ABB MEASUREMENT & ANALYTICS | DATA SHEET | DS/ADS420-EN REV. D

ADS420

Optical dissolved oxygen sensor



Measurement made easy

EPA-approved optical dissolved oxygen measurement

Easy to use
- plug-and-play digital sensor connection
- automatic sensor recognition and set-up
- advanced predictive maintenance diagnostics
- supplied factory-calibrated ready for use

Accurate and reliable
- dynamic luminescence quenching technology eliminates sensor drift
- fast response time with patented signal processing
- robust construction provides abrasion and UV resistance

US EPA Approved
- US EPA approved technology for use in Clean Water Act programs
- suitable for use by NPDES permit holders for monitoring influent, effluent and treatment processes

Low cost of ownership
- long-life SmartCap preloaded with factory calibration coefficients
- no need for on-site calibration
- fully automatic air cleaning system available

Flexible installation options
- suitable for tank, open channel or T-piece installation
- range of handrail or wall mounting kits
- suitable for saline applications

ADS420 optical dissolved oxygen sensor

The ADS420 dissolved oxygen (DO) sensor uses optical technology for measuring dissolved oxygen in the most demanding process environments including, high saline applications. The robust construction resists abrasion and photobleaching effects that limit the lifetime of other optical DO sensors.

The ADS420 optical DO sensor's patented signal processing ensures the fastest response time to changes in concentration and maintains stability, even in dynamically changing conditions up to 50 mg/L dissolved oxygen.

To eliminate programming errors, the SmartCap is preloaded with factory calibration coefficients, serial number, lifetime indication and manufacture date enabling long-term deployment without the need for on-site calibration.

Analysis and signal conditioning is conducted within the robust sensor housing and transmitted digitally to the transmitter.

Featuring ABB's EZLink™ technology, users of this system benefit from plug-and-play connectivity, automatic sensor recognition/set-up and predictive diagnostics.

Applications
Typical applications for the ADS420 optical DO sensor include:
- municipal and industrial water and wastewater treatment
- food and beverage process control
- aquaculture control
- environmental and discharge monitoring

Accurate and reliable measurement

The ADS420 optical DO sensor uses the latest advancements in optical measurement technology to provide an extremely stable and accurate measurement system that maintains calibration and operates without drift. This enables the system to operate continuously for up to 24 months. The advanced diagnostics notifies users of maintenance requirements, resulting in the lowest cost-of-ownership.

Measuring principle
When the ADS420 optical DO sensor initiates a reading, an LED emits blue light that excites the lumiphore molecules within the SmartCap. Excited lumiphore molecules emit red light that is detected by a photodiode.

Oxygen molecules quench the excited lumiphore molecules and prevent the emission of red light. This process is called 'dynamic luminescence quenching'.

The ADS420 optical DO sensor measures the phase shift between the returned red light from the excited lumiphore molecules and red light from a red reference LED to calculate luminescence lifetime.

As the relationship between the dissolved oxygen concentration and the returned red light is inversely proportional, the sensor is able to calculate the dissolved oxygen concentration accurately.

A titanium temperature sensor is fitted in the body of the probe to compensate for changes in process temperature.

Dissolved oxygen determination by luminescence quenching has a linear response over a broad range of concentrations and offers a high degree of accuracy and stability.

...Accurate and reliable measurement

...Measuring principle

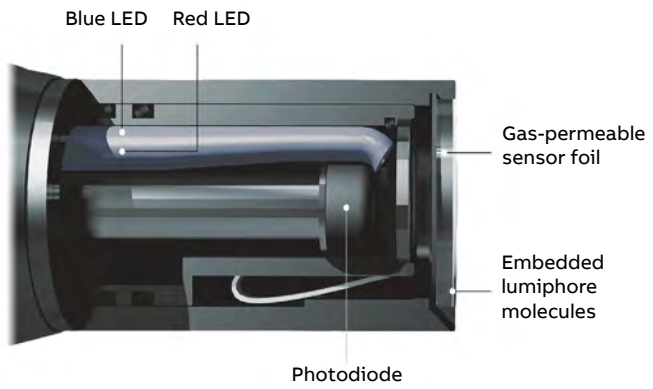


Figure 1 Overview of the ADS420 optical DO sensor

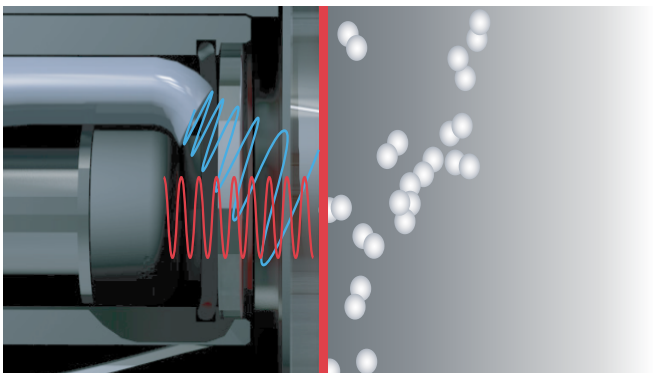


Figure 2 Lumiphore molecules are excited by blue light causing them to emit red light that is detected by the photodiode

Fast response
The patented signal processing within the ADS420 optical DO sensor enables up to 5 times faster response times to changes in process conditions than other optical systems, delivering improved process control and maximum process savings.

Withstands harsh conditions
The abrasion-resistant sensing element withstands fouling, high sediment loads and rapid flow rates. The lumiphore is not affected by photobleaching or stray light. In addition, unlike membrane-based sensors, the ADS420 optical DO sensor is unaffected by sulfides, sulfates, hydrogen sulfide, carbon dioxide, ammonia, pH, chloride, and other interferents.

The ADS420 optical DO sensor is constructed from inert, noncorrosive materials making it suitable for use in high-salinity environments.

EPA-approved technology
The US Environmental Protection Agency (EPA) has approved RDO methods for use in their Clean Water Act programs.

NPDES permit holders can use the ADS420 optical DO sensor for monitoring influent, effluent and treatment processes.

Known interferents
There are some known interferents such as: alcohols >5 %; hydrogen peroxide >3 %; sodium hypochlorite (commercial bleach) >3 %; gaseous sulfur dioxide; gaseous chlorine. Organic solvents and certain petroleum-based hydrocarbons may swell the sensing element and destroy it.

Examples include, but are not limited to: acetone, chloroform, methylene chloride, and BTEX (benzene, toluene, ethylbenzene, xylene) compounds.

Easy-to-use and maintain

The ADS420 optical DO sensor features ABB's EZLink technology to provide plug-and-play measurement with ABB's latest digital transmitters. This has created the easiest-to-use and maintain monitoring system on the market today.

EZLink

- No wiring, no complicated sensor set-up or configuration; simply connect the sensor using the EZLink connection and the transmitter configures the sensor setup automatically.

No calibration required

- The ADS420 optical DO sensor is not susceptible to drift due to the use of a nonconsumptive, nonreactive method of measurement.
- To eliminate programming errors, the SmartCap is preloaded with factory calibration coefficients, serial number, lifetime indication and date of manufacture. These are uploaded to the ADS420 optical DO sensor automatically. Simply snap on the SmartCap and start measuring!



Figure 3 ADS420 SmartCap

Minimal maintenance

The SmartCap enables continuous operation for up to 24 months. Advanced sensor diagnostics evaluate sensor performance to provide maintenance interval alerts.

In applications where high biofouling is expected, the ADS420 optical DO sensor can be used with ABB's EZClean system that is compatible with the AWT420, which cleans the sensor surface automatically with a powerful jet of air.



Figure 4 ABB EZClean system

Versatile transmitters

The AWT420 four-wire, dual-channel transmitter offers true flexibility for measuring a wide variety of parameters in a single device.

The transmitter that gives you more choice

Offering swappable communications and sensor modules, options for panel, pipe, and wall mountings and general purpose and safety enclosures, the AWT420 is the versatile single box solution for measuring a range of parameters including pH/ORP, conductivity, dissolved oxygen and the 4690 turbidity sensor.



Figure 5 AWT420 transmitter

Available in both corrosion-resistant polycarbonate, or a durable metal version with optional non-incendive approvals for hazardous area installation, it offers a versatile solution for use in utility and industrial process applications.

Your data, when you need it



Secure access to your data
Easy and secure access to measurement, diagnostic and audit data.

Keep your analysis up-to-date
Access software updates and sensor information through your smartphone.

Reduce process downtime
Keep track of current and upcoming maintenance tasks.

The AWT420 incorporates several key features to help you find the data you need quickly and easily. An easily navigable full-color TFT display makes it easy to find and access sensor data, while Bluetooth® technology provides up-to-the-minute information and technical support using ABB's EZLink Connect app.

Dimensions

All dimensions in mm (in)

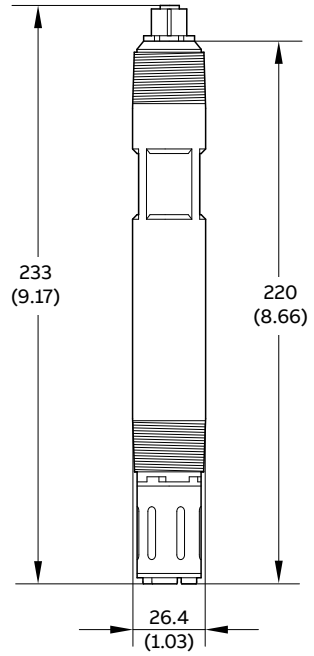


Figure 6 ADS420 cable detached

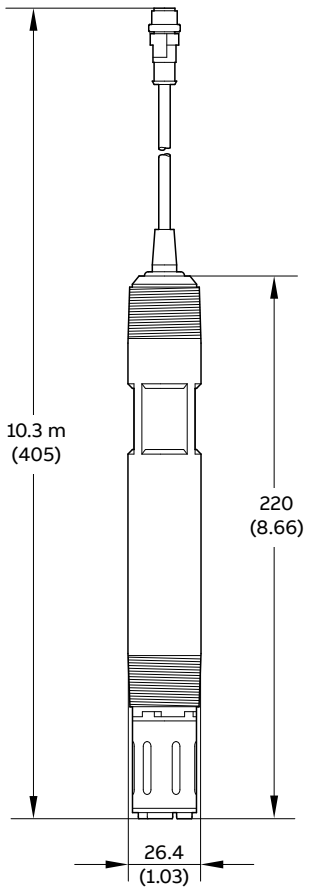


Figure 7 ADS420 cable attached

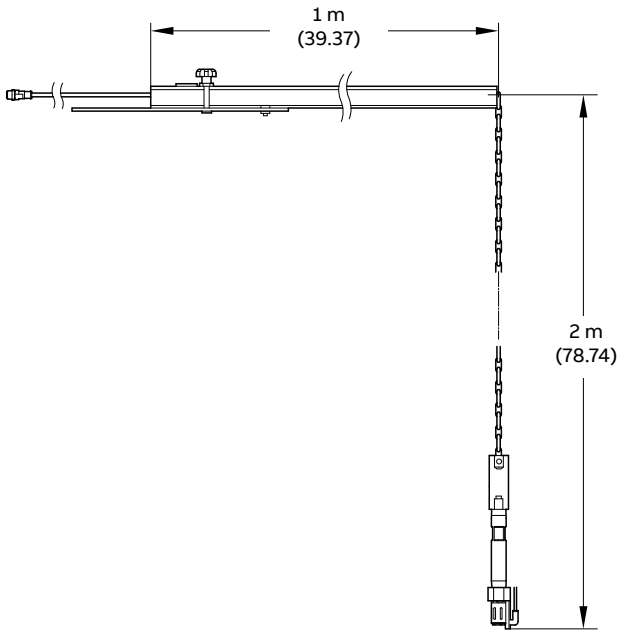


Figure 8 Chain mount

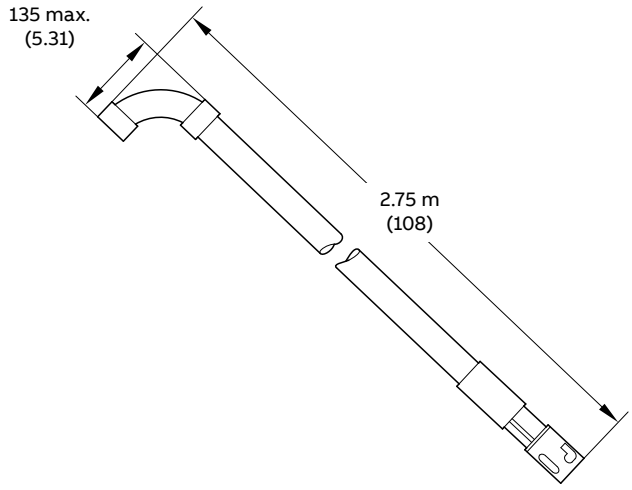


Figure 9 Dip pole assembly

...Dimensions

All dimensions in mm (in)

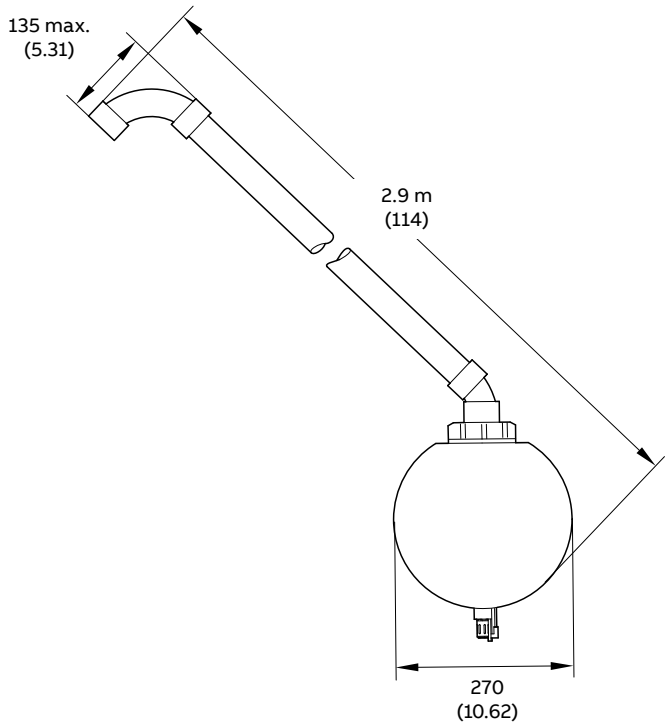


Figure 10 Floating ball assembly

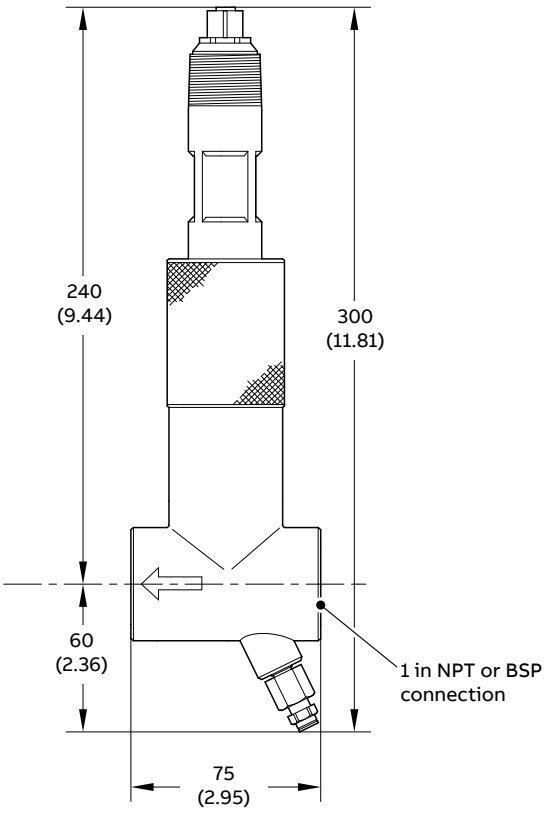


Figure 11 T-piece assembly

Specifications

Sensor type

Optical (luminescent) dissolved oxygen sensor

Probe

IP rating

IP68

Range

0 to 50 mg/L concentration; 0 to 600 % saturation

Accuracy

- ±0.1 mg/L, 0 to 8 mg/L
- ±0.2 mg/L, 8 to 20 mg/L
- ±10 % of reading, 20 to 50 mg/L

Resolution

0.01 mg/L

Response time

T90 < 45 s; T95 < 60 s @ 25 °C (77 °F)

Storage conditions

-5 to 60 °C (23 to 140 °F)

Dimensions

- 19 mm (¾ in) diameter
- 203 mm (8 in) length

Probe mounting thread

¾ in NPT

SmartCap

Typical working life

2 years

IP rating

IP68 (when fitted)

Storage conditions

1 to 60 °C (33 to 140 °F) in factory container

Temperature sensor

Operating temperature range

0 to 50 °C (32 to 122 °F)

Accuracy

±0.1 ° C typical

Resolution

±0.01 °C

Power

Consumption (maximum)

50 mA @ 12 V DC

Measurement current

6 mA typical @ 24 V DC

Idle current (no measurement or consumption)

160 µA typical @ 24 V DC

Cable

Fixed length

10 m (32.8 ft)

EZLink digital sensor connector IP rating

IP67 (when connected)

Extension cable (options)

1, 5, 10, 15, 25, 50 m (3.2, 16.4, 32, 49.2, 82, 164 ft)

Maximum length (including optional extension cable)

Up to 210 m (689 ft)

Salinity compensation

0 to 42 PSU (ppt)

Barometric pressure

506 to 1114 mbar (380 to 835 mmHg)

Environmental ratings

Pressure

- 10.342 bar (150 psi) from 0 to 50 °C (32 to 122 °F)
- 20.468 bar (300 psi) @ 25 °C (77 °F)

Operating temperature range

0 to 50 °C (32 to 122 °F)

Compliance

Heavy industrial, IEC:61000-6-2:2005

Methods

- Standard methods 4S00-0
- In-Situ methods 1002-8-2009, 1003-8-2009, 1004-8-2009 (EPA approved)

Materials of construction

SmartCap

PC/PMMA

Probe body

PVDF

Temperature sensor

Titanium

Cable

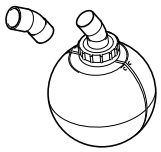
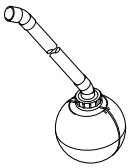
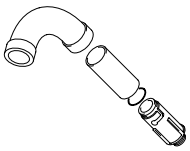
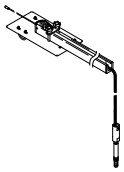
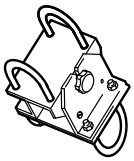
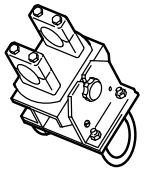
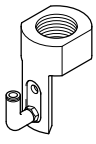
Polyurethane

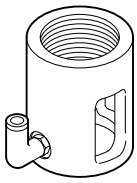
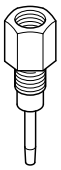
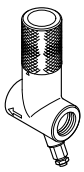
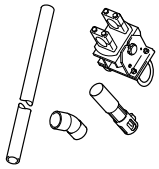
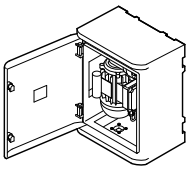
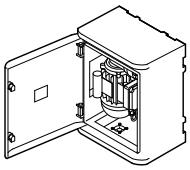
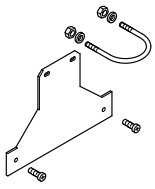
Approvals

CE mark

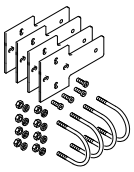
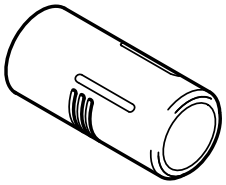
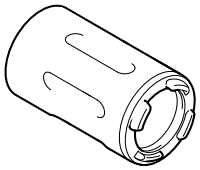
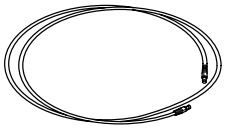
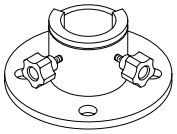
UKCA mark

Accessories

Part number	Description	
3KXA494400L0001	Floating ball kit	
3KXA494400L0002	Floating ball assembly (2.5 m)	
3KXA494400L0003	Dip pole bayonet kit	
3KXA494400L0004	Dip pole with bayonet assembly (2.5 m)	
3KXA494400L0005	¾ in chain mount assembly	
3KXA494400L0006	¾ in chain mount kit	
3KXA494400L0007	Handrail mounting bracket (tilt), 1.25 in NB pole	
3KXA494400L0008	Handrail mounting bracket (tilt & swivel), 1.25 in NB pole	
3KXA494400L0009	Cleaning adapter – to be connected to the ¾ in NPT sensor thread (e.g., floating ball, chain mounts)	

Part number	Description	
3KXA494400L0010	Cleaning adapter – to be connected to bayonet kit (3KXA494400L0003)	
3KXA494400L0011	Cleaning adapter (T-piece)	
3KXA494400L0012 3KXA494400L0045	1 in NPT bayonet polycarbonate T-piece 1 in BSP bayonet polycarbonate T-piece	
3KXA494400L0013	Floating ball mounting kit	
3KXA494400L0014	Dip pole mounting kit	
3KXA494400L0043	EZClean compressor 230 V	
3KXA494400L0044	EZClean compressor 115 V	
3KXA494400L0017	Compressor pole-mounting kit	

continued...

Part number	Description	
3KXA494400L0018	Compressor handrail-mounting kit	
3KXA494400L0019	Cap replacement kit	
3KXA494400L0020	Guard replacement kit	
AWT4009010 AWT4009050 AWT4009100 AWT4009150 AWT4009250 AWT4009500	1 m (3.3 ft) EZLink cable 5 m (16.4 ft) EZLink cable 10 m (32.8 ft) EZLink cable 15 m (49.2 ft) EZLink cable 25 m (82.0 ft) EZLink cable 50 m (164.0 ft) EZLink cable	
ATS4000785	Open-tank flanged dip mount	

Ordering information

ADS420 optical dissolved oxygen sensor	ADS420/	X	X	Options
Build revision				
Reserved		A		
Cable options				
Cable detached			1	
10 m integral attached length			2	

Optional ordering codes
Add 1 or more of the following codes after the standard ordering information to select any additional options if required:

Installation assemblies	
Dip pole assembly (straight), 1.25 in 2.5 m (8.2 ft)	B1
Dip pole adapter kit (straight) for attachment to 1.25 in NB pole	B2
Floating ball assembly (45°), 1.25 in 2.5 m (8.2 ft)	B3
Floating ball kit (45°) for attachment to 1.25 in NB pole	B4
Chain-mount assembly with 3 m (9.8 ft) of chain[1]	B5
Chain-mount kit with 3 m (9.8 ft) of chain[2]	B6
1 in NPT bayonet polycarbonate T-piece	B7
Mounting accessories[3]	
Handrail mounting bracket (swivel/tilt) for 1.25 in NB dip pole, suitable for 42 or 51 mm (1.7 or 2.0 in) diameter handrail	H1
Handrail mounting kit for 40 mm or 1.25 in diameter dip pole, suitable for 42 or 51 mm (1.7 or 2.0 in) diameter handrail (tilt only)	H2
EZClean options[4]	
EZClean adapter	C1
EZClean system for 230 V AC (supplied with compressor, adapter and tubing kit) (wall, handrail and pole mounting)	C2
EZClean system for 115 V AC (supplied with compressor, adapter and tubing kit) (wall, handrail and pole mounting)	C3
EZLink digital sensor extension cables	
1 m (3.3 ft)	E01
5 m (16.4 ft)	E05
10 m (32.8 ft)	E10
15 m (49.2 ft)	E15
25 m (82 ft)	E25
50 m (164 ft)	E50
Operating Instruction	
English	M5
German	M1
Italian	M2
Spanish	M3
French	M4
Chinese	M6
Portuguese	M9
Turkish	MB
Polish	MT

1 Not selectable with cable length option 0.

2 Not selectable with cable length option 1.

3 Not selectable with B6 and B5.

4 Will select the correct cleaning adapter depending on which probe attachment is selected.

Acknowledgements

- Bluetooth is a registered trademark of Bluetooth SIG, Inc.
- EZLink is a trademark of ABB Limited.

Notes

ABB Measurement & Analytics

For your local ABB contact, visit:
www.abb.com/contacts

For more product information, visit:
www.abb.com/measurement

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