Monitor ALP-900

User Manual

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Table of Contents

1 Introduction

About this chapter

This chapter contains important user information, descriptions of safety notices and intended use of the ALP-900 (Air, Level, Pressure transmitter) monitor.

In this chapter

1.1 About this manual

Purpose of this manual

The *User Manual* provides you with the information needed to operate and maintain the ALP-900 monitor in a safe way. It does not provide information about the use of the parent system that the monitor may be incorporated into.

Scope of this manual

The *User Manual* covers the ALP-900 monitor. The illustration below shows the ALP-900 system.

Typographical conventions

Software items are identified in the text by ***bold italic*** text.

Hardware items are identified in the text by **bold** text.

In electronic format, references in *italics* are clickable hyperlinks.

1.2 Important information

Read this before operating the product

All users must read the following documents in their entirety before installing, operating or maintaining the product:

- this *User Manual*, 29265903
- the *Operating Instructions* manual of the parent system.

Always keep this *User Manual* and the *Operating Instructions* at hand when operating the product.

Do not operate the product in any other way than described in the user documentation. If you do, you may be exposed to hazards that can lead to personal injury and you may cause damage to the equipment.

Intended use of the product

ALP-900 is a high precision multi-purpose monitor designed to detect air, measure and supervise pressure and temperatures, handle level signals from the air trap and internal and external I/O signals. It is used in ÄKTAprocess™, BioProcess™ and UniFlux™ systems.

The instrument is delivered pre-installed in the parent system with all electrical connections prepared inside the electronics cabinet. ALP-900 monitor has no user interface for the operator, it is controlled entirely via the system control software.

Prerequisites

In order to operate ALP-900 in the way it is intended:

- The user should understand the concepts of liquid chromatography.
- The user must read and understand the Safety Instructions chapter in this manual and in the *Operating instructions* manual of the parent system.

Safety notices

This user documentation contains safety notices (WARNING, CAUTION, and NOTICE) concerning the safe use of the product. See definitions below.

WARNING

WARNING indicates a hazardous situation which, if not avoided, could result in death or serious injury. It is important not to proceed until all stated conditions are met and clearly understood.

CAUTION

CAUTION indicates a hazardous situation which, if not avoided, could result in minor or moderate injury. It is important not to proceed until all stated conditions are met and clearly understood.

NOTICE

NOTICE indicates instructions that must be followed to avoid damage to the product or other equipment.

Notes and tips

Note: *A note is used to indicate information that is important for trouble-free and optimal use of the product.*

Tip: *A tip contains useful information that can improve or optimize your procedures.*

2 Safety instructions

About this chapter

This chapter describes safety precautions, labels and symbols that are attached to the equipment.

Important

WARNING

Before installing, operating or maintaining the product, all users must read and understand the entire contents of this chapter to become aware of the hazards involved.

Safety precautions

Refer to the safety instructions described in the manual of the parent system.

Follow the instructions provided to avoid injury to the operator or other personnel, damage to the product, or to other equipment in the area.

NOTICE

The **ALP-900** safety module that monitors the pump/operating pressure is a protection for the system and NOT the column.

3 Instrument description

About this chapter

This chapter gives an overview of the ALP-900 monitor, and a brief description of its function.

In this chapter

3.1 Instrument

Introduction

This section gives an overview of the ALP-900 monitor.

ALP-900 monitor

The ALP-900 monitor detects air, and measures and supervises pressure and temperatures in ÄKTAprocess, BioProcess and UniFlux systems.

The ALP-900 module has air, pressure and temperature monitoring modules.

- The air module monitors signals from two air sensors.
- The pressure module monitors signals from up to four pressure sensors.
- The ALP-900 also monitors temperature in the electronics cabinet and the liquid temperature in the system.

If any of the monitored parameters reaches a critical limit, the ALP-900 will shut down the pumps independently of the system control software.

ALP-900 functionality

The following table describes examples of how ALP-900 functionality options may be used in a parent system. The examples provided are for illustrative purposes only and may vary according to the configuration of the individual system.

Parent system	ALP-900 functionality
ÄKTAprocess	• Air detection • Pressure measurement and surveillance • Temperature measurement and surveillance
UniFlux	• Pressure measurement and surveillance • Temperature measurement and surveillance
BioProcess	• Pressure measurement and surveillance

Illustration of ALP-900

The illustration below shows the ALP-900 monitor.

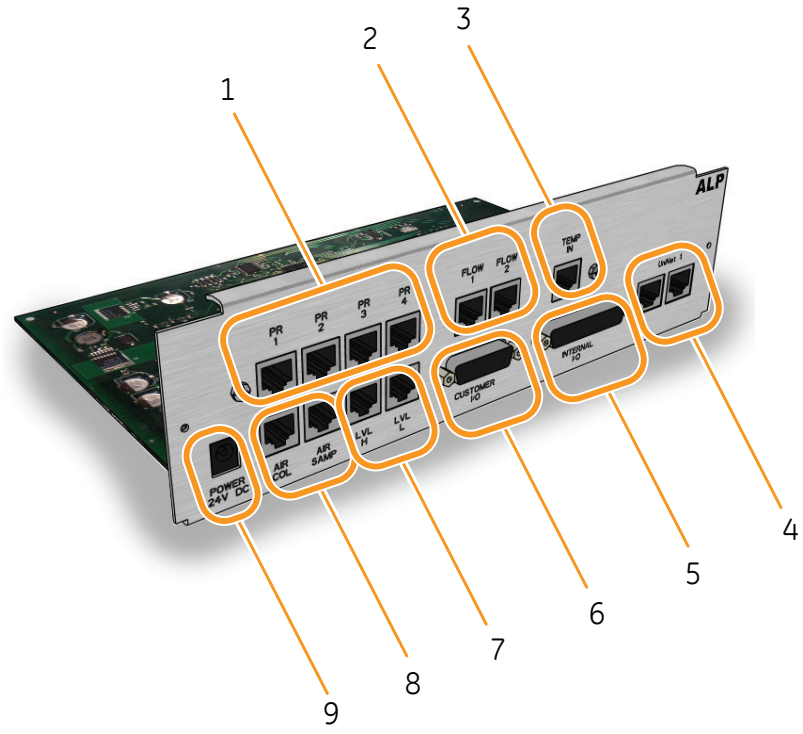
3.2 Modules

Introduction

This section gives an overview of the modules of the ALP-900 monitor.

Illustration of connectors on ALP-900

The illustration below shows the locations and gives brief descriptions of the connectors on ALP-900.



Part	Function
1	Pressure sensor connector
2	**Flow** meter connector (future option for BioProcess systems)
3	Temperature sensor **IN** connector
4	**UniNet 1** connector
5	**Internal I/O** connector

Part	Function
6	**Customer I/O** connector
7	Level sensor connector (**LVL Hi** and **LVL Lo**)
8	Air sensor connectors (**AIR COL** and **AIR SAMP**)
9	Power connector

Air sensors

ÄKTAprocess and BioProcess systems are equipped with two air sensors. ALP-900 monitors the signals from these air sensors.

1. The first sensor (**AIR COL**) is permanently installed before the column valve block(s). The purpose of this sensor is to protect the column(s) from air in the liquid flow. When the **AIR COL** is enabled (default) and air is detected, this sensor will set the system to ***PAUSE*** and an error will be indicated. For more information, refer to the manual of the parent system.
2. The second sensor (**AIR SAMP**) is movable and can be inserted after any inlet. A typical application for this sensor is to indicate when a sample is finished. When the movable sensor is not used it should be placed in a recessed holder in the system frame, above the inlets. For more information, refer to *Section 4.1 Attaching the movable air sensor, on page 15*.

Level sensors

ALP-900 monitors the signals from two capacitive level sensors (***High*** and ***Low***), installed in the air trap. The signals from these sensors monitor the liquid level in the air trap.

This function is not used when the parent system is ÄKTAprocess.

Pressure sensors

The ALP-900 monitor can register pressure signals from up to four pressure transmitters. Two pressure sensors are mandatory for ÄKTAprocess and BioProcess systems.

- One pressure sensor is located before the air trap.
- One pressure sensor is located before the column 1 valve block.

If a sample pump is included in the parent system, a third pressure sensor is located after the sample pump.

If a fourth sensor is included in the parent system, it is located after the column valve blocks.

For ÄKTAprocess and BioProcess systems configured with pressure control valves (PCV), pressure sensors are located before the pressure control valves. For systems configured with two pumps, pressure sensors are located between the pumps and the PCVs. These sensors are monitored by an additional ALP-900 monitor.

Temperature sensors

ALP-900 monitors the following two temperature signals:

- One signal monitors the temperature in the electronics cabinet. The temperature is registered by a sensor that is mounted inside ALP-900. If the temperature in the electronics cabinet exceeds 40°C a warning is sent to system control software.
- The second signal monitors the temperature in the process liquid by feedback from the pre-column pH and conductivity monitor, pH/C-902, from the temperature sensor in the conductivity cell CE-101.

Pressure and temperature surveillance

A surveillance function will turn off the flow if the temperature and/or pressure exceeds the limits for the tubing type and size in question. Refer to the manual of the parent system for information about the pressure and temperature limits.

Note: *For ÄKTAprocess and BioProcess: Maximum accepted system pressures may only be set by Cytiva service engineers.*

For other systems: Maximum accepted system pressure can also be set to match the pressure rating on that system.

Customer I/O connections

An external 15-pin D-sub connector is available on ÄKTAprocess and BioProcess systems, for programmable general purpose DC signals, both inbound and outbound. The signals may be used for many different purposes, for example to control an external valve and to receive state readings in return from the valve. Instrument readings may be transmitted to general process control systems and external alarms can be controlled.

Refer to the manual of the parent system for information about the location of the customer I/O connector and mapping between the pins and signal types. For more information about suitable applications and technical solutions, contact Cytiva customer service.

4 Installation

About this chapter

The instrument is delivered pre-installed in the parent system with all electrical connections prepared inside the electronics cabinet. The air and pressure sensors are also mounted in the correct positions.

This chapter describes how to use the movable air sensor connected to the ALP-900. It also describes how the ALP-900 calculates the volume of accumulated air.

In this chapter

4.1 Attaching the movable air sensor

Introduction

This section describes how to use the movable air sensor. Refer to the manual of the parent system for more information about the movable air sensor.

Requirements

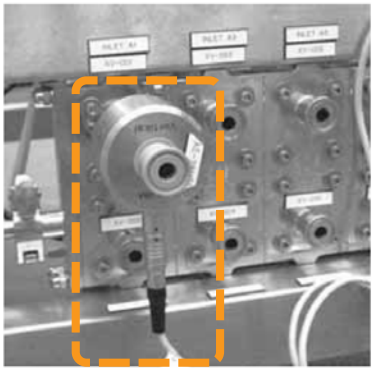
To be able to detect air before it enters the system certain minimum tubing lengths are required. The table below describes the specified tubing diameters, length and maximum flows that are required for the ***AIR SAMP*** air sensor to function properly.

Tubing diameter (mm)	Maximum flow rate (L/hr)	Minimum tubing lenght (m)
6.00	180	0.71
10.00	600	0.85
22.00	1800	0.53

Attaching the movable air sensor

Follow the instructions below to use the movable air sensor.

Step	Action
1	The movable air sensor may be optionally placed on any inlet.
2	Place the movable air sensor (***AIR SAMP***) on a horizontal flow path (e.g. on the inlet).
3	Rotate the connector, so that it is vertical, as marked on the air sensor.



Step	Action
	Note: *The air sensor connector may face either upwards, downwards, left or right. Downwards is recommended to minimize the risk for ingress of liquid into the connector when disconnecting it. If the sensor is oriented in any other angle it may not detect small bubbles properly.*

4.2 Calculate accumulated air

Introduction

This section describes how to calculate the accumulated air volume that goes into the column during a run.

Accumulated air

An approximation of the accumulated air volume that passes the air sensor before the column can be calculated to keep track of how much air goes into the column during a run.

The calculation of accumulated air is started when a new run is started and stopped when the system is set to ***END***. When the system is set to ***RUN*** again the accumulated air is set to zero and a new accumulated air volume is calculated for this run.

5 Maintenance

About this chapter

This chapter provides information to enable users and service personnel to clean and maintain the product.

In this chapter

5.1 Maintenance program

Periodic maintenance

Refer to the manual of the parent system for information about maintenance of the ALP-900 monitor.

5.2 Cleaning

Cleaning before planned maintenance/service

To ensure the protection and safety of service personnel, all equipment and work areas must be clean and free of any hazardous contaminants before a Service Engineer starts maintenance work.

Please complete the checklist in the *On Site Service Health and Safety Declaration Form* or the *Health and Safety Declaration Form for Product Return or Servicing*, depending on whether the instrument is going to be serviced on site or returned for service, respectively.

Copy the form you need from *Section 7.2 Health and Safety Declaration Form, on page 28*.

6 Troubleshooting

About this chapter

This chapter provides information to assist users and service personnel to identify and correct problems that may occur when operating the product.

If the suggested actions in this guide do not solve the problem, or if the problem is not covered by this guide, contact your Cytiva representative for advice.

In this chapter

6.1 Before calling Cytiva support

Instrument information

Before contacting Cytiva for support, access the system control software and select ***Maintenance Manager*** in the ***System Control*** module to display the instrument information (e.g. version number, for reference).

Follow the instructions below to access the instrument information.

Step	Action
1	Select ***System*** →***Maintenance***.
2	Select the ***Info*** tab.
3	Click the ***ALP*** icon.
4	Click ***General***.

6.2 Troubleshooting guide

Pressure and temperature monitors

Error message	Cause and action
Pressure X not available (1 – 4)	1. Check if the pressure transmitter in position X on the ALP-900 monitor is connected. 2. Restart the parent system. 3. Contact a Cytiva service engineer if the error message reappears.
Com error – pressure X (1 – 4)	A communication error has occurred with pressure transmitter X. 1. Check if the pressure transmitter in position X on the ALP-900 monitor is connected. 2. Restart the parent system. 3. Contact a Cytiva service engineer if the error message reappears.
Liquid temperature too high	The pumps are turned off because the liquid temperature exceeds 80°C. Ensure that the temperature is lowered below 80°C.
Pressure and temp too high Refer to the manual of the parent system for the temperature and pressure limits.	The pumps are turned off because the liquid temperature exceeds pressure and temperature limits. Make sure that the pressure and temparature are within their respective limit range.
Pressure above max	The pumps are turned off because the pressure is above the accepted limit for the system. Ensure that the pressure is lowered before resuming operation.
Error pres X (1 – 4)	The reported error regarding pressure has been detected by pressure transmitter in position X on the ALP-900 monitor.

Error message	Cause and action
No variation in pressure	The pressure sensor might be broken. 1. Restart the parent system. 2. Contact a Cytiva service engineer if the error message reappears.
The pressure difference between the pressure sensors is too large. One pressure sensor might be broken.	The pressure difference between the pressure sensors 1 and 2 is too large. One pressure sensor might be broken. 1. Restart the parent system. 2. Contact a Cytiva service engineer if the error message reappears.
No response system pump	The pump cannot be started because the pump motor does not respond. Contact a Cytiva service engineer.
Check temp sensor cabinet	The temperature sensor measuring the temperature in the electronics cabinet is not connected or broken. 1. Restart the parent system. 2. Contact a Cytiva service engineer if the error message reappears.
Check temp for pres. surv.	The temperature signal used for pressure surveillance is disconnected. The pumps are turned off or cannot be started. Contact a Cytiva service engineer.
Temp in cabinet too high	The temperature in the electronics cabinet is above the recommended limit of 40°C. 1. Check the cooling filter. If the filter is clogged, replace the filter. 2. If not, contact a Cytiva service engineer.

Error message	Cause and action
Pressure transmitter not conn. (pos. 1 or 2)	The pressure transmitter in position 1 or 2 on the ALP-900 monitor is not connected. Due to safety regulations the system pump cannot be started. 1. Connect the pressure transmitter. 2. Restart the parent system. 3. Contact a Cytiva service engineer if the error message reappears.
Pressure transmitter not conn. (pos. 4)	The pressure transmitter in position 4 on the ALP-900 monitor is not connected. Due to safety regulations the sample pump cannot be started. 1. Connect the pressure transmitter. 2. Restart the parent system. 3. Contact a Cytiva service engineer if the error message reappears.

7 Reference information

About this chapter

This chapter lists the technical specifications of ALP-900. The chapter also includes a Health and Safety Declaration form for service.

In this chapter

7.1 Technical specifications

Air module

Parameter	Specification
Minimum size of detectable bubble	< 4 mm
Air detection cells:	
I	6 mm (~3/8") PEEK
II	10 mm (~1/2") PEEK
III	22 mm (~1") PEEK
Maximum backpressure per cell	0.1 bar

Pressure module

Parameter	Specification
Accuracy	± 0.12 bar of read value
Pressure range	Refer to the General Specification for the parent system.

Degree of protection

Parameter	Specification
Pressure transmitter	IP66
Air detection cells	IP66

7.2 Health and Safety Declaration Form

On site service

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On Site Service Health & Safety Declaration Form

Service Ticket #:	

To make the mutual protection and safety of Cytiva service personnel and our customers, all equipment and work areas must be clean and free of any hazardous contaminants before a Service Engineer starts a repair. To avoid delays in the servicing of your equipment, complete this checklist and present it to the Service Engineer upon arrival. Equipment and/or work areas not sufficiently cleaned, accessible and safe for an engineer may lead to delays in servicing the equipment and could be subject to additional charges.

Yes	No	Review the actions below and answer "Yes" or "No". Provide explanation for any "No" answers in box below.
○	○	**Instrument has been cleaned of hazardous substances**. Rinse tubing or piping, wipe down scanner surfaces, or otherwise make sure removal of any dangerous residue. Make sure the area around the instrument is clean. If radioactivity has been used, perform a wipe test or other suitable survey.
○	○	**Adequate space and clearance is provided to allow safe access** for instrument service, repair or installation. In some cases this may require customer to move equipment from normal operating location prior to Cytiva arrival.
○	○	**Consumables, such as columns or gels, have been removed or isolated from the instrument and from any area that may impede access to the instrument.**
○	○	**All buffer / waste vessels are labeled. Excess containers have been removed from the area to provide access.**
Provide explanation for any "No" answers here:		

Equipment type / Product No:		Serial No:	

I hereby confirm that the equipment specified above has been cleaned to remove any hazardous substances and that the area has been made safe and accessible.

Name:		Company or institution:	
Position or job title:		Date (YYYY/MM/DD):	
Signed:			

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Product return or servicing

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Health & Safety Declaration Form for Product Return or Servicing

Return authorization number:		*and/or* **Service Ticket/Request:**	

To make sure the mutual protection and safety of Cytiva personnel, our customers, transportation personnel and our environment, all equipment must be clean and free of any hazardous contaminants before shipping to Cytiva. To avoid delays in the processing of your equipment, complete this checklist and include it with your return.

1. Note that items will NOT be accepted for servicing or return without this form
2. Equipment which is not sufficiently cleaned prior to return to Cytiva may lead to delays in servicing the equipment and could be subject to additional charges
3. Visible contamination will be assumed hazardous and additional cleaning and decontamination charges will be applied

Yes	No	Specify if the equipment has been in contact with any of the following:	
◯	◯	Radioactivity (specify)	
◯	◯	Infectious or hazardous biological substances (specify)	
◯	◯	Other Hazardous Chemicals (specify)	

Equipment must be decontaminated prior to service / return. Provide a telephone number where Cytiva can contact you for additional information concerning the system / equipment.

Telephone No:		
Liquid and/or gas in equipment is:	☐	**Water**
	☐	**Ethanol**
	☐	**None, empty**
	☐	**Argon, Helium, Nitrogen**
	☐	**Liquid Nitrogen**
	Other, specify	

Equipment type / Product No:		**Serial No:**	

I hereby confirm that the equipment specified above has been cleaned to remove any hazardous substances and that the area has been made safe and accessible.

Name:		**Company or institution:**	
Position or job title:		**Date (YYYY/MM/DD)**	
Signed:			

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To receive a return authorization number or service number, call local technical support or customer service.

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