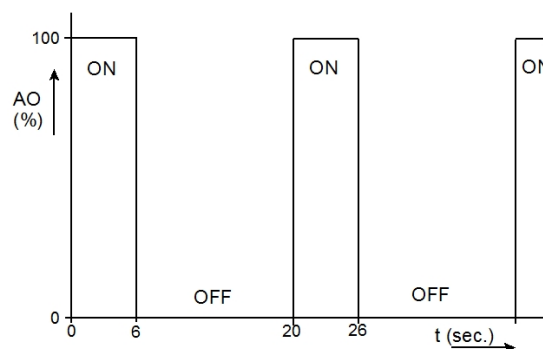
#### 3.6.1 DIGITAL ACTUATORS VERSUS CONTINUOUS ACTUATORS

Discrete (digital) actuators like valves are controlled in a “Pulse-Width Modulated” manner (PWM):

- within a predefined “cycle time”, the output (Actuator) is switched on during the “On-time” and off during the rest of the cycle.

**Example 1**

If Cycle time = 20 sec. and  
 Actuator Output = 30 %  
 then On/Off Output will be repeatedly switched:  
 on during 6 sec (30 % of 20 seconds).  
 off during 14 sec.

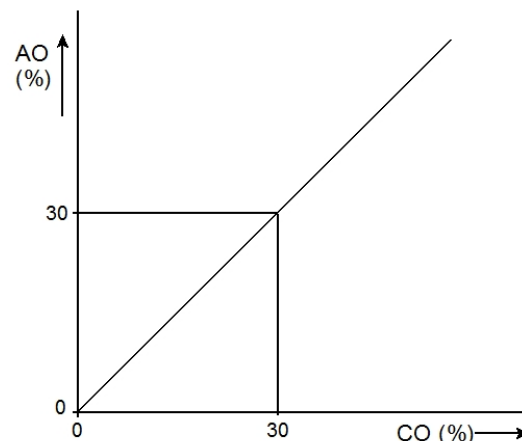


Continuous (analog) actuators like pumps, mass flow controllers and stirrers do not have a “cycle time” or an “on-time”.

Deviation from set-point results in a controller output that relates to the actuator output in a linear way.

**Example 2**

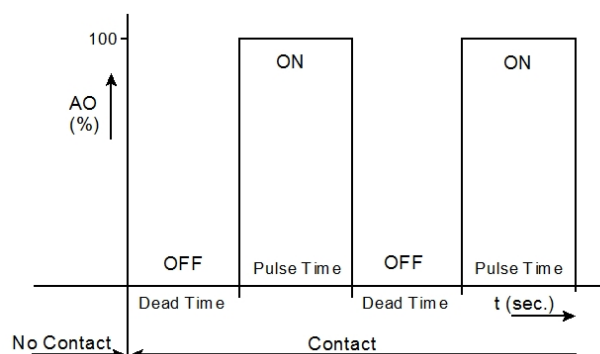
If Controller Output = 30 %  
 Then Continuous output has an Actuator Output = 30 %.



#### 3.6.2 ACTUATOR FOR LEVEL / FOAM CONTROL

The actuator for the level / anti-foam controller is either off (AO = 0 %) or on (AO = 100 %). In most cases the desired situation is “No Contact”.

When the status “No Contact” changes into “Contact”, first a “Dead Time” elapses after which the actuator is switched on during the “Pulse Time” interval. This sequence is repeated until the status changes into “No Contact” again.



- Values for Dead Time and Pulse Time and the parameters of the level/foam sensor can be edited by navigating to System > Settings > Controller Setup.
- Since a 200 rpm pump is used for antifoam agent, the upper limit of the pump speed can best be limited to 50% resulting in a maximum pump speed of 100 rpm.  
 Refer to section 4.5.2 of the Software Reference Manual: Actuator Limits and Inhibit.

### 3.7 SENSOR INPUT SPECIFICATIONS

The applied sensor input amplifiers have the following specifications.

pH amplifier:	Range:	0 pH ... 14 pH
	Accuracy:	$\pm 0.01$ pH
	$R_{in}$ :	$> 10^{15} \Omega$
	Resolution:	0.01 pH
Temperature amplifier:	Type:	Pt-100 (3-wire type)
	Range:	0 °C ... +150 °C
	Accuracy:	$\pm 0.1$ °C
	Resolution:	0.1 °C
dO <sub>2</sub> amplifier:	Type:	Polarographic
	Range:	0 % - 100 % (when calibrated with oxygen) 0 % - 500 % (when calibrated with air)
	Accuracy:	$\pm 0.1$ %
	Resolution:	0.1 %
Level amplifier 1 and 2:	Type:	On/Off signal
	Sensitivity:	Software-selectable: High Sensitivity: Conductivity $\geq 26 \mu\text{S}$ equals "Contact" Low Sensitivity: Conductivity $\geq 200 \mu\text{S}$ equals "Contact" Refer to section 4.6.1 (Level / Foam Sensor Settings) of the Software Reference Manual.



The Redox Sensor can be used as an option (the Redox Amplifier Board is required; refer to [section 3.3](#)). It will be connected to the Level 2 sensor connection at the front of the *my*-Control cabinet. It in fact substitutes the Level 2 sensor.

Redox amplifier:	Range:	$0 \pm 2000$ mV
	Accuracy:	$\pm 1$ mV
	Resolution:	1 mV



### 3.8 ANALOG AND DIGITAL I/O CONNECTIONS

The analog and digital I/O connections are located at the rear of the *my*-Control:

#### Analog Inputs

The (max. 4) analog input connectors contain four pins:

- Pin 1 = Analog input
- Pin 2 = Ground
- Pin 3 = Spare
- Pin 4 = Spare

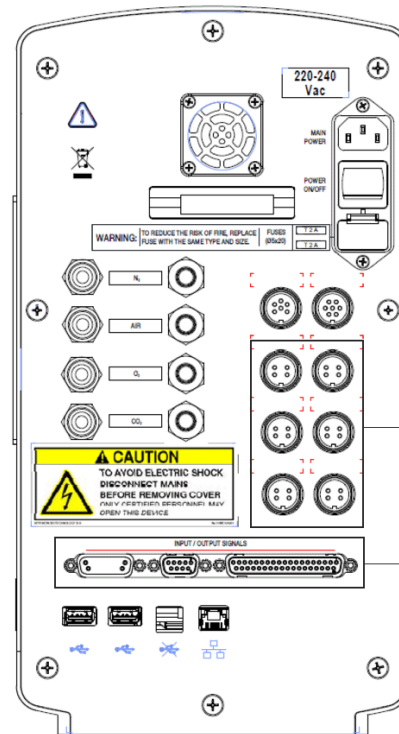


Input range: 0 – 10 V  
Impedance: > 100 kΩ

Analog input for the *my*-Control including external cables and license:

Z310214010\* Analog Input *my*-Control,

\*The above mentioned part consists of one internal cable and two external cables: one for V-signals and one for mA signals (with a 500 Ohm resistor in its connector to convert the mA signal to a V-signal)). Additional Analog Inputs must be installed by a certified Service Engineer.



Positions for Optional I/O Connections and Devices (e.g. Analog Outputs)

9, 15 and 37 pins D-sub Connectors for I/O Signals (e.g. Analog and Digital Outputs)

#### Analog and Digital Outputs (37 pins sub-connector):

Pin #	Description	Pin #	Description
1	DIGITAL OUTPUT 6+	17	ANALOG OUTPUT 3
2	DIGITAL OUTPUT 6-	18	ANALOG OUTPUT 1
3	DIGITAL OUTPUT 7+	19	ANALOG OUTPUT 2
4	DIGITAL OUTPUT 7-	20	ANALOG OUTPUT 4
5	DIGITAL OUTPUT 4+	21	GND
6	DIGITAL OUTPUT 4-	22	GND
7	DIGITAL OUTPUT 5+	23 / 24	SYSTEM ALARM OUTPUT (NO / COM)
8	DIGITAL OUTPUT 5-	25 / 26	DEVIATION ALARM OUTPUT (NO / COM)
9	DIGITAL OUTPUT 1+	27	24V for Digital I/O (max. 0.5A)
10	DIGITAL OUTPUT 1-	28	GND
11	DIGITAL OUTPUT 2+	30	GND
12	DIGITAL OUTPUT 2-	32	GND
13	DIGITAL OUTPUT 3+	34	GND
14	DIGITAL OUTPUT 3-	35	15Vext. (max. 0.1 A)
15	DIGITAL OUTPUT 8+	36	GND
16	DIGITAL OUTPUT 8-		



- Analog output 5 can be found at the 9 pins D-sub connector: pin 2 (+) and pin 6 (GND)!
- The System Alarm output (pin 23/24) indicates that the process cannot be supported anymore.
- The Deviation Alarm output (pin 25/26) indicates that a process value is out-of-limits.
- The ground (GND) pins are used in combination with the analog outputs.

Analog Outputs: 0/4 – 20 mA (software selectable)  
Digital Outputs: 0/5 VDC, 100 mA each

### 3.9 ENVIRONMENTAL CONDITIONS

The *my*-Control for autoclavable Bioreactor Systems may be used at locations with the following environmental conditions:

- Use: indoor
- Altitude: up to 2000 m
- Temperature: 4 °C to 40 °C
- Relative humidity: maximum 80 % for temperatures up to 31 °C, decreasing linearly to 50 % relative humidity at 40 °C
- Mains supply voltage: 220 – 240 / 100 - 120 VAC, 50/60 Hz
- Transient over voltages: according to Installation category II
- Pollution: Pollution degree 2 in accordance with IEC 664
- Power consumption: P-max = 400 VA

### 3.10 STORAGE INSTRUCTIONS

When the *my*-Control, after being used, has to be stored for a longer time (> 1 month), follow the instructions below:

- Disconnect the sensor cables and stirrer motor cable(s) from the *my*-Control. Store the sensors according to the instructions in the User Manual that comes with the sensor. Store the Stirrer Motor in its original box.
- Remove the pump tubing from the Pumps of the *my*-Control. Drain and rinse the pump tubing and store it together with the feed bottles.
- Disconnect the gas supply lines from the gas inlets at the rear panel of the *my*-Control cabinet.
- Purge the gas supply lines (especially the O<sub>2</sub> and CO<sub>2</sub> lines) inside the *my*-Control with instrument air. Cover the gas inlets and outlets with blind caps.
- (if necessary) Clean the outside of the *my*-Control cabinet according to the instructions below.
- Pack the *my*-Control in its original packaging (plastic bag and box).
- Store it at altitude, temperature and humidity as specified in [section 3.9](#) (Environmental Conditions).
- Clean and dry the bioreactor with all its auxiliaries and store it, preferably in its original packaging.

### 3.11 CLEANING INSTRUCTIONS

The *my*-Control cabinet may be cleaned with a moist tissue in combination with a non-abrasive cleaner.

## 4 INTERNAL ACTUATORS

The *my*-Control may be equipped with internal actuators for aeration and liquid addition:

- Solenoid valve with tuning valve per gas inlet line (nitrogen, air, oxygen and carbon dioxide)
- 1-channel or 3-channel mass flow controller
- Tubing pump for liquid additions



Gasses that are used for aeration and pH control (CO<sub>2</sub>) must comply with the following spec's:

- Required inlet pressure for the gasses: 2 barg.
- Required quality of the gasses: Instrument grade (dry and free of particles or oil).

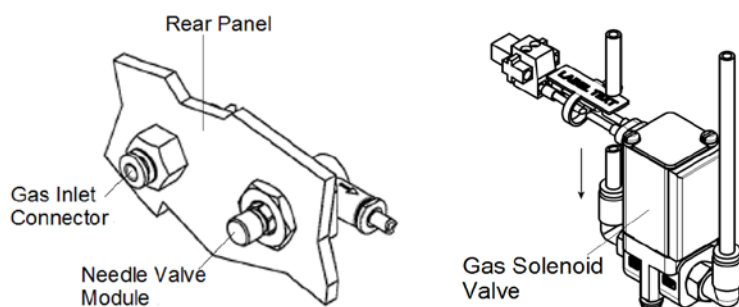
### 4.1 SOLENOID VALVE WITH TUNING VALVE

Per gas inlet line, inside the *my*-Control a solenoid valve may be installed. The individual gas flows can be manually tuned by a Needle Valve Module. The needle valve module includes a Non-Return valve that prevents back-flow of gas.



By default, the tuning valve is set to the required gas flow.

Changing the tuning valve setting must only be performed while using a flow meter.



Z310212012\* Gas Solenoid Valve Assembly 24 VDC SMC

Z310212022\* Needle Valve Module (including the Non-Return Valve)

\*Additional (needle ) valves must be installed by a certified Service Engineer.

For gas flows up to 500 ml/min, a precision metering valve is available for more accurate gas flow regulation:

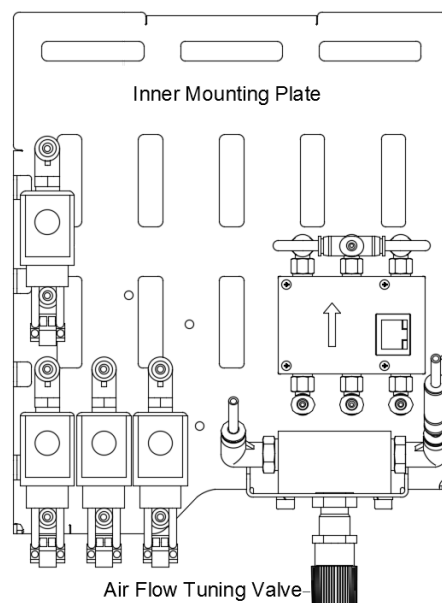
This metering valve is located inside the Control Console cabinet. Changing the default gas flow requires opening the cabinet and must only be performed by qualified personnel.

Top View image of the inner mounting plate with the precision air flow tuning valve(s) installed:

If two or more metering valves are installed, they are mounted on top of each other.

Z310212021\* Precision Metering Valve Module  
(including the Non-Return Valve)

\*Additional Metering Valves must be installed by a certified Service Engineer.



## 4.2 MASS FLOW CONTROLLERS

Two types of mass flow controllers are used in the *my*-Control.

- 3-Channel Mass Flow Controller (for controlling the flow of three individual gasses)
- 1-Channel Mass Flow Controller (for controlling the flow of one gas only)

Both Mass Flow Controllers (MFC) are applied for bioreactor aeration.

The following gasses may be applied:

- Nitrogen
- Air
- Oxygen
- Carbon dioxide



3-Channel MFC



1-Channel MFC



### Possible MFC configurations:

- If the flow of only one gas supply line needs to be controlled, the 1 Channel MFC is mounted,
- If the flow of two gas supply lines need to be controlled, two pieces of the 1 Channel MFC are mounted,
- If the flow of three gas supply lines need to be controlled, the 3 Channel MFC is mounted,
- If the flow of four gas supply lines need to be controlled, a 1 Channel MFC and a 3 Channel MFC are mounted,

### MFC Specifications:

Aeration range: for N<sub>2</sub>, air or O<sub>2</sub>: up to 1,500 ml/min  
for CO<sub>2</sub>: up to 800 ml/min

Gas flow accuracy:  $\pm 2\%$  full scale\*

\*The given accuracy is obtained under standard operating conditions (after at least 1 hour of operation):

Environmental temperature: 20 .. 25°C

Internal my-Control temperature: 35 .. 40°C

In case of different operating conditions, the accuracy may be less (theoretical temp. sensitivity for air, N<sub>2</sub> and O<sub>2</sub> = approx. 0.2%/°C, theoretical temp. sensitivity for CO<sub>2</sub> = approx. 0.6%/°C).

### Gas Specifications:

Required gas inlet pressure: 2 barg

Required quality of the gasses: Instrument grade (dry and free of particles or oil).

### Rule of Thumb for the Gas Flow Rates for Sparging and Overlay:

Gas	Cell Culture	Microbial Culture	Cell Culture	Microbial Culture
	Sparging		Overlay	
Air	Approx. 0.1 vvm	1 .. 2 vvm	Approx. 0.1 vvm	10% of sparger air flow
O <sub>2</sub>	10% of air flow	20 .. 30% of air flow	N.A.	N.A.
CO <sub>2</sub>	10 .. 25% of air flow	20 .. 30% of air flow	10% of sparger air flow	N.A.
N <sub>2</sub>	50 % of air flow	50 % of air flow	N.A.	N.A.

**MFC Ordering Information:**Z310212120\* 1-Channel MFC Assembly for *my*-ControlZ310212320\* 3-Channel MFC Assembly for *my*-ControlZ310212110\* Mounting Kit for 1-Channel MFC *my*-ControlZ310212310\* Mounting Kit for 1-Channel MFC *my*-Control

When one or more MFCs must be added to an existing *my*-Control, one of the cables below must be ordered: VBL2080321\* Cable Act. Board MFC (to connect the 1- or 3-channel MFC with the actuator board)

VBL2080351\* Cable Act. Board MFC 2x (T-piece with extension cable to connect an additional MFC)

\* Additional Mass Flow Controllers must be installed by a certified Service Engineer.

### 4.3 CONNECTION FOR SPARGING AND OVERLAY

An Aeration Outlet for Sparging is located at the front of the *my*-Control cabinet.

A second outlet for Overlay is optional.



Z310212071 Gas Overlay Connection

Z310212081 Gas Overlay Blind Plug

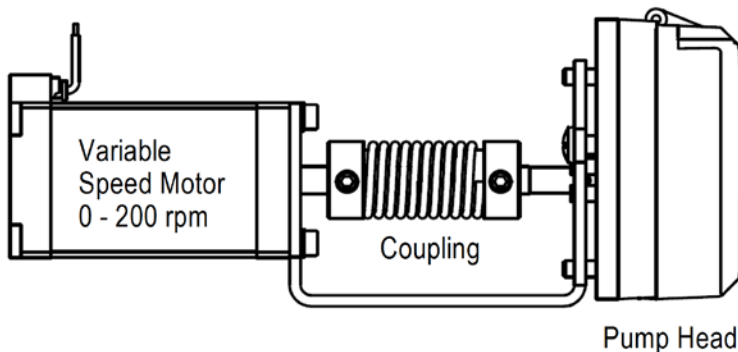
## 4.4 TUBING PUMP ASSEMBLY



### WARNING

Risk of damaging the equipment.

- Application of damaged tubes may result in fluid leaking into the pump drive.
- Verify the tube quality inside the pump head before every new cultivation.
- Do not use the tubing pump drives for other purposes than displacement of fluids (or gas).



Microflex Pump Head with  
Closed and Open Cover

Total number of positions for tubing pump (and micro valves) at the front of the *my-Control* = 4.

The variable speed pump motor (0 – 200 rpm) drives a pump head.

Inside the pump head, Silicone or Pharmed tubing is applied.

Applicable tubing diameter:

- Microbore tubing size 48: ID = 2.79 mm

Tubing Type	Flow* at 200 rpm
Microbore tubing size 34	11 ml/min
Microbore tubing size 48	17 ml/min

\*the nominal flow may vary  $\pm 25\%$  due to tube tolerances and material characteristics (see remark below)!

When activated, the pump will rotate counterclockwise.

	<p>The loading procedure for new pump tubing is described on the next page.</p> <p>Due to stretching of the Pharmed tubing material, the liquid displacement of the tubing pump may show a decrease during the first few days after replacement of the tubing. When accurate dose monitoring is required, it is advisable to let the pump run continuously for approximately 24 hours before calibrating the Dose Monitor factor! Autoclaving may influence the liquid displacement as well!</p>
--	--

- Z310216011\* Pump & Pump Head Variable Speed *my-Control* V2
- Z360762534 Silicone Tubing Microbore Size 34 (L = 15m)
- Z369580934 Pharmed Tubing Microbore Size 34 (L = 30m)
- Z360762548 Silicone Tubing Microbore Size 48 (L = 15m)
- Z369580948 Pharmed Tubing Microbore Size 48 (L = 30m)
- Z310216051 Blind Plate Pump Position *my-Control* V2

\*Additional Pumps must be installed by a certified Service Engineer.

#### 4.4.1 MICROBORE TUBING SET WITH LUER LOCK CONNECTORS

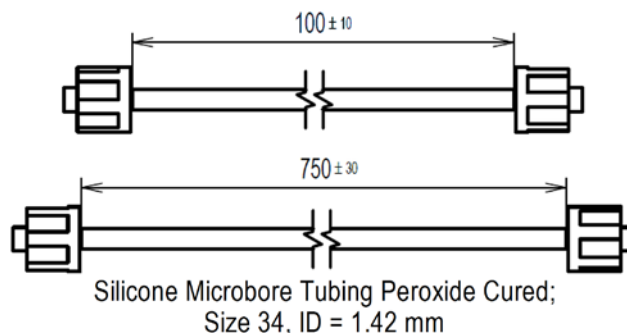
Since the MiniBio Reactors are equipped with Luer Lock connections at the addition and sample ports, a Microbore Tubing Set with Luer Lock connectors has been prepared.

Z811000271 MiniBio Tubing Set Microbore

The Tubing Set consists of:

5 pieces of tubing with a length of 100 mm and  
10 pieces of tubing with a length of 750 mm.

The silicone tubing is peroxide cured and has size 34.  
The 750 mm pieces are used for addition with pumps.  
The 100 mm pieces can be used blinding two addition ports.



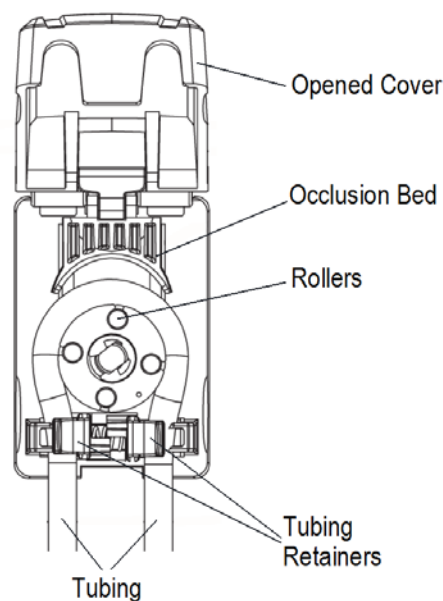
#### 4.4.2 LOADING THE PUMP TUBING



**WARNING:**

Before loading tubing into the Pump Head, switch off the power of the my-Control. Fingers or loose clothing could be caught in the rollers.

1. When the cover is opened, the Occlusion Bed moves upward, away from the rollers.
2. Holding both ends of the tubing in one hand, form a loop and wrap the tubing around the Rollers, making sure that the tubing is centered on the rollers and keeping the free ends of the tubing outside of the Tubing Retainers.
3. Once the tubing is in place, close the Door and the Occlusion Bed will automatically align itself within the pump.
4. Insert the tubing into one of the Tubing Retainers by moving the retainer toward the center of the pump and placing the tubing in the v-notch of the retainer. Release the retainer so that the tubing is secured in place.
5. Repeat the previous step for the other tubing retainer.
6. The tubing should be stretched slightly around the rollers so that there is no excess tubing between the rollers and the retainers – any excess can be removed by pulling slightly on the tubing outside of the Pump Head.



The Microbore Pump Tubing is now loaded in the Pump Head.

When activated, the pump will rotate counterclockwise.

## 5 EXTERNAL ACTUATORS

External actuators are used for:

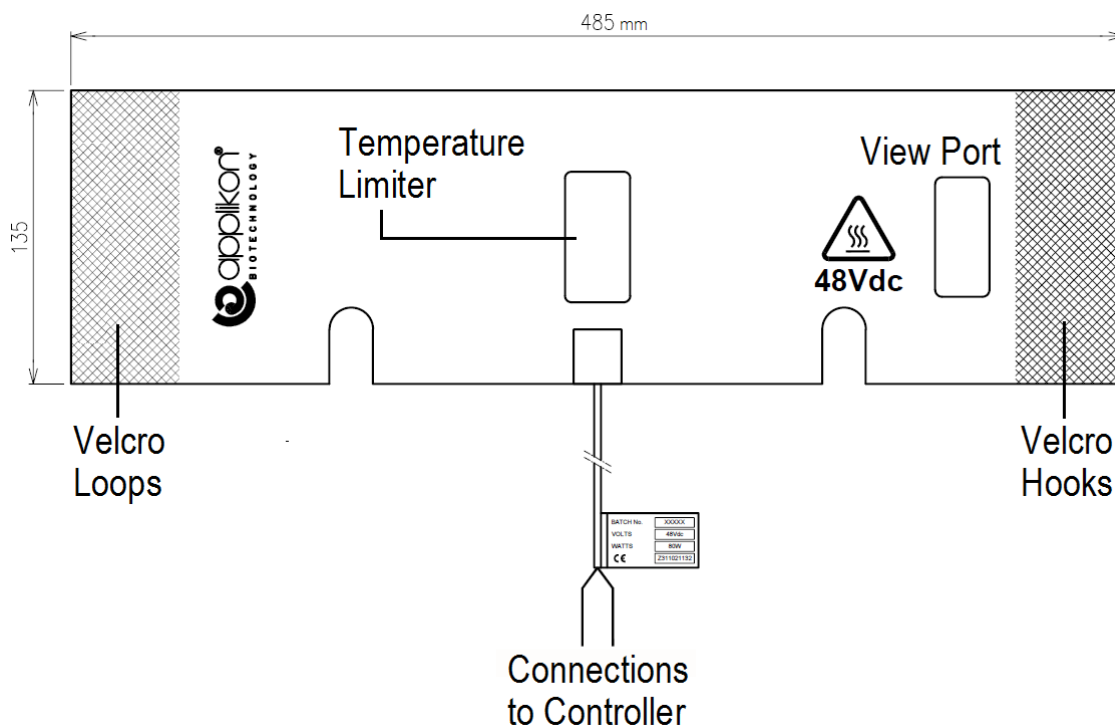
- Temperature control and
- Stirrer speed control.

The different actuator types are described in the sections below.

### 5.1 ACTUATOR FOR TEMPERATURE CONTROL

#### 5.1.1 HEATING BLANKET

The reactor temperature can be controlled by a Heating Blanket for upward control (heating).



A heating blanket can be wrapped around the bioreactor.

The maximum temperature of the outer surface is limited (by thermal cut-off) to 85 °C.

Maximum medium temperature that can be reached by heating with a heating blanket: 60 °C (or higher; depending on the reactor size and working volume). However, at 60 °C the deformation of the vessel starts. See the warning below!

The heating blanket is powered by the *my*-Control with a 48 VDC supply.





**CAUTION**

In order to prevent vessel deformation, the Actuator Output to Heating Blanket or Thermo-Electric Element must be limited. In the table below, the maximum Actuator Output value presented, depending on the working volume.

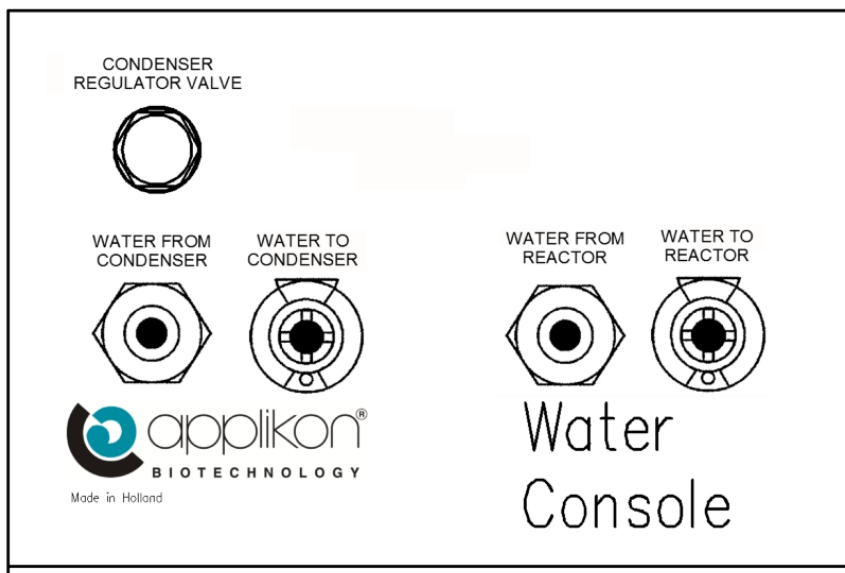
Reactor Volume	Working Volume	Actuator	Maximum Actuator Output	Max. Working Temperature
3L	1.0 L	Heating Blanket 80W	50%	45 °C
	1.5 L		50%	45 °C
	2.0 L		70%	50 °C
	2.5 L		80%	55 °C

Z311021132 Heating Blanket for 3L Reactor (autoclavable or single use)  
P<sub>max</sub> = 80W.

The Heating Blanket is connected to the Heating Control Module, located at the rear of the *my*-Control. Refer to [section 3.2](#) (Rear View of the my-Control) and [section 3.8](#) (Analog and Digital I/O Connections).

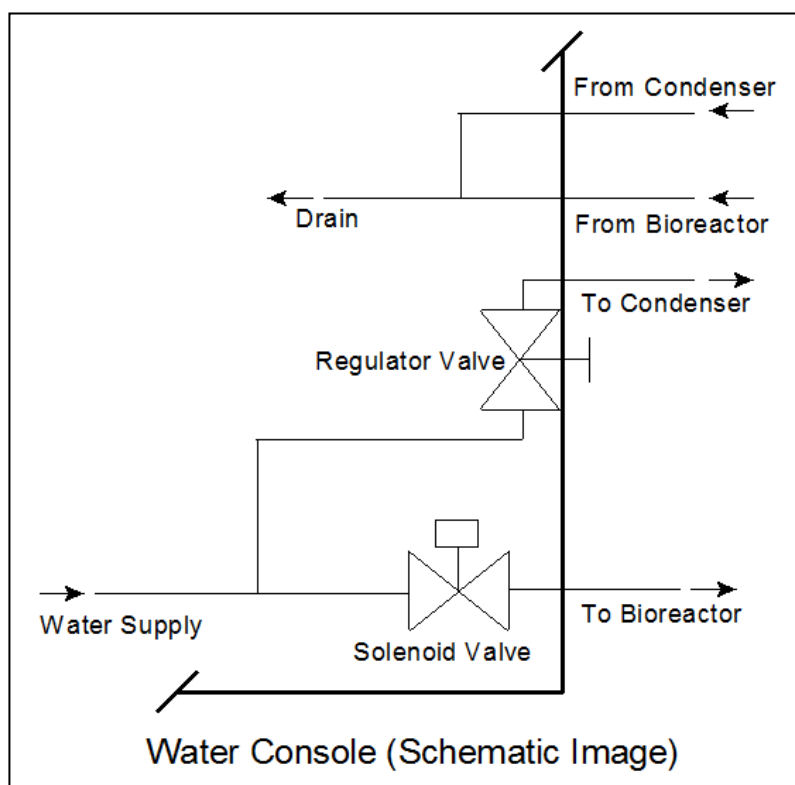
**5.1.2 COLD WATER VALVE AND CONDENSER REGULATOR VALVE**

The Cold Water Valve module and Condenser Regulator Valve are mounted in the External Cold Water / Condenser Assembly.



The Cold Water Valve module consists of:

- A Cold Water Solenoid Valve for Temperature control in the bioreactor
- A Regulator Valve that is used to tune the water flow to the condenser
- A water supply line connection
- A drain line connection
- Quick connectors to and from the bioreactor (10 mm)
- Quick connectors to and from the condenser (10 mm)



Z311304010 Cold Water and Condenser Console Assembly

*Note: the condenser that is normally part of this assembly is not used for AppliFlex Single-Use reactors; the Peltier condenser unit is used instead.*

## 5.2 ACTUATORS FOR MIXING

Although different types of stirrer motors can be used in combination with the 3L AppliFlex ST Single Use reactor, the Stepper Stirrer Motor is most commonly used for mixing,



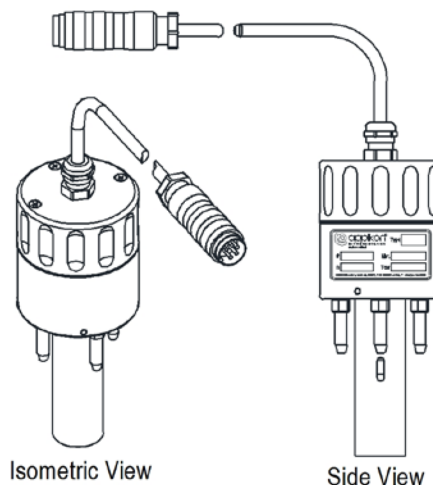
### WARNING

- The stirrer motor is a machine with potential hazard (moving parts).
- In order to avoid dangerous situations, make sure that the stirrer motor is only operated when it is properly seated in the stirrer assembly of the bioreactor.
- The stirrer motor must only be used as part of a Bioprocess (bioreactor with control system).
- The stirrer motor must not be put into service until the machinery into which it is to be incorporated has been declared to conform to machinery directive 2006/42/EEC.
- When the stirrer motor has been put to operation, it may become hot. Take precautions to prevent personal injury.

### 5.2.1 STEPPER STIRRER

#### Ordering numbers Stepper Stirrer Motor:

Z510002121	Stepper Stirrer for 2 and 3L AC Cell Culture (including motor studs and flexible coupling)
Z310213010	Stepper Stirrer Control Module

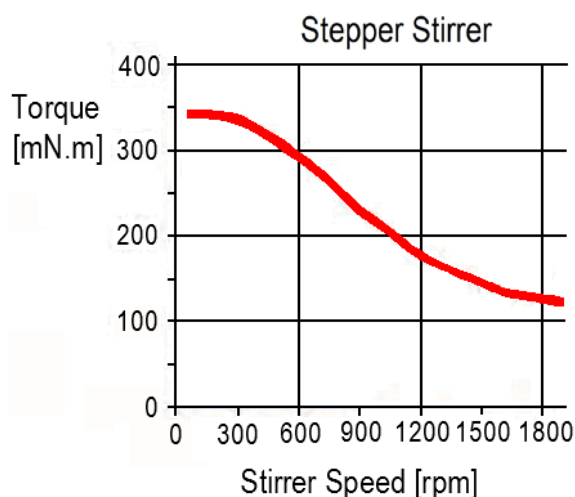


#### Maximum Torque of the Stepper Stirrer Motor:

The torque that can be supplied by the Stepper Stirrer Motor depends on the Stirrer Speed.

In general terms: the higher the stirrer speed, the lower the supplied torque.

The image shows the torque of the Stepper Stirrer Motor as a function of the stirrer speed:



The maximum current to the Stepper Stirrer is limited in order to prevent motor damage. In case of increasing viscosity of the medium, the current limit of the motor may be reached.

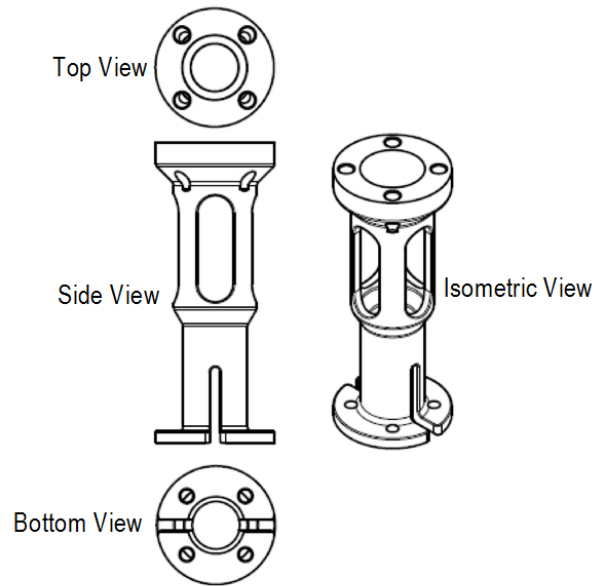
As a result, the stirrer may not be able to continue mixing (it will stop turning). If this occurs, the stirrer speed setpoint must be decreased.

5.2.2 MOTOR ADAPTER

The Stepper Stirrer studs are fitted in the four holes of the Motor Adapter that is mounted on top of the bioreactor head plate.

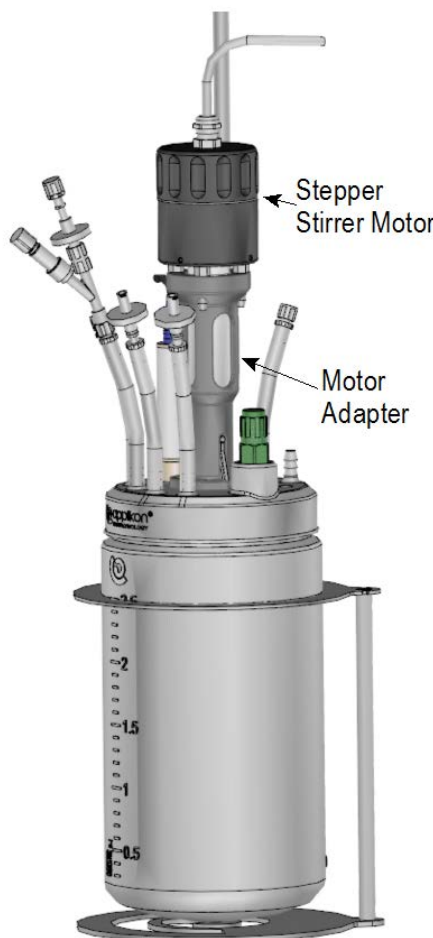
The adjacent image shows the Motor Adapter in different positions.

Instructions for mounting the Motor Adapter can be found in [section 6.3](#).



Motor Adapter

The image below shows both the Stepper Stirrer and Motor Adapter on top of the bioreactor:



### 5.2.3 BRUSHLESS DC STIRRER MOTOR M10

The DC Stirrer Motors are more powerful than the Stepper Motor and therefore very suitable for microbial applications where a high stirrer speed is required.

In addition to the stirrer power, the Brushless DC Motor has the advantage that it hardly requires maintenance (it does not have carbon brushes). Only the ball bearings need to be replaced every 20.000 operating hours (equivalent to almost 2.5 year of continuous operation).

The motor comes with four motor studs to fit in the top of the Motor Adapter and a covered flexible fork coupling fits on the top of the Stirrer Shaft.

Maximum Stirrer Speed: 2000 rpm  
Maximum Torque: 0.24 Nm

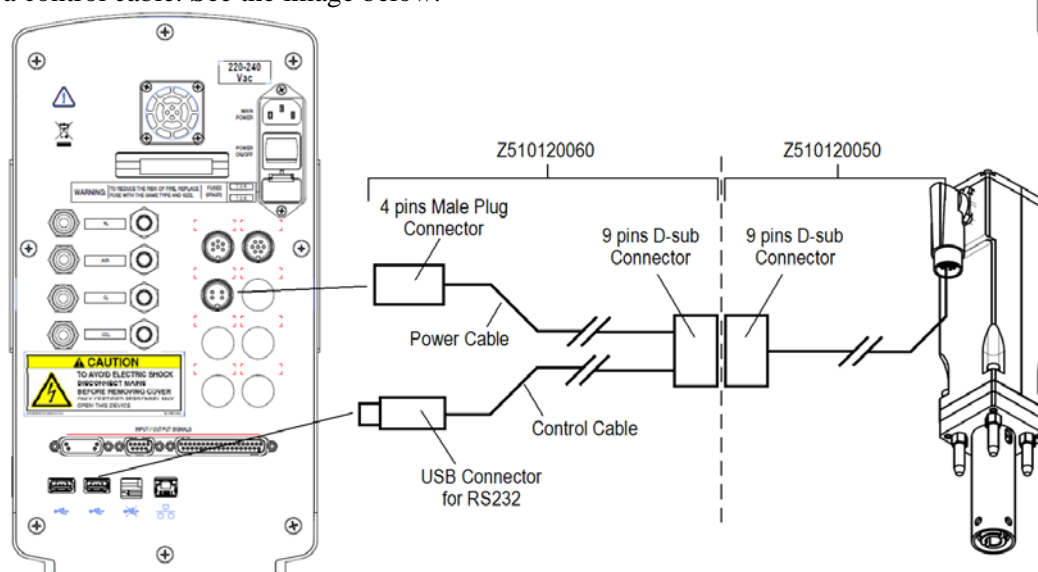
Z510003010 Brushless Stirrer Motor M10

#### Cables between the my-Control and the M10 Motor:

Two cables are required to connect the M10 stirrer motor to the my-Control.

The (modified) standard motor cable Z510121050 is used at the motor side.

The conversion cable Z510121060 at the my-Control side splits up the cable into a power cable and a control cable. See the image below.



Z510121050 Brushless Motor Cable L = 2m

Z510121060 Brushless Motor Cable via USB for my-Control and in-Control

Z310213030 Brushless Stirrer Control Module

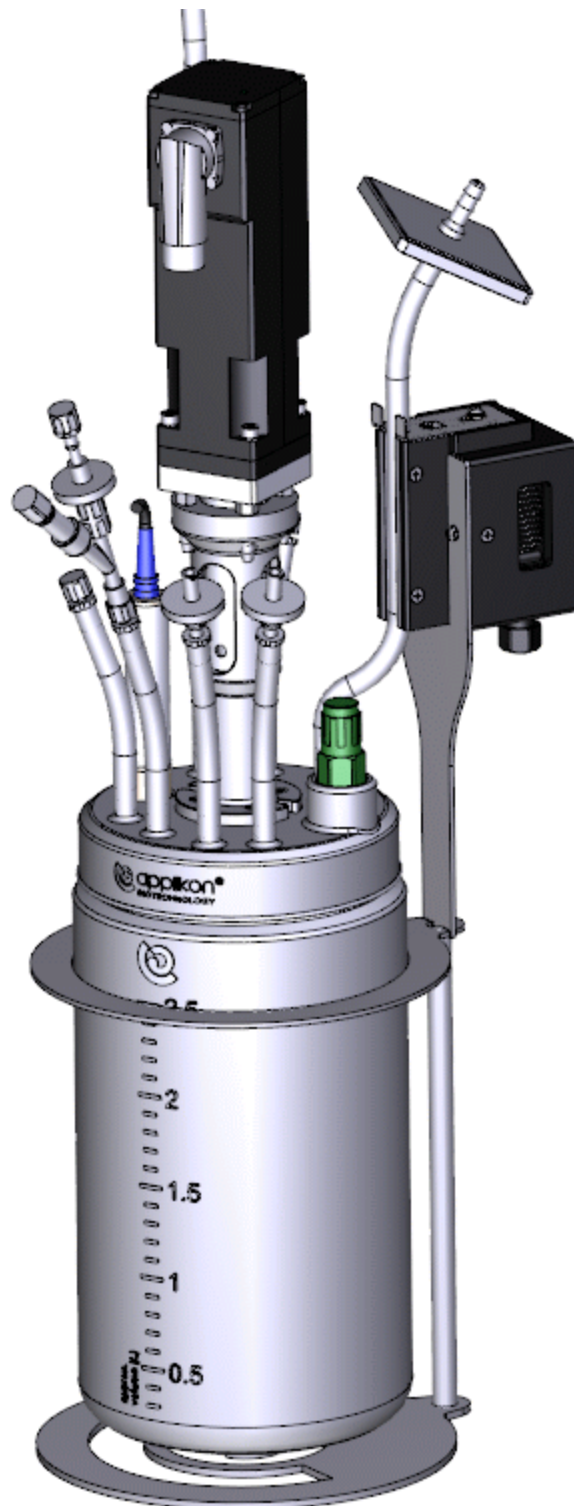


**WARNING:** do not disconnect the USB Connector from the my-Control during operation.

When during operation the control cable USB Connector is disconnected from the my-Control, the stirrer motor cannot receive a new stirrer speed setpoint. As a result, the stirrer will continue to run at the same speed until the USB connector is reconnected or the my-Control power is switched off.

On the next page, the 3L AppliFlex ST Single Use Bioreactor is shown in combination with the M10 Motor.

The image below shows the 3L AppliFlex Single Use Bioreactor with the M10 Motor:



## 6 REACTORS AND AUXILIARIES

The AppliFlex ST 3L Single Use Bioreactor can be combined with the *my*-Control.

### 6.1 THE APPLIFLEX ST 3L SINGLE-USE REACTOR FAMILY

#### 6.1.1 THE STANDARD APPLIFLEX ST 3L SINGLE USE REACTOR AND HOLDER

During preparation of the reactor in the Biosafety Cabinet (BSC), and during the cultivation on the lab bench, the AppliFlex ST 3L reactor is placed in the corresponding Holder.

The image below shows an example of a 3L Single Use Reactor and the corresponding Holder.



3L Single Use Reactor

Holder for 3L Reactor

The 3L Single Use Bioreactor can be supplied in different configurations. The part numbers of the presented articles are listed below:

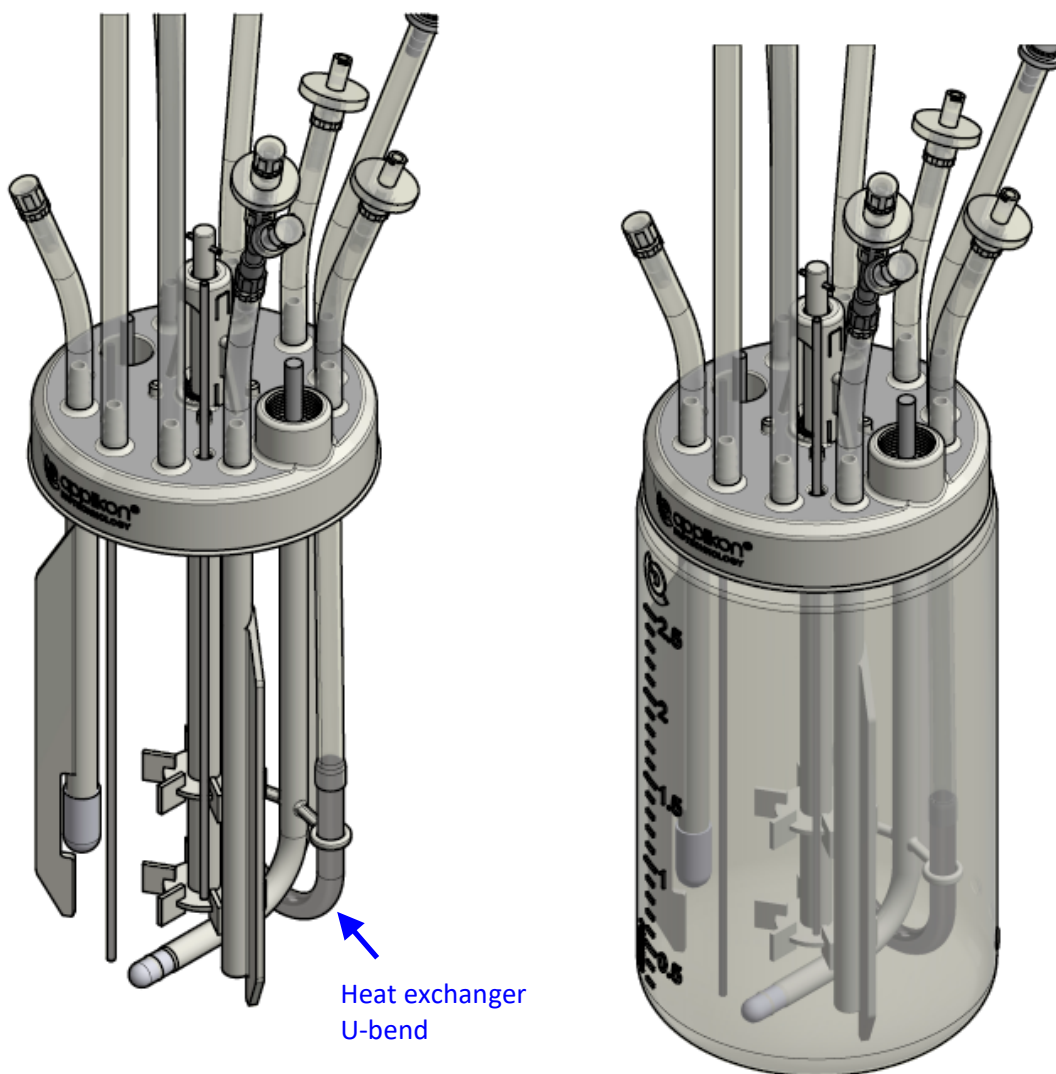
Z655030110 AppliFlex ST Single Use 3L Cell Configuration (2 pieces)

Z811110351 Holder for AppliFlex ST Single Use 3L

### 6.1.2 THE MICROBIAL APPLIFLEX ST 3L SINGLE-USE REACTOR

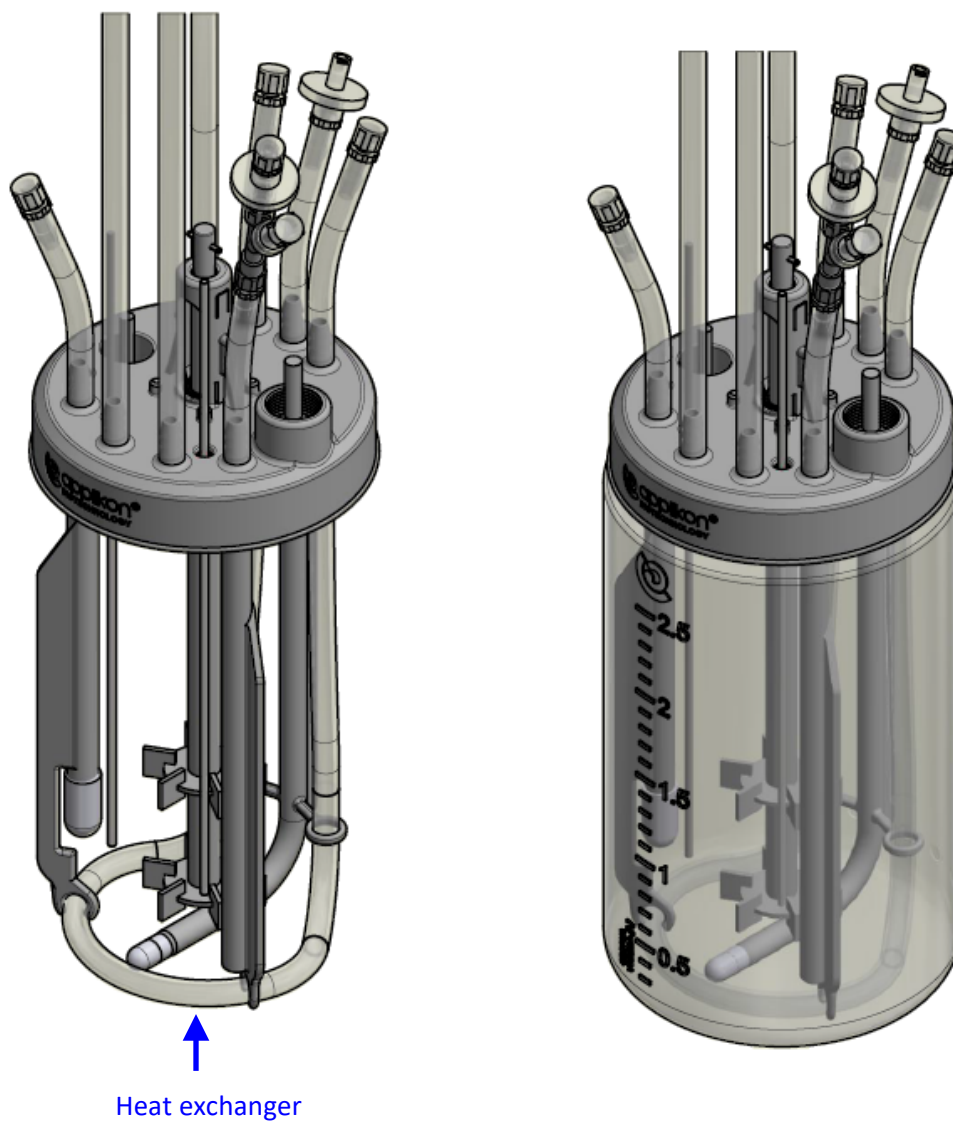
This reactor adds a heat exchanger to the standard model and itself comes in two subversions.

#### MICROBIAL CONFIGURATION, HIGH DENSITY



The high-density microbial configuration is used for those cultivations that require maximum heat exchange, and supports agitation at up to 2000 RPM.



**MICROBIAL CONFIGURATION, REGULAR**

The regular microbial configuration is used for those cultivations that require moderate heat exchange, and supports agitation at up to 1000 RPM.

Microbial configurations:

- Z655030210 Appliflex-ST 3L microbial configuration, high density (2 pieces)
- Z655030220 Appliflex-ST 3L microbial configuration, regular (2 pieces)

## 6.2 THE APPLIFLEX ST SINGLE USE BIOREACTOR 3L

The 3L AppliFlex ST Single Use Bioreactor is  $\gamma$ -irradiated (> 25 kGray) and therefore comes as a sterile empty reactor that is ready for operation.

### Material specification:

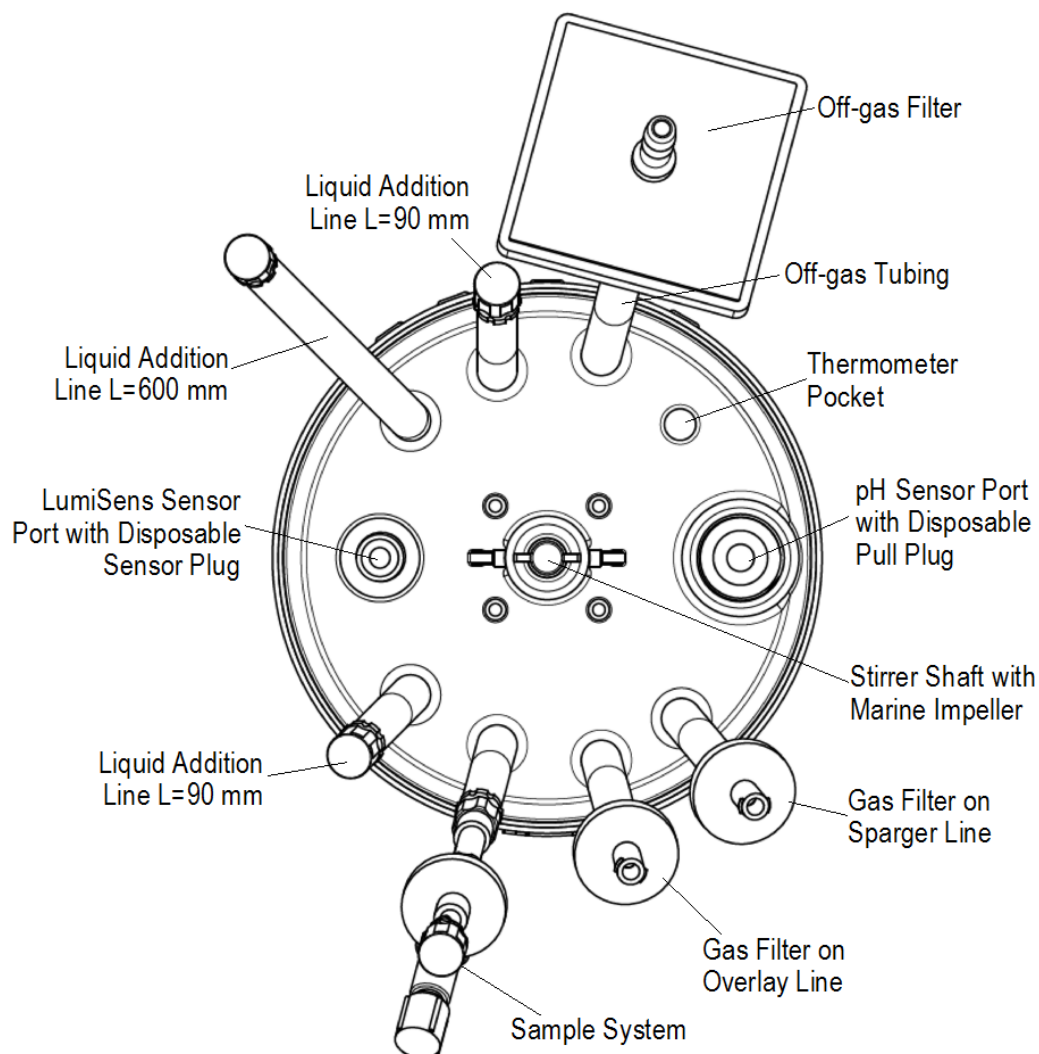
- For information regarding the material specification of your AppliFlex bioreactor, refer to the designated Data Sheet.

### Specification of the operation temperature:

- The AppliFlex ST Single Use Bioreactor may be used in environments and for media in a temperature range of 5 . . 45 °C.

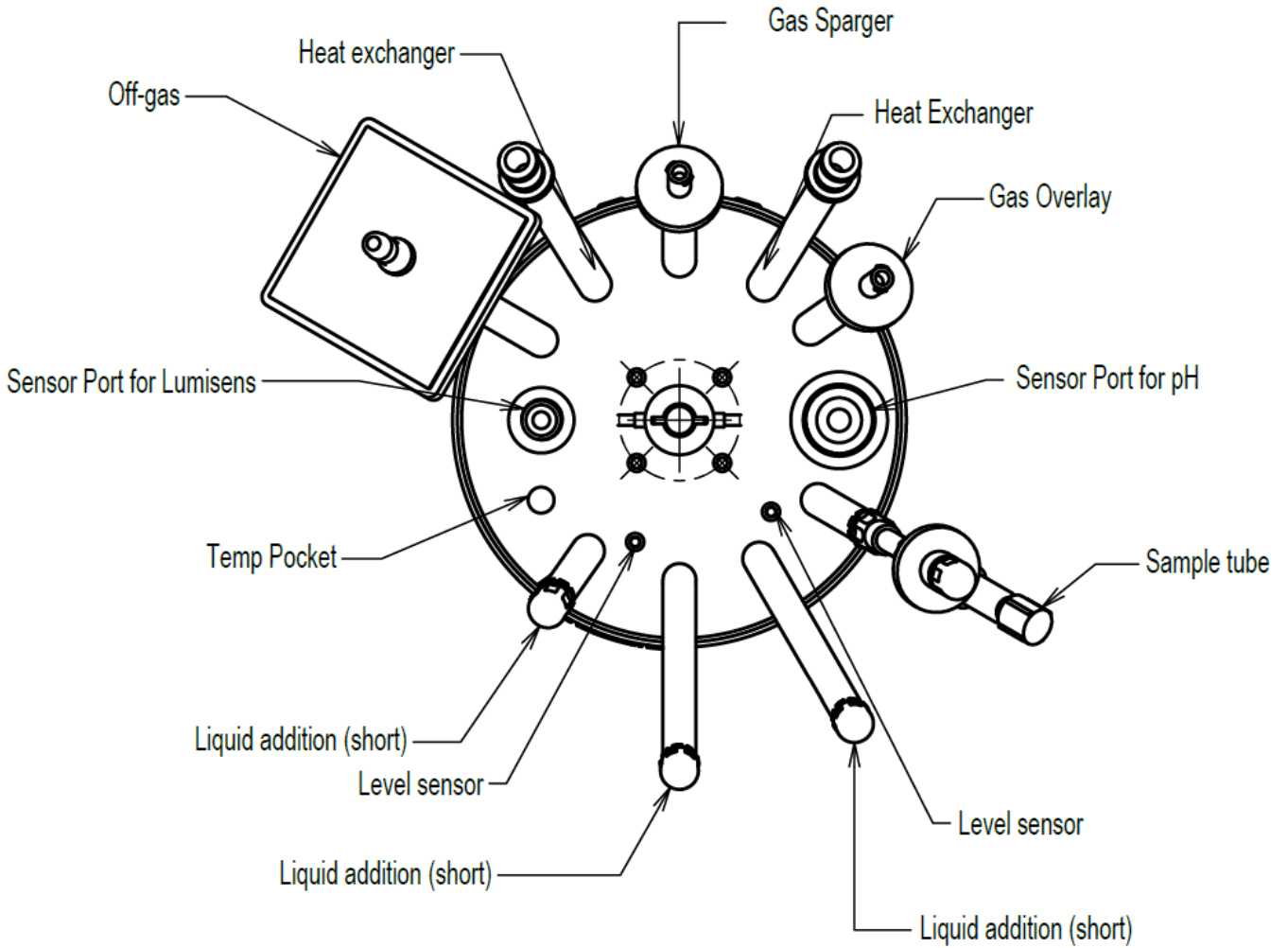
### 6.2.1 THE CELL CULTURE REACTOR TOP PLATE

The Top Plate configuration of the Single Use Bioreactor is available on demand; the configuration that is described below can be used for Cell Culture applications.



### 6.2.2 THE MICROBIAL REACTOR TOP PLATE

The image below portrays a typical top plate setup for the microbial configuration.



6.2.3 SPECIFICATIONS OF THE TOP PLATE TUBING CONNECTIONS

The description of the tubing connections refers to the example of the head plate layout that is presented on the previous page.

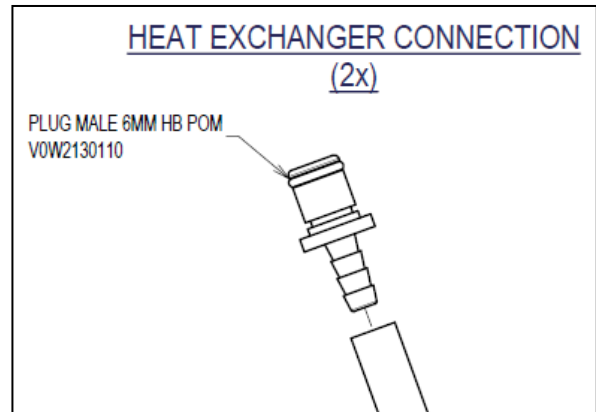
- Gas Inlet Tubes to Sparger and Overlay with Hose Barb and Filter.
- Off-gas Tube with Filter.
- Liquid Addition Tube (short) with Hose Barb and Cap.
- Liquid Addition Tube (long) with Hose Barb and Cap.
- The Sample System is described in [section 6.5](#).
- The Sensors are described in [section 6.6](#).



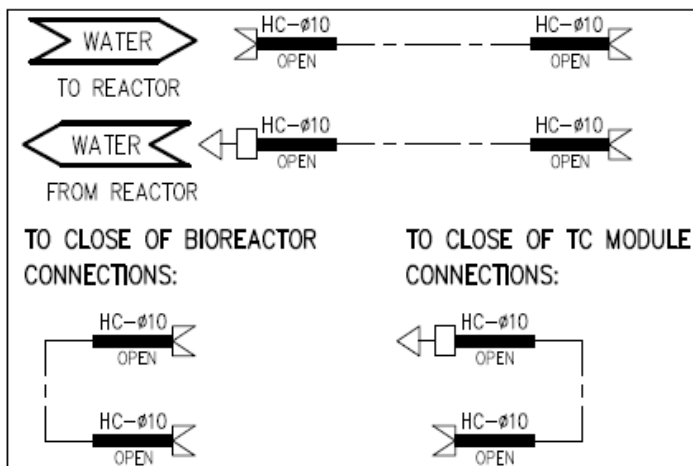
The tubing connection specifications for a specific top plate layout can be found at the latest version of the Bioreactor Data Sheet.

Heat Exchanger Connection

The AppliFlex ST 3L vessels with a Heat Exchanger come with the connections and tubing as show in the image. The male plugs connect to the water inlets and outlets on the Cold Water Valve assembly.

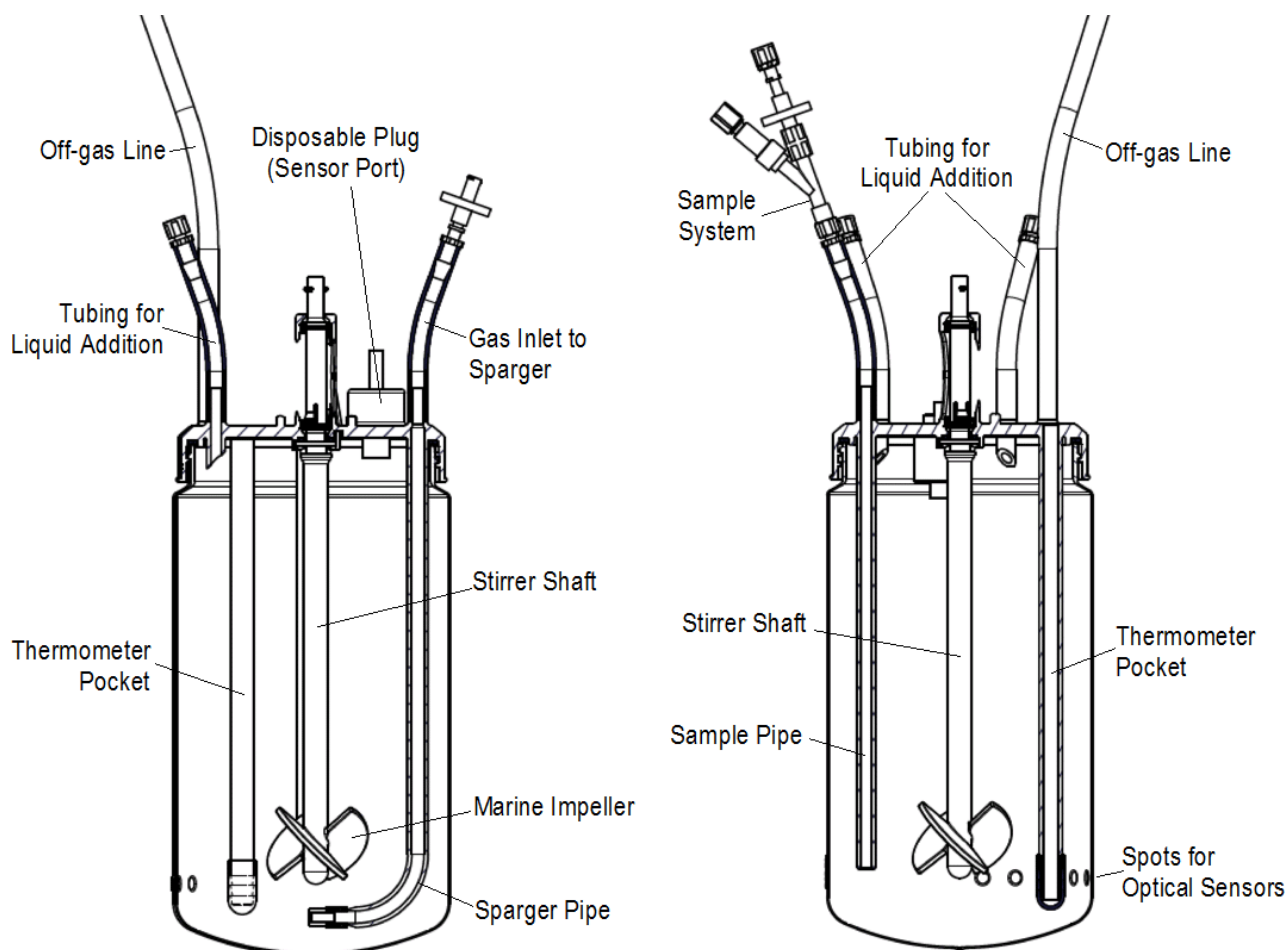


THE APPLIFLEX BIOREACTOR DOES NOT REQUIRE A CONDENSER.  
 CONNECTIONS BETWEEN APPLIFLEX AND THERMOCIRCULATOR ARE GIVEN BELOW.



## 6.2.4 THE REACTOR INSERTS

In the section below, examples of cross sections of the Single Use Bioreactor are presented (different angle cross sections of the Cell Culture reactor with Marine impeller):



In this example, the medium is aerated through the Sparger Pipe.

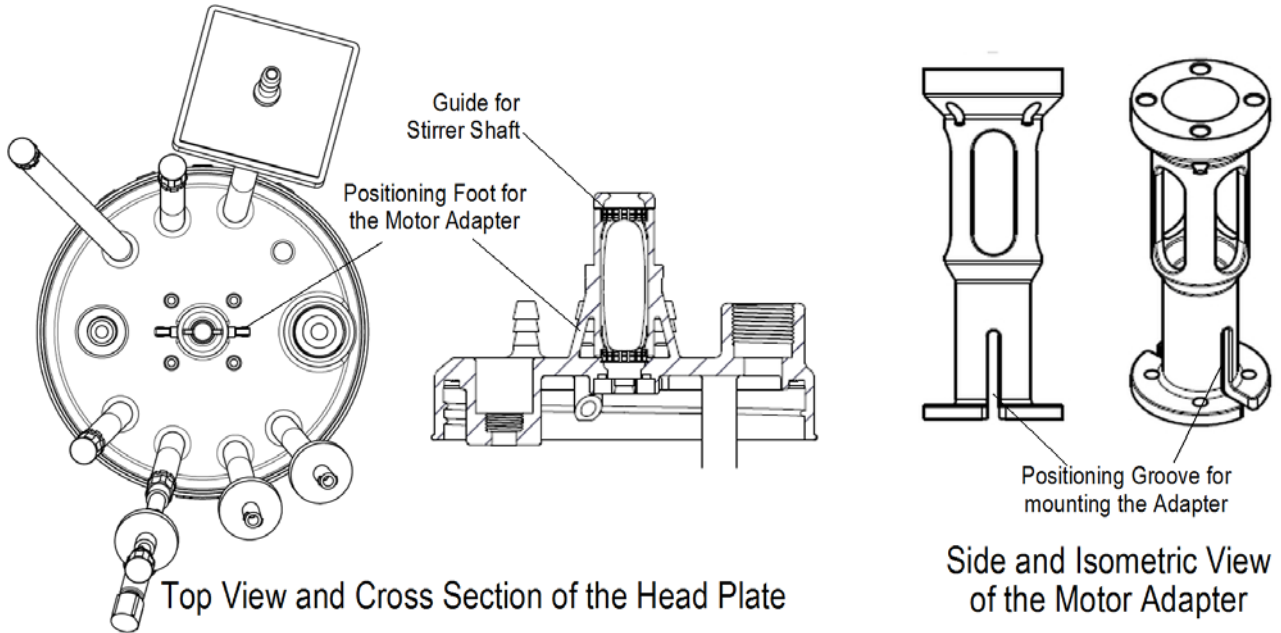
## 6.2.5 SPECIFICATIONS OF THE REACTOR INSERTS

- Sample Pipe: insertion depth = 215 mm, OD = 9 mm, ID = 5 mm.
- Sparger Pipe for Cell Culture applications: bent pipe; nominal insertion depth = 236 mm, OD = 10 mm, ID = 6 mm. The end of the pipe is covered with a stainless steel filter element. The 15 $\mu$  pore size of the filter element ensures the formation of tiny gas bubbles.
- The Stirrer Shaft is described in [section 6.3.1](#).
- The Thermometer Pocket is described in [section 6.6.3](#).

### 6.3 STIRRER MOTOR MOUNTING

As described in [section 5.2](#), the reactor content (medium) is mixed by used a Stirrer Shaft (that is equipped with an impeller). The stirrer shaft is driven by a Stirrer Motor.

The Stirrer Motor can be mounted on top of the Head Plate through the use of the Stirrer Adapter. The Stirrer Adapter can be fitted on the Guide for the Stirrer Shaft (see the image below). Mind the Positioning Feet and make sure that they fit in the Adapter Groove.



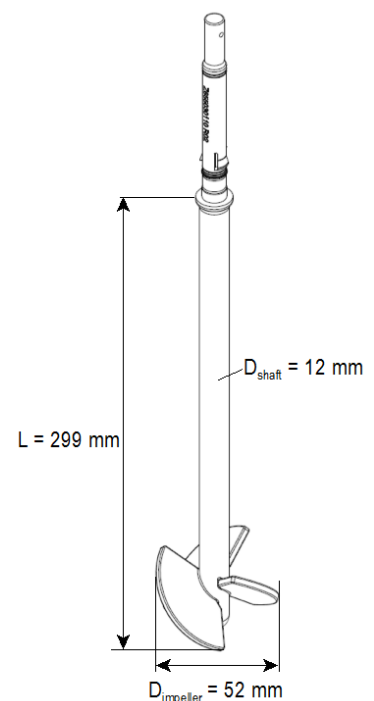
The four Motor Studs of the Stirrer Motor assembly fit in the four holes of the upper ring of the Motor Adapter. The flexible fork of the Stirrer Motor fits on the top of the Stirrer Shaft that is described below.

#### 6.3.1 THE STIRRER SHAFT

The Stirrer Shaft for the Cell Culture version of the AppliFlex ST Single Use bioreactor is equipped with a Marine type of impeller. See the adjacent image.



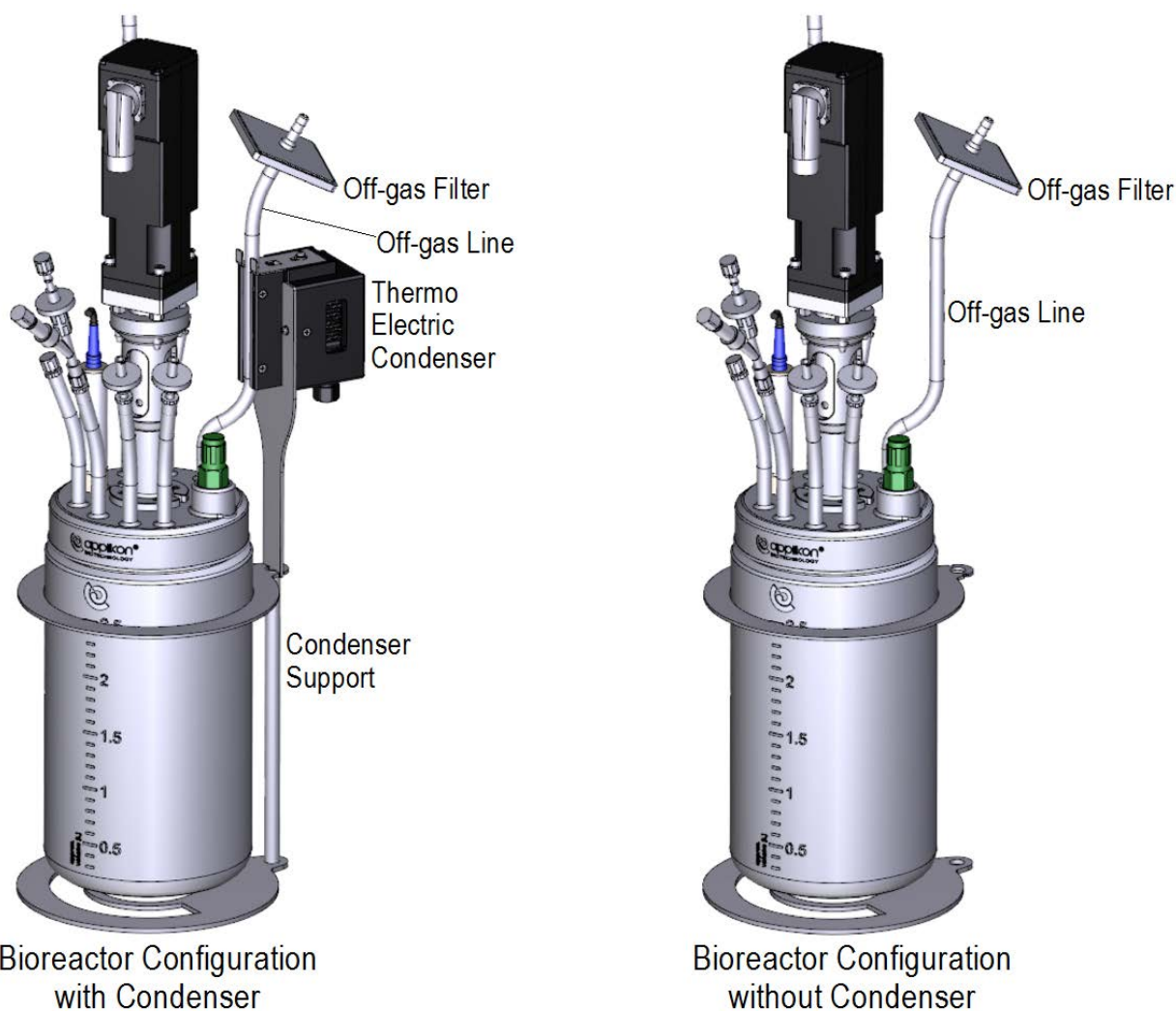
When operating the Stirrer Drive in a normal manner, the Marine Impeller is creating a Vortex.



## 6.4 OFF-GAS LINE CONFIGURATION

During operation, the bioreactor must be aerated in order to maintain the amount of dissolved oxygen. Depending on the gas flow, it may be necessary to use a (Thermo Electric) Condenser in the Off-gas line in order to decrease the rate of medium evaporation. In the Condenser, the Off-gas is cooled down and the condensed water vapor can flow back to the reactor.

The image below shows the 3L bioreactor in two Off-gas line configurations (with and without the Thermo Electric Condenser):



- Z813080260 Thermo Electric Condenser Module
- Z811110450 Support for Thermo Electric Condenser Module.

For connection of the Thermo Electric to the my-Control, the Condenser Control Module must be installed in the controller:

- Z310211040 Condenser Control Module

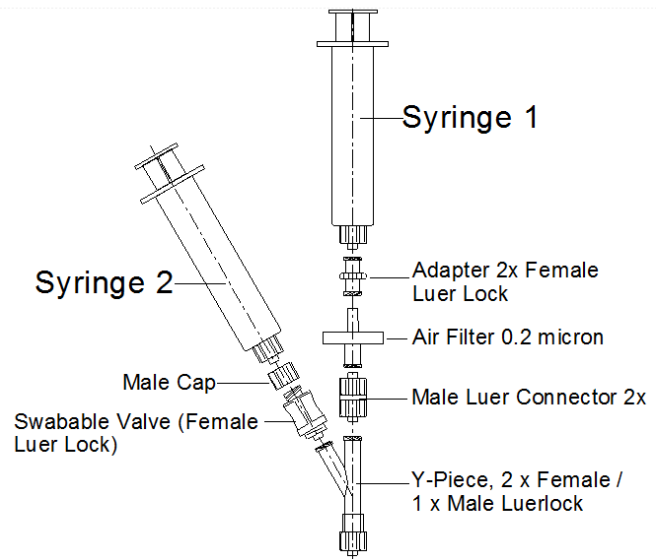
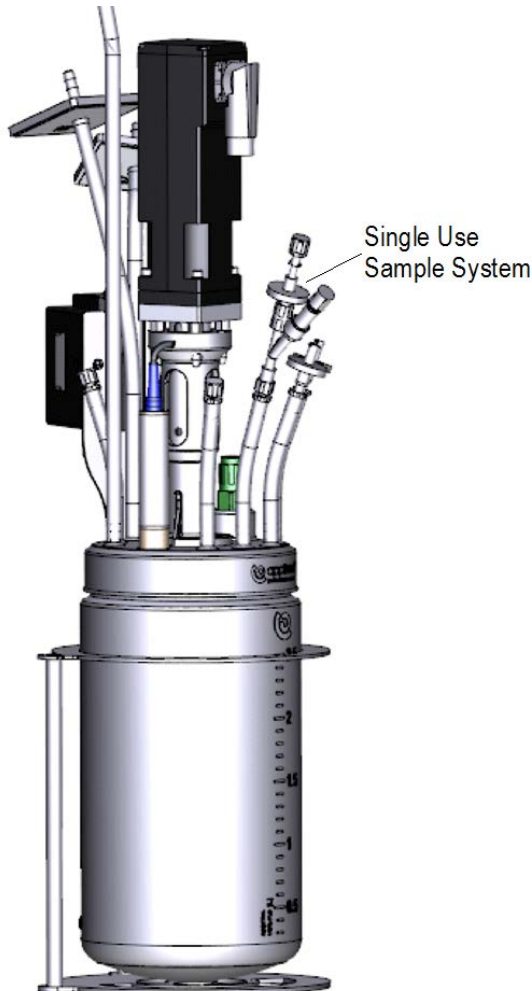
## 6.5 SINGLE USE SAMPLE SYSTEM

The Single Use Sample System is fixed on top of the Sample Pipe. It consists of a Y-piece with two Luer Lock syringe connections.

Two syringes can be connected to the Sample System.

Syringe 1 is used to remove medium from the Sample Pipe (in order to prevent taking “old” sample).

Syringe 2 is used to withdraw sample from the Single Use Bioreactor.



- Z81207SS02 Sample System Small Reactors
- Z81207BT30 Sample Bottle 30 ml incl. Open Cap (5 pcs)

The syringes that are described in the sampling procedure below, are not included in the Sample System.

Before sampling, a sterile Syringe 2 is mounted on top of the swabable valve.



Before mounting Syringe 2, clean the syringe and swabable valve with 70% ethanol in order to create a sterile connection!

Syringe 1 is mounted (with withdrawn plunger) on top of the air filter. Push the plunger of Syringe 1 to remove medium from the sample pipe.

Withdraw the plunger of Syringe 2 to extract a sample from the reactor.

Remove Syringe 2 from the Sample System and clean the Syringe and swabable valve with 70% ethanol.



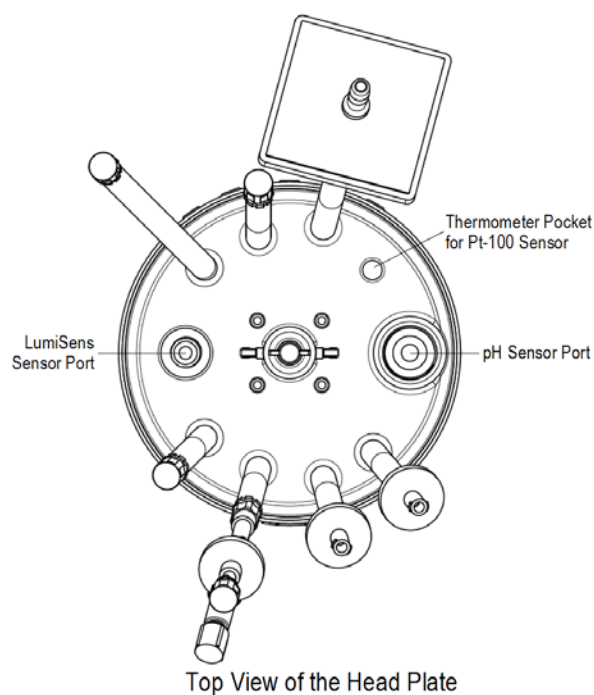
## 6.6 SENSORS

The Head Plate of the 3L bioreactor is designed for support of reusable pH and dO<sub>2</sub> sensors.

The Thermometer Pocket accommodates a Pt-100 temperature sensor

The pH sensor port is equipped with a PG13.5 thread for the pH sensor head

The LumiSens is equipped with a M12x1 thread for the LumiSens sensor tip.

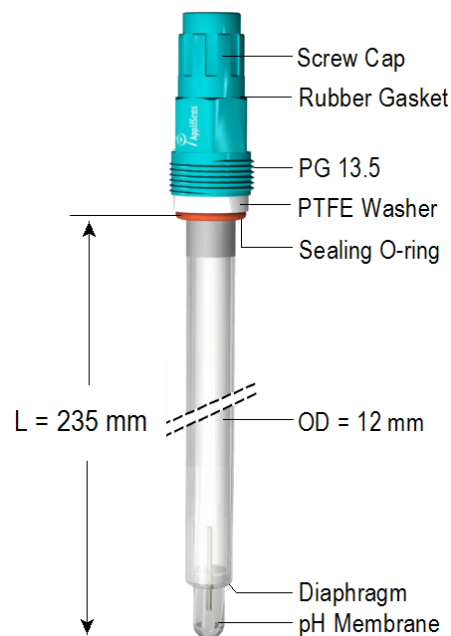


### 6.6.1 pH SENSOR

Z001023551 pH+ Sensor, L = 235 mm, D = 12 mm

Z100200010 pH Sensor Cable, L = 2m, K9 and BNC connectors

For additional information and user instructions concerning the pH sensor, refer to the User Manual that comes with the sensor.



For the reusable pH sensor, an Autoclavable Sensor Holder is available. The Holder can be used as an alternative for an autoclavable bag. Refer to [section 6.6.4](#).

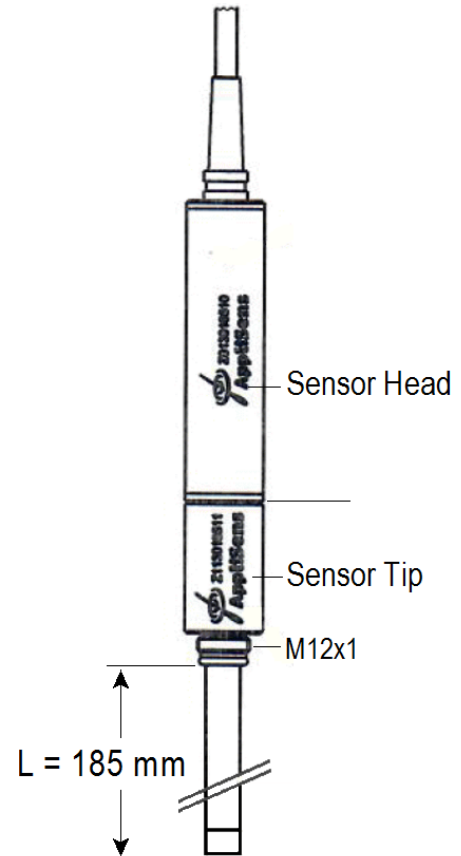
6.6.2 LUMISENS SENSOR

The LumiSens sensor is an optical dO<sub>2</sub> sensor with replaceable sensor tip.

Z013018510 LumiSens dO<sub>2</sub> Sensor L = 185

For additional information and user instructions concerning the LumiSens optical dO<sub>2</sub> sensor, refer to:

- The User Manual that comes with the sensor and
- The LumiSens USB Sensor Manual that is part of the my-Control documentation (comes with the controller)



6.6.3 TEMPERATURE SENSOR

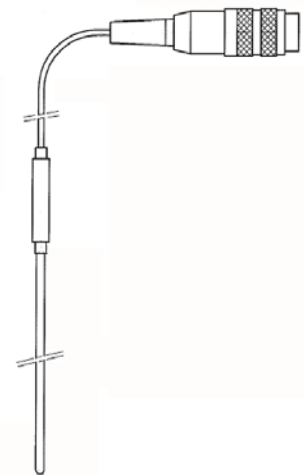
The AppliFlex ST Top Plate is equipped with a Thermometer Pocket. The Thermometer Pocket consists of a OD = 11.5 mm / ID = 7.5 mm tube with an insertion depth of 189 mm. The bottom end of the tube is blinded with a cap.

The Temperature Sensor contains a Pt-100 resistor for measuring the reactor temperature.

The sensor is placed in the Thermometer Pocket, which must be filled with water in order to improve the heat transfer between pocket and sensor.

Sensor diameter (insertion part) 6 mm  
 Sensor length (insertion part) 200 mm  
 Attached Sensor Cable L = 1.5 m

Measuring principle 3- wire Pt-100 (correction for cable length)  
 Pt-100 standard: DIN EN 60751  
 Measuring range: -20 . . +180 °C  
 Measuring accuracy According to 1/3 DIN Class B



Z034150010 Temperature Sensor Pt-100 L=185, D=3

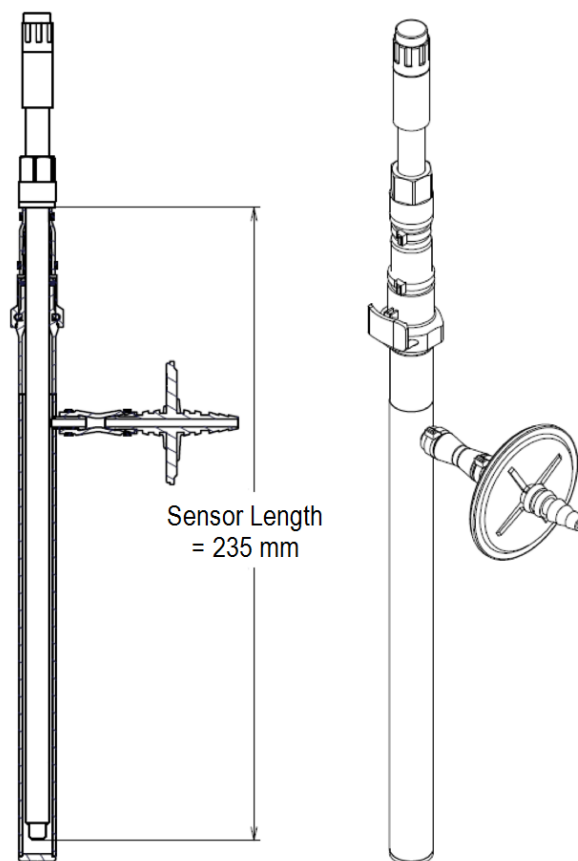
#### 6.6.4 AUTOCLAVABLE SENSOR HOLDER

The stainless steel Autoclavable Sensor Holder is used as protection during autoclaving and as a sterile environment between autoclaving and mounting the sensor in the bioreactor.

The Holder can be used as an alternative for an autoclavable bag.

The Sensor Holder can accommodate sensors with an insertion length of 235 mm.

It is equipped with a vent filter that prevents pressure differences between the sensor and the environment.



Z850030310 Autoclavable Sensor Holder

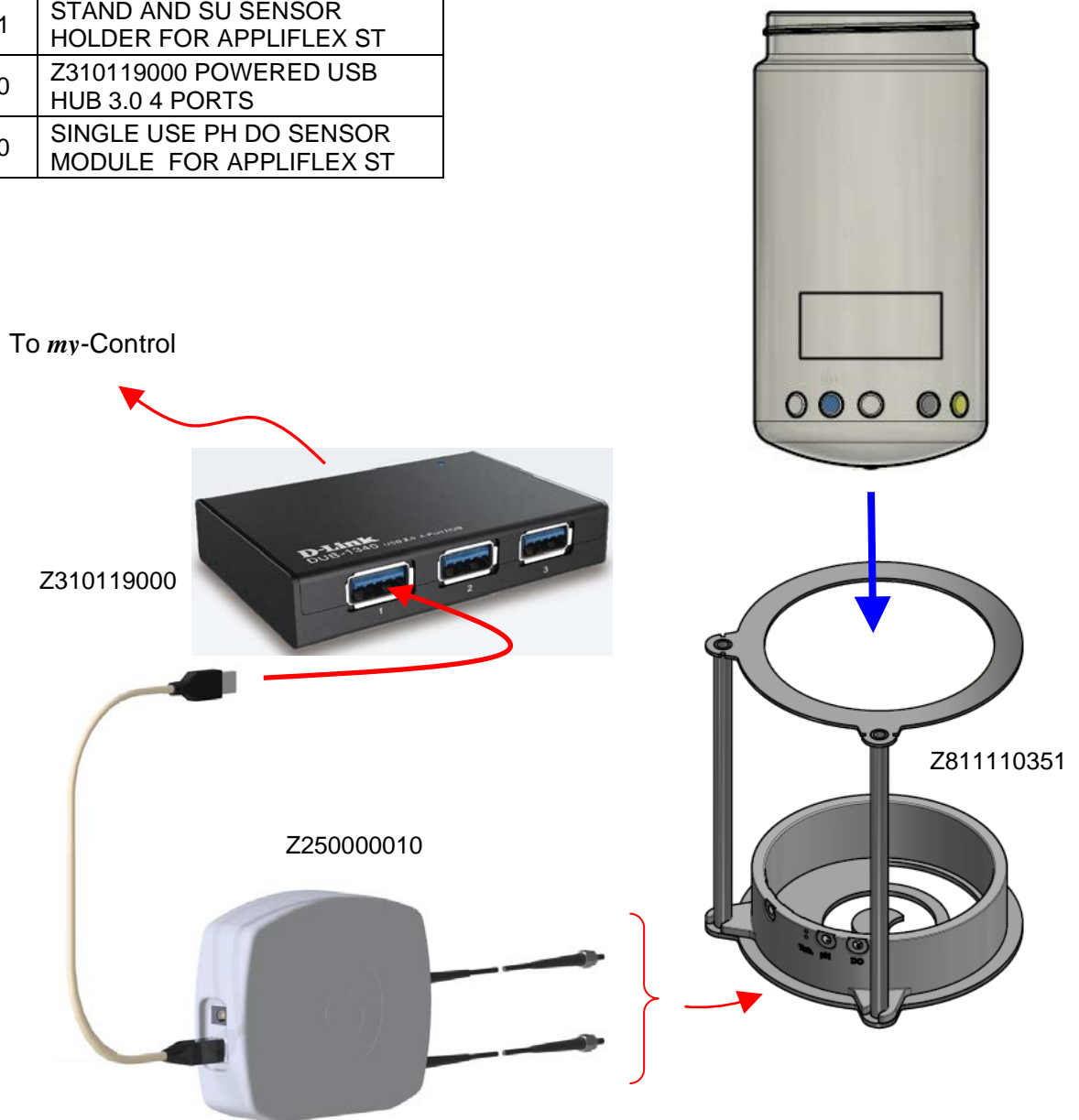
An Autoclavable Sensor Holder with M12 sensor connection will also become available

6.6.5 SINGLE-USE pH AND dO<sub>2</sub> SENSORS

The 3L AppliFlex ST has a number of recessed ports to hold pH and dO<sub>2</sub> sensor spots for the optical measurement of pH and dO<sub>2</sub>. The bioreactor stand also acts as a holder positioning fiber optic cables into the recesses.

The sensor module converts the analog optical input to digital USB input. We recommend using a powered hub to connect all USB devices to the controller will be used with the vessel.

Part	Description
Z811110351	STAND AND SU SENSOR HOLDER FOR APPLIFLEX ST
Z310119000	Z310119000 POWERED USB HUB 3.0 4 PORTS
Z250000010	SINGLE USE PH DO SENSOR MODULE FOR APPLIFLEX ST



## 6.7 START-UP KIT

The table below lists the content of the Start-Up Kit for the Small Scale Single Use Bioreactors (Z811000310).

Part #	Part Description	Quantity
V0N0000092	KWIK CLAMP PA HOSE OD 8.1-9.7MM	4
V0N0000093	KWIK CLAMP PA HOSE OD 9.1-11.0MM	4
V0R1451010	CABLE TIE BLACK 92X2.3 MM	25
V0R1451030	CABLE TIE BLACK 140X3.6 MM	10
V0W0530004	REDUCER MALE-MALE 1/8"-3/16"	4
V0W0530005	REDUCER MALE-MALE 1/16"-3/16"	4
V0W0700001	TUBING CLAMP	4
V0W3300005	TWIST LOCK 14.0 - 16.5MM	10
V0W3300006	TWIST LOCK 22.9 - 25.4MM	10
V0W6070018	BOX WITH TRANSPARANT COVER 61 X 378 X 290 MM	1
V0W6500002	SYRINGE PP/PE WITHOUT NEEDLE 10ML, WIH LUER LOCK	25
V0W0030108	HOSE BARB 1/8" - MALE LUERLOCK PC	10
V0W0030109	HOSE BARB 1/8" - FEM LUERLOCK PC	10
V0W0030110	HOSE BARB 1/16"- MALE LUERLOCK PC	10
V0W0030100	MALE CAP FITS FEMALE LUER LOCK PC	10
V0W6050003	STERILISATION BAG 300X500MM <134C	25