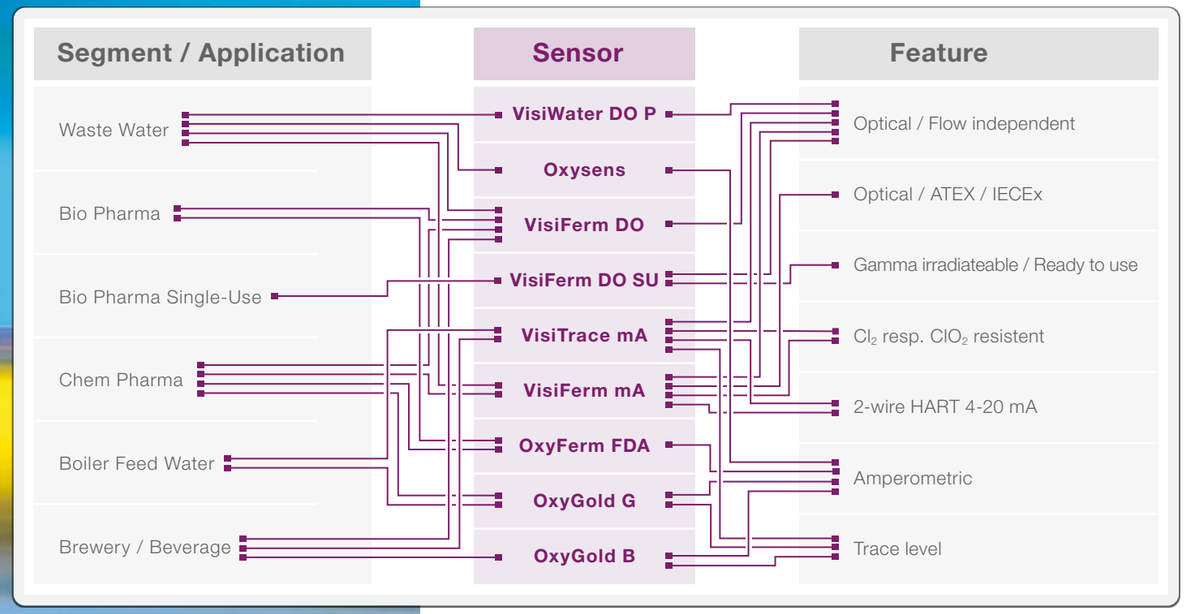
DO

The partial pressure of dissolved oxygen (DO) plays an important role in many biological, chemical and physical processes. Respiration in a lung or a leaf depends on the differences of the partial pressure as well as fermentation of substrates by yeast or bacteria. The amount of dissolved oxygen is also important for the safety and the quality of many other industrial processes.

The most common technologies to measure DO are the classical amperometric and the modern optical method. Classical amperometric Clark cells, where cathode and anode are separated from the sample by a gas permeable membrane, generate an electrical current proportional to the oxygen partial pressure of dissolved oxygen. The oxygen is reduced in the sensor, catalyzed by an electrolyte at a platinum cathode. At the anode silver is oxidized. In contrast to the Clark cells the optical measurement is based on the luminescence of a luminophore that absorbs photons and releases a part of the absorbed energy by emission of photons with a higher wavelength. Oxygen quenches this process by transferring the energy partially by collision. The more oxygen present the more quenching is observed. Hamilton measures the phase shift between excitation and emission across a population of light pulses in order to achieve the highest accuracy and widest operating range. The difference in the intensity of both waves is used for online sensor diagnostics.



VisiFerm DO family

Specifications	
Measuring range	4 ppb to 25 ppm (DO)
Measurement Principle	Oxygen dependent luminescence quenching
Response time $t_{98\%}$	< 30 s at 25 °C, from air to nitrogen
Process temperature	-10 to 140 °C, the sensor provides no DO reading above 85 °C
Operating voltage	7 to 30 VDC max. 1 W
Pressure range (relative to ambient)	-1 to 12 bar
Hygienic aspects	Autoclavable, CIP, SIP
Surface Quality	R_a < 0.4 µm (N5)
Material	Stainless steel 1.4435
O-ring	EPDM

For more specifications see www.hamiltoncompany.com

The VisiFerm DO is the first optical oxygen sensor with integrated opto-electronics, having the full functionality of a measuring device with self-diagnostics. It is steam sterilizable, autoclavable and CIP compatible. The VisiFerm requires less maintenance than a classical oxygen sensor as it does not have a mechanically sensitive membrane or a corrosive electrolyte.

“Did you know… that Hamilton invented the first optical DO sensor in 12 mm format?”

Benefits

- No fragile membrane – with a solid sensor cap
- No polarization time required
- Instantly stable values, low drift, quick response
- Electrolyte-free, so no leakage
- Convenient precalibration in the laboratory, because data is stored in the sensor head

Typical applications

- Ethanologenic fermentation
- Biotechnical fermentation
- Brewery fermentation, filtration, filling
- Proactive corrosion control in HVAC systems

Ordering Information

VisiFerm DO Family Structure

	Code	Interface		
243666	1	Arc		
	2	ECS		
	Code	a-length (mm)		
	1	120		
	2	160		
	3	225		
	4	325		
	5	425		
		Code	ODO Cap	
		1	H0	
		2	H2	
243666 –				← Order Code

ODO Cap H0: For general application in biotechnology, water treatment and monitoring as well as in breweries, wineries and soft drink processing.

ODO Cap H2: The ODO Cap H2 is designed for fermentation processes where sterilization in place (SIP) is performed in media containing higher amounts of lipophilic compounds. It comes with a hygienic design.

Accessories

- **ODO Cap H0 Kit** Ref 243515
- **ODO Cap H2 Kit** Ref 243505

Cables see page 112
Arc Accessories see page 116
Housings see page 127

VisiFerm DO SU new

Specifications	
Measuring range	4 ppb to 25 ppm (DO)
Measurement Principle	Oxygen dependent luminescence quenching
Response time $t_{98\%}$	< 30 s at 25 °C, from air to nitrogen
Process temperature	4 to 50 °C
Operating voltage	7 to 30 VDC max. 1 W
Hygienic aspects	Gamma irradiation up to 50 kGy (for the disposables)
O-ring	EPDM

For more specifications see www.hamiltoncompany.com

Hamilton's single-use dissolved oxygen monitoring system is comprised of the reusable VisiFerm DO SU and a single-use optical dissolved oxygen sensor cap. The cap is integrated with the single-use container by the container manufacturer.

Hamilton's reusable sensor element enables a compact and cost-effective measurement solution without sacrificing accuracy or precision. A standard measuring loop consists of a sensor element, which is connected to the VisiFerm DO SU.

"Did you know… *that Hamilton invented the first optical DO sensor in 12 mm format?*"

Benefits

- Specially designed for sterile application in SU Pharma and Biotechnology
- Highly reliable measurements after gamma sterilization and dry storage even after short wet-in time (<30 min)
- Very low drift
- Biocompatible material

Typical applications

- SU bioreactors (bag application)
- SU bioreactors (rigid containers)
- SU mixer (fill and finish application)

Ordering Information

	a-length	Arc	ECS	ODO Cap S0*	ODO Cap S2*	ODO Cap S3*
VisiFerm DO SU	120	10078255	10116427	243461	10077858	10113953
	225	10087920	10116428	–	–	–

*Only for OEM integration available

Accessories

Silicone Sleeve (for ODO Cap S3) Ref 10114324

Cables see page 112

Arc Accessories see page 116

VisiFerm mA family new

The VisiFerm mA is the optical dissolved oxygen (DO) sensor for use in explosive environment. VisiFerm mA optical technology improves the measuring performance and simplifies maintenance. Improvements compared to conventional electrochemical (amperometric) sensors include flow independence, rapid startup with no polarization time, and simplified maintenance.

Designed especially for production environments, the new VisiFerm mA is a 2-wire sensor with 4-20 mA standard or digital HART signal output, and ATEX & IECEx approval. The new VisiFerm mA mitigates the negative effects of aging, temperature, and photobleaching in order to reduce the frequency of calibration and deviation reports.

“Did you know… that Hamilton invented the first optical DO sensor in 12 mm format?”

Benefits

- Reliable and robust optical measurement in hazardous environments
- Longer cap and sensor life
- Less frequent calibrations
- Easy installation with 2-wire connection
- Direct analog 4-20 mA or digital HART communication
- Calibration, verification, and maintenance data accessible via ArcAir app

Typical applications

- Explosive atmospheres environment
- Fermentation
- Wort aeration in breweries

Specifications

Measuring range	4 ppb to 25 ppm (DO)
Measurement Principle	Oxygen dependent luminescence quenching
Response time $t_{98\%}$	< 30 s at 25 °C, from air to nitrogen
Process temperature	-20 to 140 °C, the sensor provides no DO reading above 85 °C
Operating voltage	7 to 30 VDC max. 1 W
Pressure range (relative to ambient)	-1 to 12 bar
Hygienic aspects	Autoclavable, CIP, SIP
Surface Quality	R_a < 0.4 µm (N5)
Material	Stainless steel 1.4435
O-ring	EPDM

For more specifications see www.hamiltoncompany.com

Ordering Information

VisiFerm mA Family Structure

10070760			
	Code	**Interface**	
	1	mA/HART	
	Code	**a-length (mm)**	
	1	120	
	2	160	
	3	225*	
	4	325	
	5	425	
	Code	**ODO Cap**	
	1	H3	
	2	H4	
	Code	**Wetted Parts**	
	1	EPDM	
10070760 –			**← Order Code**

*The VisiFerm mA 225 have, in reality, a shaft length of 215 mm. This ensures optimal rinsing in retractable armatures, such as Retractex.

ODO Cap H3: For general application in biotechnology, water treatment and monitoring as well as in breweries, wineries and soft drink processing.

ODO Cap H4: The ODO Cap H4 is designed for fermentation processes where sterilization in place (SIP) is performed in media containing higher amounts of lipophilic compounds. It comes with a hygienic design.

Accessories

- **ODO Cap H3 Kit** Ref 10068400
- **ODO Cap H4 Kit** Ref 10078261

Cables see page 112
Housings see page 127

VisiTrace mA family new

Specifications	
Measuring range	0 to 2000 ppb (DO)
Measurement Principle	Oxygen dependent luminescence quenching
Response time $t_{98\%}$	< 20 s in gas; < 90 s in water
Process temperature	-20 to 140 °C, the sensor provides no DO reading above 85 °C
Operating voltage	18 to 30 VDC
Pressure range (relative to ambient)	-1 to 12 bar
Hygienic aspects	Autoclavable, CIP, SIP
Surface Quality	R_a < 0.4 µm (N5)
Material	Stainless steel 1.4435
O-ring	EPDM

For more specifications see www.hamiltoncompany.com

The VisiTrace mA is designed to measure dissolved oxygen in the low ppb ranges in brewing applications, notably during filtration, and filling. In addition, the special designed ODO Cap L1 for breweries is stabilized against standard disinfectant solution with active chlorine and chlorine dioxide. This is powerful during measurements in breweries, which may not allow for calibration after every CIP.

With the transmitter integrated, the intelligent VisiTrace mA sensor provides more reliable measurements directly to your process control system via the 4-20 mA output. The also integrated Bluetooth 5 wireless interface may be used for monitoring, configuration and calibration, and saves time without compromising quality.

“Did you know… that the VisiTrace mA is the only optical DO sensor that withstands chlorine and chlorine dioxide for a long time?”

Benefits

- For measurements from 0 to 2000 ppb
- Stable against chlorine and chlorine dioxide
- Rapid start-up with no polarization
- Flow and CO_2 independent readings
- Robust design for high flow rates

Typical applications

- Breweries
- Power Plants

Ordering Information

VisiTrace mA Family Structure

	Code	Interface			
10068709	1	mA/HART			
		Code	**a-length (mm)**		
		1	120		
		3	225*		
		4	325		
		5	425		
			Code	**ODO Cap**	
			1	L1	
				Code	**Wetted Parts**
				1	EPDM
10068709 –					← **Order Code**

**The VisiTrace mA 225 have, in reality, a shaft length of 215 mm. This ensures optimal rinsing in retractable armatures, such as Retractex.*

ODO Cap L1: The L1 cap is designed for trace level measurements of dissolved oxygen in breweries, water de-aeration and power plants.

Accessories

- **ODO Cap L1 Kit** Ref 10107102
- **Calibration station** Ref 243575

Cables see page 112
Housings see page 127

VisiWater DO P new

The VisiWater DO P is an optical dissolved oxygen sensor designed for applications in water, wastewater, fish farming, lakes, and rivers. Its robust plastic shaft is ideal for these applications. The optical measurement technology ensures fast response time and minimum maintenance without polarization time. Like for all optical DO sensors the only spare part is the cap, which is easy and quickly replaceable.

The output signals 4-20 mA or Modbus can easily be integrated into process control systems (PCS). Calibration and configuration can be done via the PCS or ArcAir Desktop version with the help of the USB RS485 Modbus Converter.

Benefits

- Simple and low maintenance
- Robust design
- Outdoor use incl. submersion

Typical applications

- Water and Wastewater
- Fish farming

Specifications

Measuring range	0 to 40 ppm (DO)
Response time $t_{98\%}$	< 60 s at 25 °C, from air to nitrogen
Process temperature	0 to 60 °C
Pressure range	-1 to 12 bar
Material	Shaft: PVC-U Cap: PPA

For more specifications see www.hamiltoncompany.com

Ordering Information

	a-length	10 m fix cable
VisiWater DO P Arc 120 FC10	150	10066566

Accessories

- **ODO Cap H20** Ref 243536
- **Junction Box** Ref 10067282

Cables see page 112

OxyFerm FDA

The OxyFerm FDA is an electrochemical oxygen sensor suited for applications with high demands for hygiene, e.g. in pharmaceutical industry, in biotechnology and in food & beverage production. It is available with 12 mm or 25 mm (XL) shaft diameter.

The sensor is equipped with an FDA-approved membrane for use in hygienic processes. It withstands steam sterilization, autoclavation and CIP cleanings.

Specifications

Measuring range	10 ppb to 40 ppm (DO)
Response time $t_{98\%}$	< 60 s at 25 °C, from air to nitrogen
Process temperature	0 to 130 °C (Arc: analog 0 to 110 °C, digital 0 to 130 °C)
Pressure range (relative to ambient)	0 to 4 bar
Hygienic aspects	Autoclavable, CIP, SIP
Electrolyte	Oxylyte
Surface Quality	R_a < 0.4 µm (N5)
Current in air at 25°C	40 to 80 nA
Material	Stainless steel 1.4435
Polarization voltage	-670 mV
O-ring	EPDM

For more specifications see www.hamiltoncompany.com

Benefits

- Sanitary Feature: The silicone membrane seals without a gap to steel membrane body (no additional o-ring)
- Little drift, fast response, short polarization time
- Replacing the cathode is possible and very simple to perform.

Typical applications

- Explosive atmospheres environment
- Fermentation

Ordering Information

	a-length	T82	VP 6	Arc	MS
OxyFerm FDA	120	237450	237540	243100	237713
	160	237455	237541	243101	10069701
	225	237452	237542	243102	237715
	325	237453	237543	243103	10069700
	425	237454	237544	243104	–
OxyFerm XL	56	237175-OP	–	243140-OP	–
	125	237170	–	–	–
	262	237174	–	–	–
OxyFerm CIP	120	243289	–	–	–

With the XL option, the o-ring position can be optimally matched to the weld-in socket from 22 to 55mm. Please state the OP you need when ordering.

Accessories

- **Membrane Kit FDA** Ref 237140
- **Membrane Kit CIP** Ref 237126
- **Membrane Kit** Ref 237123
- **Oxylyte 30 mL** Ref 237118
- **Replacement Cathode OxyFerm** Ref 237306
- **Autoclavation Cap Oxyferm** Ref 242000
- **Polarization Module G** Ref 237350
- **Polarization Module T** Ref 237370

Cables see page 112
Arc Accessories see page 116
Housings see page 127

OxyGold B

The OxyGold B is an electrochemical oxygen sensor especially designed for applications which contain carbon dioxide like the production of beer, sparkling wine or soft drinks. The sensor is not affected by acidic gases.

Apart from the production of sparkling beverages, the OxyGold B can be used in all production processes where CO_2 might be an issue for electrochemical sensors.

Did you know…

“that the OxyGold B is the only sensor in the market with a polarization voltage of 0 mV?”

Benefits

- No cross-sensitivity with CO_2
- Only very little flow required
- Pressure and CIP resistent
- Replacing the cathode is possible and very simple to perform.

Typical applications

- CO_2 recovery
- Water de-aeration

Specifications

Measuring range	8 ppb to 40 ppm (DO)
Response time $t_{98\%}$	< 60 s at 25 °C, from air to nitrogen
Process temperature	0 to 100 °C
Pressure range (relative to ambient)	0 to 12 bar
Hygienic aspects	CIP
Electrolyte	Oxylyte B
Surface Quality	R_a < 0.4 µm (N5)
Current in air at 25°C	180 to 500 nA
Material	Stainless steel 1.4435
Polarization voltage	0 mV
O-ring	EPDM

For more specifications see www.hamiltoncompany.com

Ordering Information

	a-length	VP 6	Arc
OxyGold B	120	237180	not available anymore*
	225	237185	

See VisiTrace sensor, page 92

Accessories

- **OxyGold Membrane Kit** Ref 237135
- **Oxylyte B 30 mL** Ref 237138
- **Polarization Module B** Ref 237360
- **Replacement Cathode OxyGold B** Ref 237437

Cables see page 112
Housings see page 127

OxyGold G

Specifications	
Measuring range	1 ppb to 40 ppm (DO)
Response time $t_{98\%}$	< 60 s at 25 °C, from air to nitrogen
Process temperature	0 to 130 °C (Arc: analog 0 to 110 °C, digital 0 to 130 °C)
Pressure range (relative to ambient)	0 to 12 bar
Hygienic aspects	Autoclavable, CIP, SIP
Electrolyte	Oxylyte G
Surface Quality	R_a < 0.4 µm (N5)
Current in air at 25°C	180 to 500 nA
Material	Stainless steel 1.4435
Polarization voltage	-670 mV
O-ring	EPDM

For more specifications see www.hamiltoncompany.com

The OxyGold G is an electrochemical oxygen sensor designed for processes in which very small amounts of oxygen have to be traced, like in the pharmaceutical or microelectronics industry. It is also suitable for processes where high pressures are applied.

Benefits

- Trace level measurement
- Suitable for use at high temperatures and high pressures during sterilization and CIP
- Little flow sensitivity
- Replacing the cathode is possible and very simple to perform.

Typical applications

- Boiler Feed Water
- Microelectronics

Ordering Information

	a-length	VP 6	Arc
OxyGold G	120	237395	243110
	225	237396	243111

Accessories

- **OxyGold Membrane Kit** Ref 237135
- **Oxylyte G 30 mL** Ref 237139
- **Polarization Module G** Ref 237350
- **Replacement Cathode OxyGold G** Ref 237427

Cables see page 112
Arc Accessories see page 116
Housings see page 127

Oxysens

The Oxysens is an electrochemical oxygen sensor designed for applications in water, e.g. wastewater treatment, swimming pools or fish farms. It is easy to maintain, because the membrane and the electrolyte do not need to be replaced.

The response time of the Oxysens is fast, it is almost independent to flow and insensitive to soiling.

Specifications

Measuring range	40 ppb to 40 ppm (DO)
Response time $t_{98\%}$	< 60 s at 25 °C, from air to nitrogen
Process temperature	0 to 60 °C
Pressure range (relative to ambient)	0 to 4 bar
Electrolyte	Oxylyte
Surface Quality	R_a < 0.8 µm (N6)
Current in air at 25°C	40 to 80 nA
Material	Stainless steel 1.4435
Polarization voltage	-670 mV
O-ring	EPDM

For more specifications see www.hamiltoncompany.com

Benefits

- Maintenance-free DO sensor, no change of membrane or electrolyte
- Robust design
- Insensitive to soiling
- Short polarization and response times

Typical applications

- Water and Wastewater
- Fish farming

Ordering Information

	a-length	5 m fixed cable
Oxysens	120	237150

Accessories

- **Immersing Set** Ref 237158
  The Immersing Set sheaths and protects 120mm sensors such as Oxysens while immersed in streams or channels.

Housings see page 127