



# AppliSens Sensors

For accurate bioprocess measurements

# Sustainable Life Science

## Passion for all dimensions of Life

Together with our partners and customers, we do everything we can to improve on dimensions of life: Planetary Life, Human Life, Patient Life, Professional Life, Business Life and Societal Life.

To improve on Planetary Life for example, and to give us all a healthier and better future, we aim to do all we can to minimize our impact on the environment. We channel our efforts into a set of initiatives, carried out in collaboration with stakeholders across our value chain.

Getinge is committed to becoming a net-zero company by 2050 across the full value chain and our targets have been approved by the Science Based Targets initiative. Getinge has signed the UN Global Compact and we support its ten principles on human rights, labor, environment and anti-corruption. Our sustainability work is governed by our Code of Conduct and a number of policies such as human rights, anti-corruption and the environment.

Read more on [www.getinge.com](http://www.getinge.com)

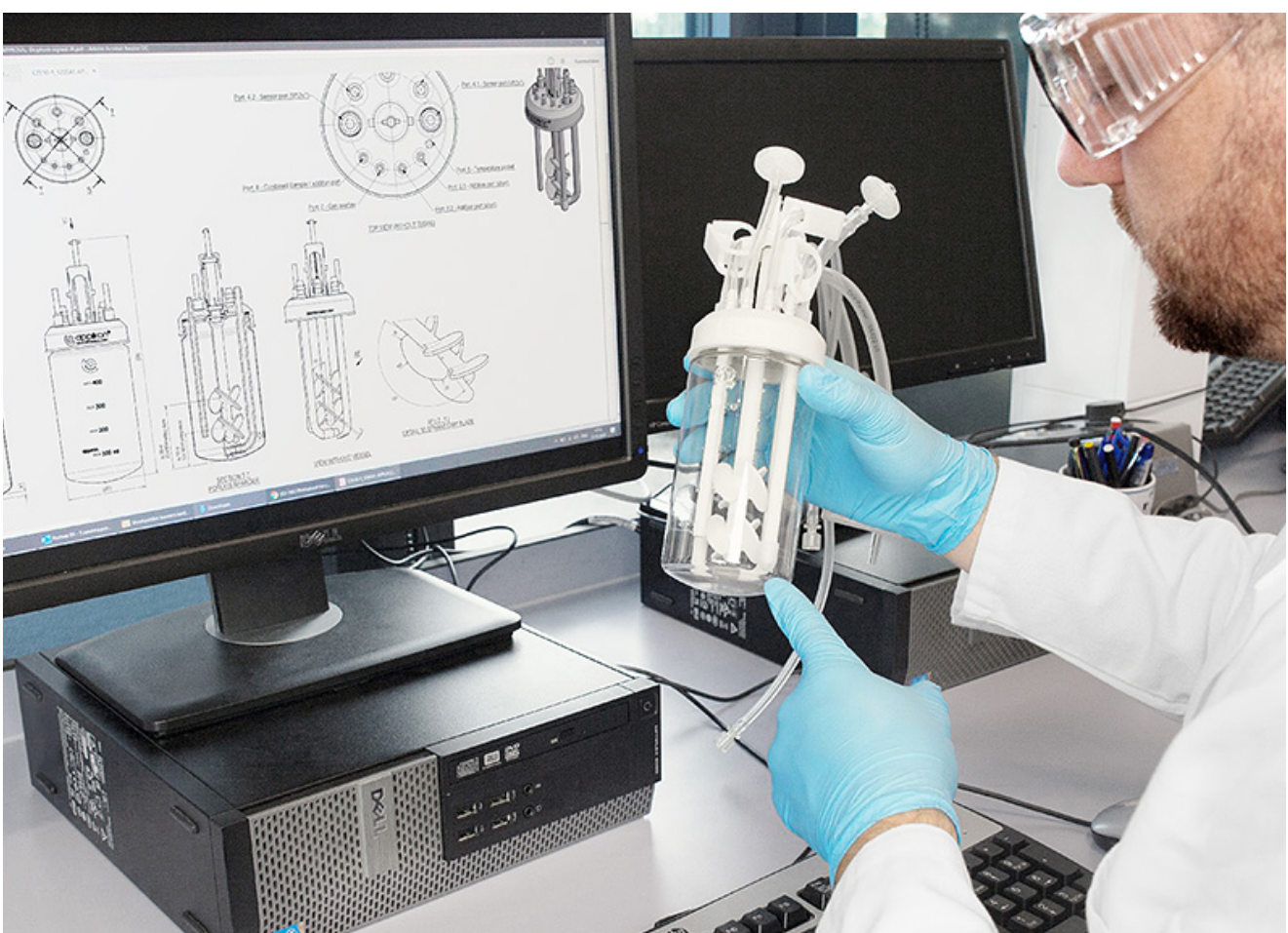


SUSTAINABLE DEVELOPMENT GOALS



WE SUPPORT

ecovadis  
Business Sustainability Ratings



# Partner of Choice

## For the life science industry

Our aim is to support scientists, (cell)biologists, lab managers and operators achieve their goals: Improving quality of life.

Our bioreactor system portfolio covers the whole upstream bioprocess, ranging from laboratory scale and

pilot plant scale to production scale. Whatever your application is, we have the right products for you to optimize the growth of cells and bacteria that is key to the production of life-saving products.



Vaccines



Bio-Pharmaceuticals



Regenerative Medicine



Food and Beverages



Bio-Chemicals



Bio-Fuels

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# AppliSens LumiSens

– Optical DO sensor



Ready to go! The AppliSens LumiSens sensor can be used right after autoclaving. Polarization is no longer needed as compared to traditional polarographic DO<sub>2</sub> sensors, and the need for calibration is significantly decreased to only once per year instead of calibrating for every run. The RedFlash optical technology allows accurate measurements especially in the low oxygen concentration ranges where classic probes are less accurate.

The AppliSens LumiSens sensor is available for our Applikon bioreactors up to 5 L. The smart sensor design separates the electronics from the glass sensor part, guaranteeing a long sensor life with repeated sterilizations.

## Benefits:

- Longer sensor life time since sensor electronics are not sterilized
- Direct use after autoclaving as no polarization is needed
- Reduced maintenance costs since no electrolyte and membranes have to be replaced

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## Applications:

- Microbial and cell culture
- Cell and gene therapy
- Cellular agriculture
- Screening studies
- Media optimization
- Process optimization
- Batch, Fed-Batch, Perfusion and Continuous cultivation

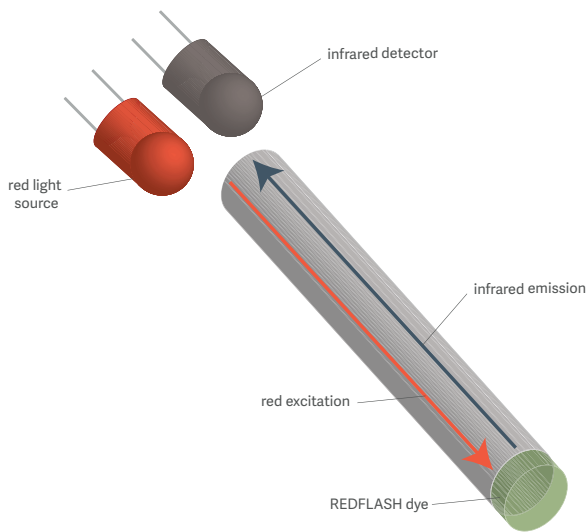
## Features:

- Health status monitor to show sensor condition
- Insensitive to CO<sub>2</sub> fouling
- Ø8 mm sensor for accurate reading on small scale
- M12 thread integrated for direct mounting in top plate
- No interference with biotech-molecules, such as mCherry, Texas Red and Chlorophyll a & b due to RedFlash technology

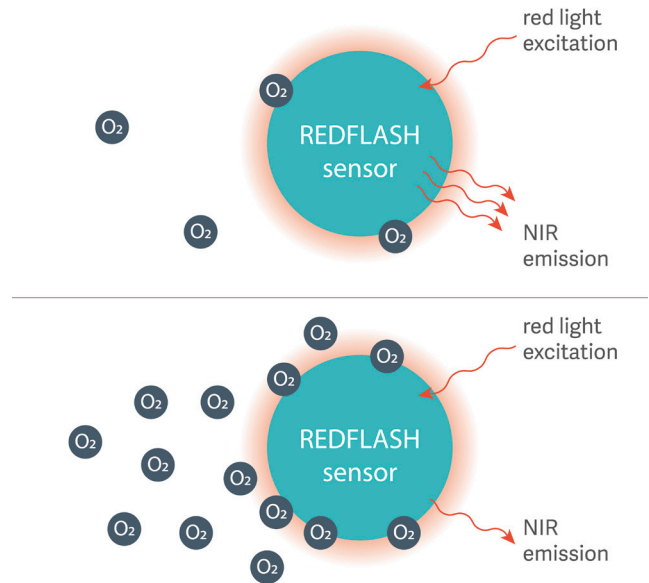
## How the AppliSens LumiSens works:

The measurement principle is based on the phase shift between excitation and emission, which is directly related to the partial pressure of oxygen.

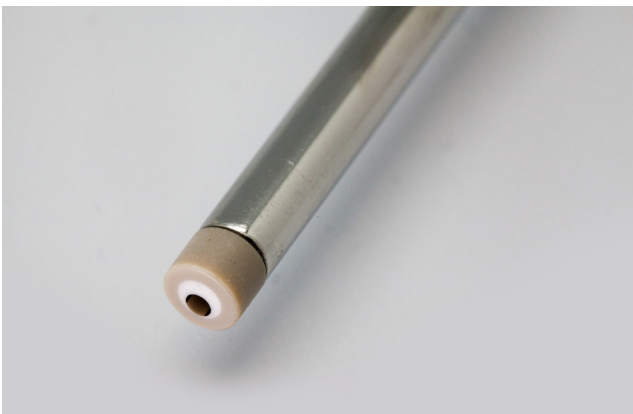
The RedFlash technology is characterized by high precision and reliability, low cross-sensitivity and fast response. The red light excitation significantly reduces



interferences caused by auto fluorescence and reduces stress in biological systems. Besides, due to the excellent luminescence brightness of the RedFlash indicator, the actual sensor matrix can be prepared much thinner, leading to fast response time of the sensor.



## AppliSens LumiSens – two parts:



Optical sensor on tip of stainless steel sensor housing



Green fluophore on tip of replaceable glass tube

## Related products:

- DO<sub>2</sub> LumiSens sensor Ø 8 mm (L = 115 / 135 / 185)
- Glass tube for DO<sub>2</sub> LumiSens sensor (L = 115 / 135 / 185)
- **Sensor holder G<sup>3</sup>/<sub>4</sub>" port M12 thread**

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# AppliSens smart pH Sensors

## – Smart pH measurement

In the biotech and pharmaceutical industry precise monitoring of the pH value during bioprocesses is paramount. The pH directly impacts productivity, stability, and the analysis of active ingredients, making it essential to have accurate and reliable pH sensors. Traditional pH sensors often require frequent recalibration when transitioning to different systems, leading to downtime and potential errors in data collection. Getinge recognizes these challenges and has taken significant steps to address them.

The AppliSens smart pH sensors mark a significant advancement in bioprocess monitoring technology. These sensors are equipped with several key features that set them apart from traditional sensors:

- VP8 connector
- Sensor chip
- Integrated pt1000 temperature sensor
- Data storage and calibration

### Benefits:

- Efficient Calibration
- Reliable Performance
- Less maintenance needed



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### Applications:

- Microbial and cell culture
- Cell and gene therapy
- Cellular agriculture
- Screening studies
- Media optimization
- Process optimization
- Batch, Fed-Batch, Perfusion and Continuous cultivation

### Features:

- Sensor health
- Storage of calibration data (offset, slope, sample correction for pH sensors)
- Integration of a temperature sensor for probe calibration and temperature compensation

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## Specifications:

AppliSens smart pH Sensors	
Diameter	12 mm
pH range	2 – 9 pH
Temperature range	10 - 80°C
Maximum temperature (sterilizing)	135°C
Maximum pressure	4 bar
Zero Point (pH7) @ 25 °C	0 ± 30 mV
Sensitivity @ 25 °C	59.1 mV/pH
Response time (t90)	< 45s pH 4- pH 7 @ 25 °C
Materials in contact with medium	Barium glass, Lithium glass, Teflon, Silicone (o-ring)

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## Related products:

- AppliSens smart pH sensor Ø 12 mm (L = 235 / 325 / 425 / 590)
- AppliSens smart pH Livit Link
- USB-C AppliSens smart pH cable (L = 0.5 / 1.2)
- Conditioning vial for 12 mm sensors

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# AppliSens pH Sensors

## – Accurate pH measurement

In your industry it is vital to have precise information about the pH value of the bioprocess. The pH level directly affects viability, productivity, and stability of the cells and it influences activity and analysis of active ingredients. The AppliSens pH+ sensor has a fixed sleeve diaphragm that reduces the influence of the culture medium on the pH measurement. Compared to classic diaphragm types, this sleeve diaphragm increases measuring accuracy and increases the lifetime of the sensor which is vital for long lasting biotech cultivation processes.

### Benefits:

- Low sensitivity to fouling and thus drifting due to sleeve diaphragm
- Accurate measurement
- Stable signal over longer time



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## Specifications:

AppliSens pH Sensors	
pH range	1 - 12 pH
Temperature range	1 - 135°C
Electrode zero point (E7)	+/-15 mV
Electrode slope (S4/7)	> 98%
Isothermal Intersection- pH (Eiso)	6.5 - 8
pH Range	4 - 9
Membrane resistance @ 25°C (ohm)	< 1200
Membrane resistance @ 37°C (ohm)	< 500
Calibration drift in Buffer 9 (mV / min)	< 2
Stirring Error (Buffer 9 @ 25 °C - pH)	< 0.05
Drift 72 hours after Autoclaving pH	< 0.13
Zero-point drift per week in PBS (pH)	< 0.05
Response Time	90%

## Applications:

- Microbial and cell culture
- Cell and gene therapy
- Cellular agriculture
- Screening studies
- Media optimization
- Process optimization
- Batch, Fed-Batch, Perfusion and Continuous cultivation

## Features:

- Robust design by using tempered glass shaft
- Sensor head occupies minimal space on bioreactor top plate
- Withstands repeated SIP and CIP cycles
- Standardized PG 13.5 connection guarantees interchangeability with other bioreactor brands

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## Related products:

- AppliSens pH gel sensor Ø 8 mm  
(L = 115 / 135 / 185)
- AppliSens pH gel sensor Ø 12 mm  
(L = 120 / 235 / 325 / 425 / 590)
- AppliSens pH sensor cable  
(L = 0.65M / 2.0M)

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# AppliSens smart DO<sub>2</sub> Sensors

## – Smart DO2 measurement

Accurate measurement of DO<sub>2</sub> is critical as it impacts the success of biotechnological processes, influencing the growth and productivity of microorganisms and cells. The AppliSens smart DO<sub>2</sub> sensor represents a significant improvement over the traditional sensor. Its advanced features, including the sensor chip, built-in temperature sensor, and health status indicator, provide enhanced connectivity, process efficiency, and peace of mind for biotechnological applications.

The smart sensor ensures that data is stored and therefore the need for frequent recalibration when transitioning to different systems is eliminated. As such, these sensors can be pre-calibrated within a controlled environment and subsequently connected to field systems. The stored data contains calibration parameters such as offset, slope, and sample corrections, alongside uptime and sensor health. The new smart DO sensor consists of a probe, a transmitter (resembling a gray metallic cylinder) known as the Livit Link. The probe is equipped with internal memory, which accounts for the "smart functionality." This functionality can be used when the smart probe is paired with the Livit Link and Livit software.

### Benefits:

- Enhanced connectivity
- Optimizing process efficiency
- Pre-calibration in controlled environment



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### Applications:

- Microbial and cell culture
- Cell and gene therapy
- Cellular agriculture
- Screening studies
- Media optimization
- Process optimization
- Batch, Fed-Batch, Perfusion and Continuous cultivation

### Features:

- cGMP compatible by using FDA approved materials
- Withstands repeated SIP and CIP cycles
- Standardized PG 13.5 connection guarantees interchangeability with other bioreactor brands

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## Specifications:

AppliSens smart DO <sub>2</sub> Sensors	
Diameter	12 mm
Ra-Value	Ra <0.4 µm
Temperature range	10 - 80°C
Maximum temperature (sterilizing)	135°C
Maximum pressure	4 bar
Optimum Polarization potential	-800 mV
Polarization Potential amplifier	-675 mV
Minimum polarization time	6 hours
Polarization Current	33-66 nA @ Air / 25 °C / 1.013 bar / 100%RH 65-98 nA @ Air / 40 °C / 1.013 bar / 100%RH 300-350 nA @ O <sub>2</sub> / 40 °C / 1.013 bar / 0%RH

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## Related products:

- AppliSens smart DO<sub>2</sub> sensor Ø 12 mm  
(L = 235 / 325 / 425 / 590)
- AppliSens smart DO Livit Link
- USB-C AppliSens smart DO cable  
(L = 0.5 / 1.2)
- DO<sub>2</sub> electrolyte
- DO membrane kits

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# AppliSens DO<sub>2</sub> Sensors

## – Accurate DO<sub>2</sub> measurement

Measurements of dissolved oxygen (DO<sub>2</sub>) in biotechnological processes is a basis for process optimization and maximization of the product yield. A microorganism or cell responds to the oxygen concentration in regulating its overall metabolism. Therefore, knowledge of the DO<sub>2</sub> concentration and its proper control during the process are of great importance.

The AppliSens DO<sub>2</sub> sensor is specifically designed for long-term, stable and accurate measurements in bioprocesses. The DO<sub>2</sub> sensor has a titanium membrane module to minimize the measurement drift. The autoclavable polarization module allows polarizing of your DO<sub>2</sub> sensor while autoclaving your bioreactor system, resulting in a reduced start-up time of your cultivation.

### Benefits:

- Low drift by usage of titanium and PEEK material
- Easy calibration & short response time
- Optimal cleanability due to fully electro-polished surface



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## Specifications:

AppliSens DO <sub>2</sub> Sensors		
Optimum polarization potential	- 800 mV @ 40°C	
Polarization potential amplifier	- 675 mV	
Max. pressure where linearity is guaranteed	4 bar	
Max. sterilization temperature	135°C	
Minimum polarization time after autoclaving	6h	
Polarization current	Air / 25 °C / 1.013 bar / 100 % RH Air / 40 °C / 1.013 bar / 100 % RH O <sub>2</sub> / 40 °C / 1.013 bar / 0 % RH	(33 - 66) nA (65 - 98) nA (300 - 350) nA
Response time gas phase 20 °C	t (90%)	(20 - 30) s
Response time gas phase 40 °C	t (90%)	(10 - 20) s
Response time gas phase 60 °C	t (90%)	(5 - 10) s
Drift between 15h - 5 days	< 0.2 % / day	
Drift between 5 days and 7 days	< 0.1 % / day	
Drift between 7 days and 30 days	< 0.05 % / day	

## Applications:

- Microbial and cell culture
- Cell and gene therapy
- Cellular agriculture
- Screening studies
- Media optimization
- Process optimization
- Batch, Fed-Batch, Perfusion and Continuous cultivation

## Features:

- cGMP compatible by using FDA approved materials
- Withstands repeated SIP and CIP cycles
- Standardized PG 13.5 connection guarantees interchangeability with other bioreactor brands

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## Related products:

- DO<sub>2</sub> sensor Ø 8 mm
- DO<sub>2</sub> sensor Ø 12 mm
- DO<sub>2</sub> sensor cable
- DO electrolyte
- DO membrane kits

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# AppliSens RedOx Sensors

– Accurate oxygen measurement

The AppliSens RedOx potential (Reduction / Oxidation) of a bioreactor culture can be measured using an AppliSens RedOx sensor. The value of the reading of the sensor can depend on pH, growth phase, growth medium components, and fermentation end products (especially fermentation acids and hydrogen). RedOx measurement is also used in anaerobic fermentations as an alternative to the Dissolved Oxygen sensor which does not give much process information in anaerobic situations.

## Benefits:

- Accurate measurement
- Short response time
- Stable signal over longer time





### Applications:

- Microbial and cell culture
- Anaerobic bioprocesses
- Screening studies
- Media optimization
- Process optimization
- Batch, Fed-Batch, Perfusion and Continuous cultivation

### Features:

- Robust design by using tempered glass shaft
- Sensor head occupies minimal space on bioreactor top plate
- FDA approved materials
- Withstands repeated SIP and CIP cycles
- Standardized PG 13.5 connection guarantees interchangeability with other bioreactor brands

### Specifications:

AppliSens RedOx Sensors	
Diaphragm Ceramic	Diaphragm
Indicator electrode shape	Ring
Indicator electrode type	Pt
Measuring range	-2000 ... 2000
Measuring unit	mV
pH range	0 ... 14
Reference electrolyte type	c(KCl) = 3 mol/L
Reference system	LL system
Shaft material	Glass
Temperature range, long-term (°C)	-5 ... 135

### Related products:

- AppliSens RedOx sensor Ø 8 mm (L = 115 / 135 / 185 mm)
- AppliSens RedOx sensor Ø 12 mm (L = 110 / 154 / 235 / 325 / 425 / 590 mm)
- AppliSens RedOx sensor cable (L = 0.65 m / 2.0 m)



# Getinge Service

## – Total Process Control for You

With Getinge, service goes beyond replacing gaskets. Service is about in depth product knowledge to provide best in class preventive maintenance. Service is an investment in reliable equipment, a reliable process and about providing advice to the to help improve efficiency. In Getinge Service you will find our complete service offer to ease your daily challenges.

### **Getinge Service for bioreactor systems contains**

- Workflow Optimization & Application Support
- Quality & Compliance
- Standard Service
- Extended Warranties
- Installation, Relocation and Retrofitting Services
- On-Demand Service



## Quality & Compliance

All Getinge equipment is tested thoroughly throughout the manufacturing process. During our in house verification processes we perform comprehensive tests on all Getinge equipment. All quality documentation is supplied with our systems. The quality documentation is setup in such a way that it is ready to use for your validation and qualification process. Tailored to your requirements we can assist with Factory Acceptance Tests (FAT), commissioning, Site Acceptance Test (SAT) and IV/OV.

We bring over 40 years of experience with cGMP and EUDRALEX in verification, validation and qualification. Our projects department can assist your in defining your requirements right from the start. It will make your life easier knowing that our experts in the bioreactor field have defined your URS so that no detail is overlooked and all specifications are realistic and achievable.

## Standard Warranty

All Getinge equipment is guaranteed for one year after delivery against defective materials and workmanship. All component parts of our products are covered by this warranty, except for normal consumable items such as glassware, sensors, O-rings and gaskets etc. Warranties are voided by unauthorized service of equipment.



# Getinge Academy

## – Be the Expert

Get trained and be ready! Well-trained scientists, operators, and engineers make sure that our systems are fully utilized in your operations. In our vision, training and instruction on how to operate our scientific equipment to make optimal use of its capabilities is not a one-time occurrence, but needs to be repeated on a regular basis.

That's why we created a curriculum to fit your needs. The courses range from educational hands-on and theoretical "Fermentation & Cultivation" sessions, to advanced SCADA/PIMS software training. Our team of bioprocess experts is ready to give you advice on basic or advanced process optimization questions, including process scale-up, aeration, mixing, temperature, pH, and dissolved oxygen control, plus other process controller settings.



Our in-house laboratory is equipped to run cultures and to mimic your process conditions so that recommendations can be drawn up for you based on hands-on experience. Through our Workflow Optimization Assessment we can even design training programs for your employees, as well as put together a curriculum for you. Training can also be held at your facility for a private training session or in a central location near you for general access. Customized training can be organized on demand, focusing on your specific process challenges. You can ask us to come to you to help improve your current workflow and bio-processes or even set-up completely new ones. Please contact us and we will be glad to act as your partner.

## Available training courses

- Basic Cultivation course
- Advanced Cultivation course
- Basic Cell Culture course
- Basic Lucillus® PIMS training
- Advanced Lucillus® PIMS training
- On-Demand Service

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## Americas

**Brasil**

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**Peru**

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Getinge is a global provider of innovative solutions for operating rooms, intensive care units, sterilization departments and for life science companies and institutions. Based on our firsthand experience and close partnerships with clinical experts, healthcare professionals and medtech specialists, we are improving everyday life for people – today and tomorrow.

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