

Advance Optima Continuous Gas Analyzers

AO2040-CU Ex

Central Unit in Category 2G

Operator's Manual (Abridged)

41/24-130 EN Rev. 3



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Preface

Content of the Operator's Manual

This operator's manual for the AO2040-CU Ex central unit in Category 2G is a supplement to the AO2000 Series continuous gas analyzers operator's manual (Publication No. 42/24-10 EN).

It should always be used in conjunction with the primary operator's manual and contains all the information required for proper and safe installation, start-up and operation of the AO2040-CU Ex central unit.

Note the information on the "Analyzer Data Sheet" shipped with every AO2040-CU Ex central unit.

Symbols and Fonts Used in the Manual



Identifies safety information to be heeded during AO2040-CU Ex central unit operation in order to avoid risks to the user.



Identifies specific information on operation of the AO2040-CU Ex central unit as well as on the use of this manual.

1, 2, 3, ...

Identifies reference numbers in figures.

General Safety Information

Requirements for Safe Operation

In order to operate in a safe and efficient manner, the AO2040-CU Ex central unit should be properly handled and stored, correctly installed and set-up, properly operated and correctly maintained.

Personnel Qualifications

Only persons familiar with the installation, set-up, operation and maintenance of comparable equipment and certified as being capable of such work should work on the AO2040-CU Ex central unit.

Special Information and Precautions

These include

- The content of this operator's manual.
- The safety information affixed to the AO2040-CU Ex central unit.
- Safety precautions for the installation and operation of electrical devices.
- Safety precautions for working with gases, acids, condensates, etc.
- Regulations, standards and guidelines for explosion protection.

National Regulations

The regulations, standards and guidelines cited in this operator's manual are applicable in the Federal Republic of Germany. The applicable national regulations should be followed when the AO2040-CU Ex central unit is used in other countries.

AO2040-CU Ex Central Unit Safety and Safe Operation

The AO2040-CU Ex central unit is designed and tested in accordance with EN 61010 Part 1/IEC 61010-1, "Safety Provisions for Electrical Measuring, Control, Regulation and Laboratory Instruments" and has been shipped ready for safe operation.

To maintain this condition and to assure safe operation, read and follow the safety information identified with the \triangle symbol in this manual. Failure to do so can put persons at risk and can lead to AO2040-CU Ex central unit damage as well as damage to other systems and instruments.

Additional Information

If the information in this operator's manual does not cover a particular situation, ABB Service is prepared to supply additional information as needed.

Contact your local ABB Service representative. For emergencies, please contact:

ABB Service, Telephone: +49-(0)180-5-222580, Telefax: +49-(0)621-38193129031, E-Mail: automation.service@de.abb.com

Special Safety Instructions for Handling the AO2040-CU Ex

Observe Safety Precautions	Before starting any work on the AO2040-CU Ex central unit, observe all explosion-protection safety precautions.
Do Not Work Where There is a Risk of Explosion	While there is a risk of explosion, do not work on current-bearing components, except intrinsically safe circuits, and do not work with equipment that poses an ignition hazard.
Potential Compensation Connection	The connection to the local potential compensation point must be made before all other connections.
Risks of Loss of Potential Compensation Continuity	The AO2040-CU Ex central unit can be hazardous if the potential compensation is interrupted inside or outside the central unit or if the potential compensation is disconnected.
Proper Operating Voltage	Be sure the AO2040-CU Ex central unit voltage setting matches the line voltage before connecting the power supply.
Risks Involved in Opening the Covers	Current-bearing components can be exposed when the covers or parts are removed, unless this can be done without tools. Current can be present at some connection points.
Risks Involved in Working with an Open AO2040-CU Ex Central Unit	The AO2040-CU Ex central unit must be disconnected from all power sources before being opened for any work. All work on a central unit that is open and connected to power should only be performed by trained personnel who are familiar with the risks involved.
Risks of Charged Capacitors	The AO2040-CU Ex central unit power supply capacitors require 10 minutes to discharge after the central unit is disconnected from all power sources. Observe the safety precautions indicated on the housing components.
When Safe Operation can no Longer be Assured	<p>If it is apparent that safe operation is no longer possible, the AO2040-CU Ex central unit should be taken out of operation and secured against unauthorized use.</p> <p>The possibility of safe operation is excluded:</p> <ul style="list-style-type: none">• If the central unit is visibly damaged• If the central unit no longer operates• After prolonged storage under adverse conditions• After severe transport stresses

Unpacking and Installing the AO2040-CU Ex Central Unit



CAUTION!

The AO2040-CU Ex central unit weighs approx. 28 kg! The following points should be observed:

- Two persons are needed for unpacking and installation.
- The installation location must be stable in order to support the central unit's weight.

Items Included

Qty.	Description
1	AO2040-CU Ex Central Unit
1	Analyzer Data Sheet (in the system housing)
1	AO2000 Series Operator's Manual (publication no. 42/24-10 EN)
1	AO2040-CU Ex Central Unit in Category 2G Operator's Manual (Abridged) (publication no. 41/24-130 EN)
1	Compressed Air Conditioning Filter

Installation Site

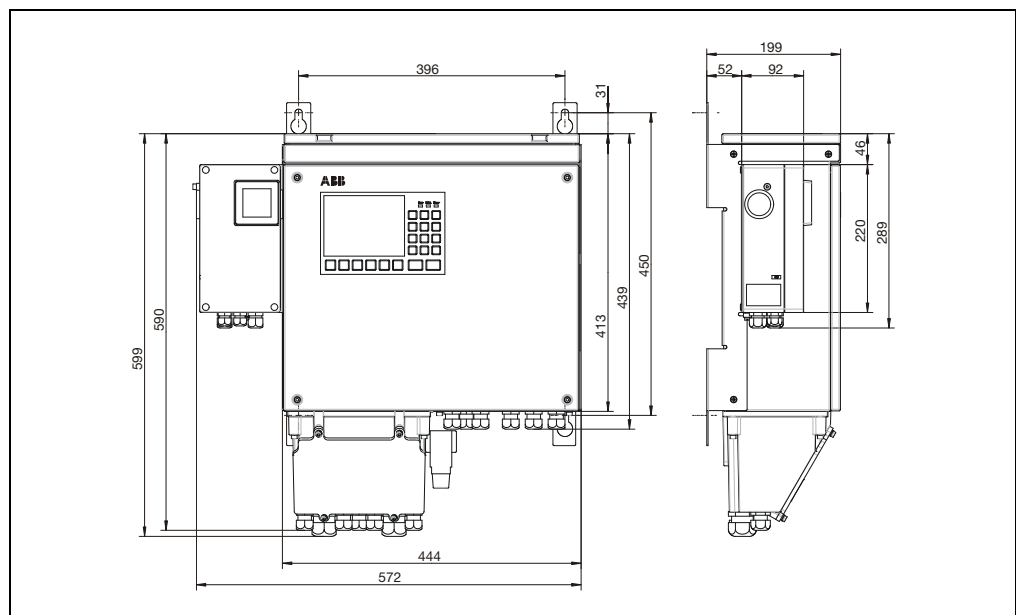
The AO2040-CU Ex central unit can be installed in Zone 1 and Zone 2 explosion hazard areas (see "Operating Specifications" section, page 20)



Do not install the AO2040-CU Ex central unit outdoors.

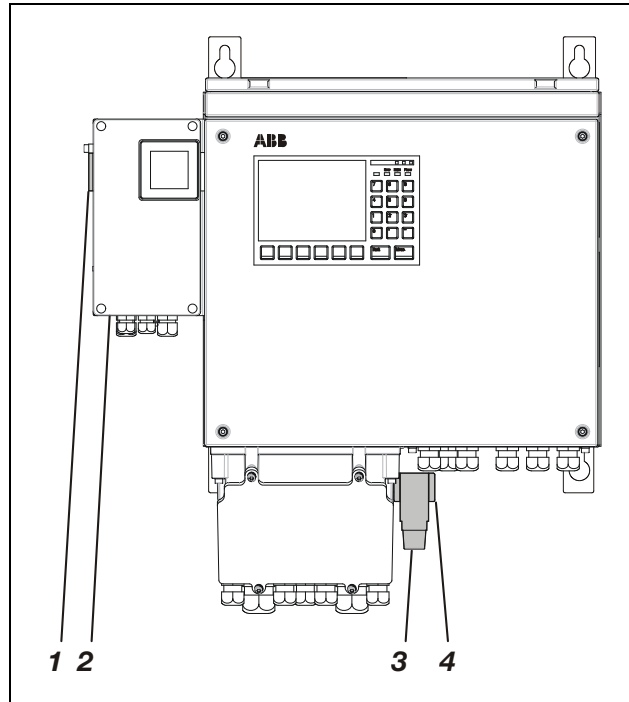
Dimensional Diagram

Figure 1
AO2040-CU Ex
Central Unit
Dimensional Diagram
 (dimensions in mm)



Connecting the Ignition Suppression Gas Line

Figure 2
Pressurized Enclosure System Modules



- 1** Ignition Suppression Gas Outlet with Particle Trap
- 2** Control Unit
- 3** Ignition Suppression Gas Valve
- 4** Ignition Suppression Gas Inlet DIN ISO G1/4

Ignition Suppression Gas

Use air as the ignition suppression gas (quality per ISO 8573-1, class 3; see “Operating Specifications” section, page 20).

Contamination of the Ignition Suppression Gas Line



Mechanical treatment of the ignition suppression gas line can lead to contamination of the gas line.

When the contamination gets to the ignition suppression gas valve, the valve does not close completely and the ignition suppression gas flows into the housing with the full working pressure of $p_e = 250\text{--}500\text{ kPa}$ (= 2.5–5 bar). An indication for a possible damage to the housing is an outward vaulting of the display and control unit key pad.

For a reliable retention of the contamination it is absolutely necessary to install the delivered compressed air conditioning filter in the ignition suppression gas line.

Ignition Suppression Gas Line Connection

(see Figure 2)

Step	Action
1	<p>Install the delivered compressed air conditioning filter as near as possible in front of the ignition suppression gas valve 3 and connect it to the ignition suppression gas inlet 4 (DIN ISO G 1/4).</p> <p> Take care that the cable openings of the signal, control and interface wiring remain accessible.</p>
2	<p>Connect the ignition suppression gas line to the ignition suppression gas inlet of the compressed air conditioning filter.</p> <p> Use a line with a cross-section large enough (depending on the line length) to provide the required flow rate and the required working pressure.</p>

Connecting Electrical Lines – Safety Instructions



CAUTION!

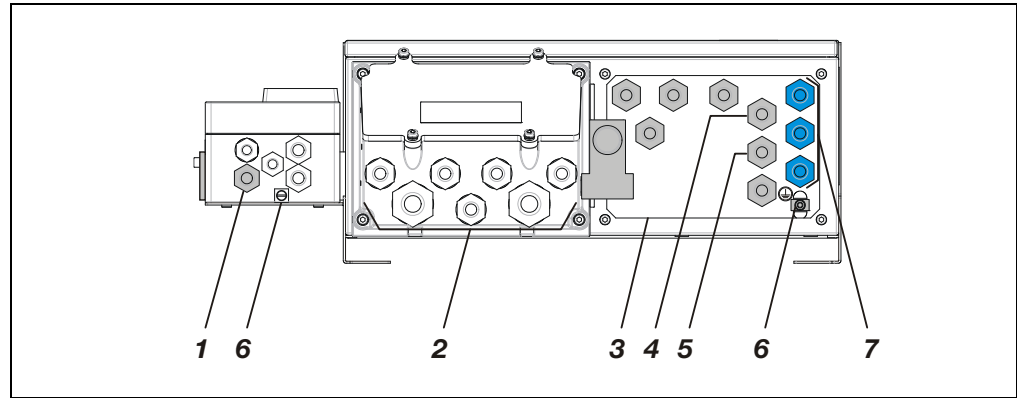
Follow all applicable national safety regulations for the preparation and operation of electrical devices as well as the following safety precautions.

Changing Factory Wiring	Factory internal wiring between the isolation relays and the system controller and I/O board connectors can be changed by the user. However, no additional wiring should be added. Changes should be documented in the analyzer data sheet. The addition of cables to device-internal wiring or the installation of additional electrical equipment represents a change to the electrical device and is hence forbidden. The operating specifications and the routing instructions must be followed.
Potential Compensation	The external potential compensation connection or the protective lead must be connected to the local potential compensation point. The connection to the local potential compensation point must be made before all other connections. Minimum conductor section = 4 mm ² . The AO2040-CU Ex central unit can be hazardous if the potential compensation connection is interrupted inside or outside the central unit or if the potential compensation connection is loosened or removed.
Securing Electrical Lines	All electrical wiring, including the AO2040-CU Ex central unit wiring, must be firmly secured.
Shielded Lines	Shielded lines (e.g. the system bus cable) must be routed through the metal wiring connectors. The shield braid must be placed on the cable connectors.
Lines for Intrinsically Safe Signals	The lines for intrinsically safe signals should only be connected to the blue cable connectors. Inside the AO2040-CU Ex central unit they must be separated from other lines by at least 8 mm. Only suitable electrical circuits should be connected to the isolation modules terminals!
Lines for Communication Interfaces	Zone 1 RS232, RS485 and Ethernet-10BASE-T interface leads must be routed via isolation relays factory-wired for this purpose. Leads should never be connected directly to the electronics module ports in the connection box.
Connecting the Power Supply	Before the power supply is connected, make sure the AO2040-CU Ex central unit operating voltage (see the identification plate) is set for the power line voltage. The power supply lines should be connected to the control unit for the pressurized enclosure system. They should never be connected directly to the system housing ports. This will compromise the explosion protection function.
Compromising Explosion Protection	Connecting external electrical leads to points in the connection box mounted on the AO2040-CU Ex central unit will compromise explosion protection. This should be done only for maintenance purposes.

Electrical Connections

Figure 3

Electrical Connections



- 1 Cable opening M20 for power supply on the control unit for the pressurized enclosure system
- 2 Cable openings for internal wiring connections
- 3 Connection plate with 6 black cable openings M20 for non-intrinsically safe wiring (some cable openings are used for internal wiring connections)
- 4 Metallic cable opening M20 for the shielded system bus cable of the AO2060-... analyzer module
- 5 Cable opening M20 for the 24-VDC connection cable of the AO2060-... analyzer module
- 6 Potential compensation connectors
- 7 3 light blue cable openings M20 for intrinsically safe wiring

Connecting Electrical Leads

Threaded Cable Connections

Type of Connector	Application
Light blue M20 connector	Intrinsically safe connecting leads
Black M20 connector	Non-intrinsically safe connecting leads, AO2060-... analyzer module 24 VDC connecting cable
Metallic M20 connector	AO2060-... analyzer module system bus cable (see page 12 for special notes and instructions)

Permissible Cable Diameters

The M20 threaded connectors are suitable for cables with outer diameters of 6-12 mm.

Sealing Unused Cable Connections

- Only the manufacturer's original equipment plugs should be used to close off the threaded cable connectors.
- Unused cable connectors must be closed off with factory-provided plugs.
- Securely tighten the cap nuts on the unused cable connectors (torque to 2.5 Nm).

AO2040-CU Ex Central Unit Electrical Equipment

Device	Description
-K01 through -K04	Isolation relays (-K01 standard, -K02 through -K04 optional) for connection of system bus and non-intrinsically safe signal leads, maximum load 30 VDC/0.4 A
-K05	Terminal strip for connecting the 8-wire AO2060-... analyzer module system bus cable leads not connected to isolation relay -K01
-Z01	Line filter for connecting the 3-wire AO2060-... analyzer module 24 VDC cable
-B01	Pressurized enclosure system control unit, power supply (230 VAC or 115 VAC, non-adjustable) status signal $p_e < 1.2$ hPa
-B02	Isolation amplifier for condensate monitor (option), Type ER 144A/Ex, electrical connection see page 13
-B03.x	Isolation amplifier for flow monitor (option), Phoenix Contact Type MACX MCR-EX-SL-2NAM-RO
-B04.x	Passive isolator for current output (option), Phoenix Contact Type MACX MCR-EX-SL-IDS1-I
-B05.x	Valve control unit for solenoid valves (option), Phoenix Contact Type MACX MCR-EX-SL-SD-21-60-LP
-B06.x	Isolation relay for switch contact (option), Pepperl+Fuchs Type KFD0-RO-Ex2



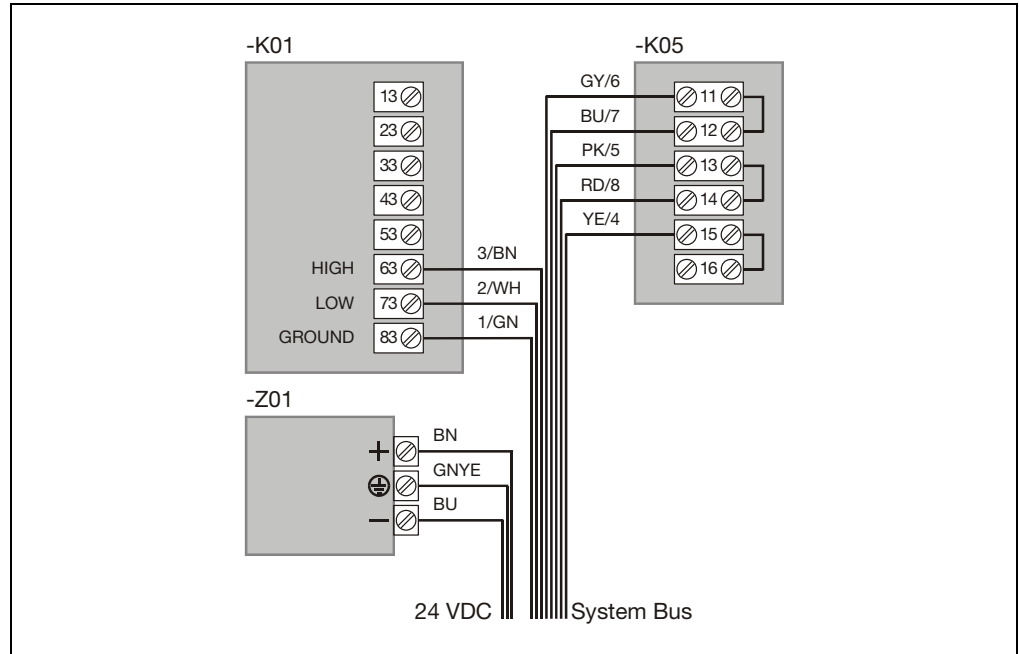
Information about electrical connection of the isolation amplifiers is contained in the respective data sheets of the manufacturers. These publications can be found on the enclosed CD-ROM under AO2000 Series – Operator's Manuals.

Information about electrical data of the isolation amplifiers is contained in the respective EC-Type Examination Certificates. These publications can be found on the enclosed CD-ROM under AO2000 Series – Certificates.

AO2060-... Analyzer Module Connection

Figure 4

Diagram for Connecting AO2060-... Analyzer Module to AO2040-CU Ex Central Unit



CAUTION!

The system bus and 24 VDC cables are integral components of the pressurized enclosure system. They should not be shortened to less than 1 meter in length and should not be damaged!

Continued on next page

Connecting the System Bus Cable to the AO2040-CU Ex Central Unit

Step	Action
1	Remove the cap nut from the metallic cable connector and remove the plastic insert and seal ring.
2	Strip the outer cover from approx. 10 mm of the system bus cable.
3	Slide the cap nut 1 , seal ring 2 and plastic insert 3 over the system bus cable 4 .

4	Bend the shield braid 5 outward and fold it back over the plastic insert 3 .
5	Push the system bus cable into the intermediate opening 6 in the metallic cable connector until the braid touches the opening and then push it in and out several times.
6	Push the non-rotating plastic insert 3 and seal ring 2 in the intermediate opening 6 until it engages.
7	Securely tighten the cap nut 1 .
8	Connect the system bus cable leads to the isolation relay -K01 and to terminal strip -K05 (see Figure 4).

Connecting the 24 VDC Cable to the AO2040-CU Ex Central Unit

Step	Action
1	Route the 24 VDC connecting cable into the AO2040-CU Ex central unit through a threaded connector.
2	Connect the 24 VDC connecting cable leads to line filter -Z01 (see Figure 4).

Connecting Non-Intrinsically Safe Signal Leads

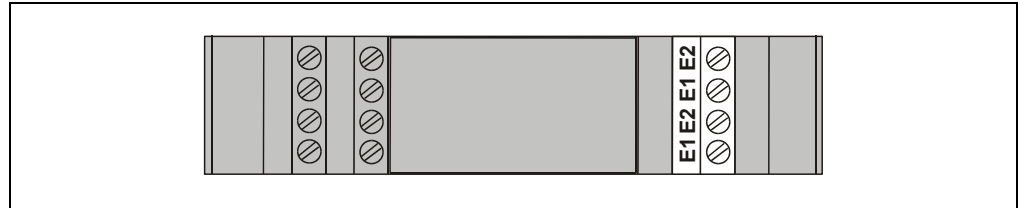
Connecting Signal Leads

Connect non-intrinsically safe signal leads to the right side of isolation relays -K01 to -K04.

ER 144A/Ex Isolation Amplifier for Condensate Monitor

Figure 5

ER 144A/Ex (-B02) Connection Diagram



Connecting Signal Leads

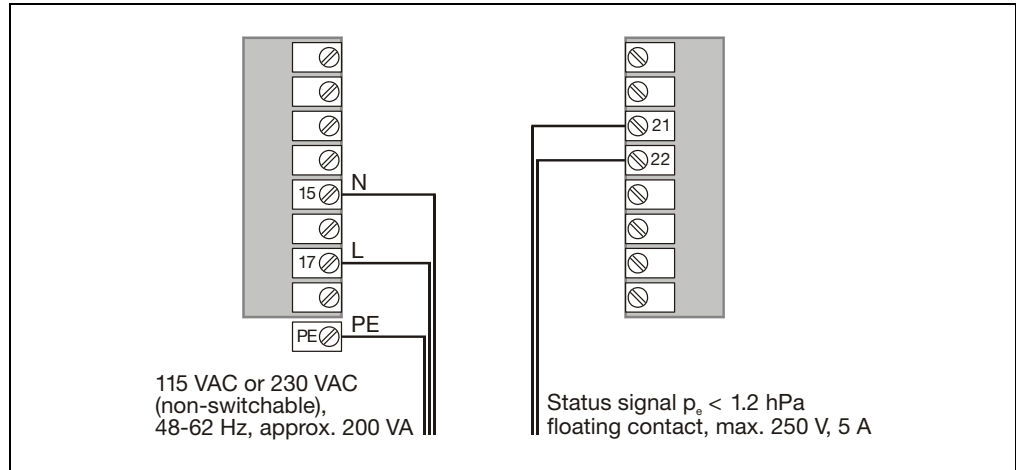
Route the condensate monitor's intrinsically safe signal leads through a bright blue cable connection and connect them to the terminals E1 and E2 on the right side of the ER 144A/Ex isolation amplifier.

The total length of the connecting leads should not exceed 75 meters. Install the supplied 100-k Ω resistor parallel to the sensor and as close to the sensor as possible. The 100-k Ω resistor is already installed on the sensor in the stainless steel version of the condensate monitor.

Connecting Status Signal, Potential Compensation and Power Supply

Figure 6

Control Unit (-B01)
Connection Diagram



CAUTION!

The AO2040-CU Ex central unit can be hazardous if the protective lead is interrupted inside or outside the central unit or if the potential compensation connection is loosened or removed. The power supply lines should be connected to the control unit for the pressurized enclosure system. They should never be connected directly to the system housing ports. This will compromise the explosion protection function!




Connecting Potential Compensation

Connect the AO2040-CU Ex central unit's external potential compensation connection and/or protective lead to the local potential compensation point. Minimum conductor section = 4 mm².

Connecting the Status Signal

Connect the minimum housing internal pressure underflow status signal (see "Pressurized Enclosure System" section, page 19) to terminals 21 and 22 on the control unit (see Figure 10).

Connecting the Power Supply

Step	Action
1	 Make sure the AO2040-CU Ex central unit voltage setting (see the identification plate) matches the line voltage.
2	Make sure the power supply leads have an adequately dimensioned protective device (breaker).  Power consumption approx. 200 VA
3	Install an easily accessible breaker in the power supply line or a switched receptacle near the AO2040-CU Ex central unit to make sure the central unit can be completely separated from the power source. Mark the breaker so that its relationship to the protected device is clear.
4	Connect the power supply leads to the terminals 15 (N) and 17 (L) and to the PE terminal on the control unit (see Figure 6).  The connections to the other terminals are part of the internal wiring. They must not be changed.

**CAUTION!**

If the AO2040-CU Ex central unit must be opened for operation or maintenance, the following safety information (which also appears on the central unit housing) must be followed:

Before opening, disconnect power and wait 10 minutes!

AO2040-CU Ex Central Unit Start-Up

Installation Check

Make sure the AO2040-CU Ex central unit is correctly installed before carrying out any start-up procedures. Use the following check list:

Test	✓
Installation site conditions (zone, explosion group, temperature class) match the information on the type plate?	<input type="checkbox"/>
AO2040-CU Ex central unit not installed outdoors? AO2040-CU Ex central unit securely mounted? Ignition suppression gas flows freely? (see “Unpacking and Installing the AO2040-CU Ex central unit”, page 6)	<input type="checkbox"/>
AO2040-CU Ex central unit housing intact? Housing tightly sealed? Unused cable connectors tightly sealed? (see “Connecting Electrical Leads” section, page 9)	<input type="checkbox"/>
Ignition suppression gas lines correctly installed? AO2040-CU Ex central unit can be adequately purged? (see “Connecting the Ignition Suppression Gas Line” section, page 7)	<input type="checkbox"/>
All electrical lines properly routed, secured and connected? (see “Connecting Electrical Leads – Safety Instructions” section, page 8 and “Connecting Electrical Leads” section, page 9)	<input type="checkbox"/>
Line power matches operating voltage setting? (see type label) Operating voltage cannot be changed.	<input type="checkbox"/>
Control unit cover securely closed? Bypass disengaged? Ignition suppression gas pilot pressure within specified limits?	<input type="checkbox"/>
Ex-i circuit characteristics within requirements? At least 8 mm between Ex-i circuit leads and other lines?	<input type="checkbox"/>

Continued on next page


AO2040-CU Ex Central Unit Start-Up

Step	Action
1	Turn on the power supply.
2	Turn on the ignition suppression gas supply.
3	After the preliminary purge is finished, the solenoid valve is switched to “leak loss compensation”, and the power supply for the units in the system housing is activated.



An ignition suppression gas pilot pressure of $p_e > 500 \text{ kPa}$ (= 5 bar) can cause problems during the preliminary purge.

Operational Checkout The following events will occur after the power supply is turned on:

Phase	Description
1	The “Power”, “Maint” and “Error” LEDs light up.
2	The different booting phases are displayed on the screen. Also the software version is displayed.
3	After a brief time the screen switches to measurement mode.
4	The  softkey appears on the screen. This indicates the possibility of a temperature or flow problem during the warm-up phase. By pressing the softkey the user can recall the status message summary and view status message details.



CAUTION!

The system controller in the AO2040-CU Ex central unit does not have a battery backup for use in case of power outages. The following data are lost in the event of a power outage:

- Date and time settings,
- All logbook entries and all data, which are not saved with the “Save configuration” function.

Do not install a battery in the AO2040-CU Ex central unit’s system controller to handle a power outage!

Inspection and Maintenance

Overriding the Pressurized Enclosure System

If no explosive atmosphere is present, the power supply for the units in the system housing can be turned on, even if the pressurized enclosure system is not active.

To accomplish this it is necessary to activate the bypass in the control unit of the pressurized enclosure system.



CAUTION!

With the bypass activated, the AO2040-CU Ex central unit should only be used with the approval of the operations manager or his/her delegate.

Such approval may only be given

- if there is assurance that for the period needed for the work to be carried out there will not be an explosive atmosphere present or
- the measures necessary to protect against explosions are in effect (“fire permission certificate”).

In normal operation of the AO2040-CU Ex central unit the bypass must be deactivated!

Bypass Activation

Step	Action
1	Remove the cover of the control unit of the pressurized enclosure system.
2	Press BYPASS key.
3	Enter code “4711”.
4	Press MENU key. The ignition suppression gas supply is turned off and “BYPASS” is blinking in the display.

Bypass Deactivation

Step	Action
1	Press BYPASS key.
2	Enter code “4711”.
3	Press MENU key. The ignition suppression gas supply is turned on.
4	Close the cover of the control unit.

Regular Inspection

Proceed according to the checklist on page 15.

Application and Design

Intended Operation The AO2040-CU Ex central unit is intended for use in conjunction with the AO2060-Caldos15, AO2060-Caldos17, AO2060-Magnos106 and AO2060-Uras14 analyzer modules to control and monitor measurement and control processes.

Design The system housing is designed as a wall-mount unit. It is designed for ignition suppression “Pressurized Enclosure with Leak Loss Compensation” per EN 60079-2. The control unit of the pressurized enclosure system is mounted on the outside left sidewall of the system housing.

Circuitry Intrinsically safe and non-intrinsically safe signal circuits can be brought into the AO2040-CU Ex central unit.

All non-intrinsically safe circuits that will remain powered when the pressurized enclosure system is deactivated shall be connected to isolation relays. Intrinsically safe circuits should be connected to suitable isolation modules.

The circuits under the display/control unit keypad sheet are intrinsically safe.

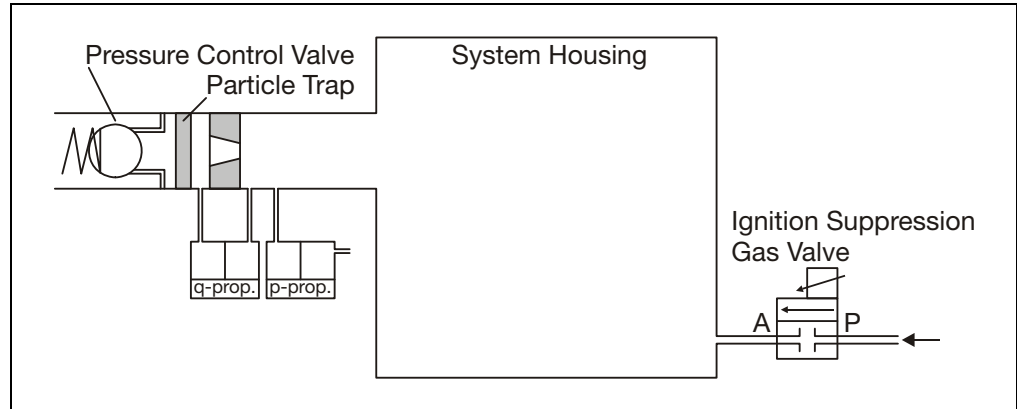


The system controller does not have a battery backup for use in case of power outages.

Pressurized Enclosure System

Figure 7

Pressurized Enclosure System Design



Ignition Suppression Gas

Use air as the ignition suppression gas (quality per ISO 8573-1, class 3; see “Operating Specifications” section, page 20).

The ignition suppression gas is routed from the AO2040-CU Ex central unit to the explosion-risk area. The control unit outlet opening contains a particle trap to prevent the passage of sparks and glowing particles.

Preliminary Purge at Start-Up

The preliminary purge volume is factory-set and shown on the identification plate. After the preliminary purge is finished, the ignition suppression gas valve is switched to “leak loss compensation”, and the power supply for the units in the system housing is activated.

Purge During Operation

During operation, the ignition suppression gas flows to maintain a positive pressure of $p_e \approx 2$ hPa inside the system housing. A pressure control valve limits the pressure inside the system housing.

Positive Pressure Monitoring

If the positive pressure falls below the $p_e = 0.8$ hPa minimum value or exceeds the $p_e = 15$ hPa maximum value, the power supply for the units in the system housing is deactivated and the circuits connected to the isolation relays are completely disconnected.


After the internal pressure again rises over the minimum value or falls below the maximum value, a preliminary purge is carried out and the power supply and connected circuits are reactivated.

Status Signal Output

A status signal is output via a passive relay contact (EEx e terminals 21 and 22 in the control unit, max. 250 V, 5 A) if the internal pressure falls below the factory-set value $p_e = 1.2$ hPa.

Operating Mode	Relay Contact
Internal pressure $p_e \geq 1.2$ hPa, ready, on	closed
Internal pressure $p_e < 1.2$ hPa, preliminary purge, bypass, pressurized enclosure failure	open

Operating Specifications

EC Type Examination Certificate	DMT 03 ATEX E 006	
Designation	 II 2G Ex px e d [ib] IIC T4	
Level of Protection	Device Group	II
	Category	2 G
Explosion Protection	Ignition Protection Type	Pressurized enclosure “p” with leak loss compensation
	Explosion Group	IIC
	Temperature Class	T4
Ambient Temperature	Operation	+5 to +50 °C
	Storage and Transport	-25 to +65 °C
Power Supply	Input Voltage	230 VAC or 115 VAC (non-switchable), 48 to 62 Hz
	Power Consumption	Approx. 200 VA
Signal Circuits	Intrinsically Safe Circuits	Connection via isolation modules (e.g. condensation monitor or flow rate monitor); connection data are shown on the modules EC Type Examination Certificates (see enclosed CD-ROM).
	Non-Intrinsically Safe Circuits	Connection via isolation relays (e.g. measurement signals, status signals), max. 30 VDC/0.4 A
Gas Data	Internal Volume	36 l
	Minimum Flow Rate	
	Preliminary Purge	1 l/sec
	Operation	Leak loss compensation, approx. 40 l/h at 2 hPa
	Preliminary Purge Volume	320 l/1100 l without/with isolation modules
	Preliminary Pressure	$p_e = 250$ to 500 kPa
	Min. Positive Pressure	$p_e \geq 0.8$ hPa
	Max. Positive Pressure	$p_e \leq 15$ hPa
	Ignition Suppression Gas	Air, quality per ISO 8573-1, class 3 (max. particle size $40 \mu\text{m}$, max. oil content 1 mg/m^3 , max. pressure dew point $+3 \text{ }^\circ\text{C}$)
Housing	Design	Wall-mount housing
	Housing Protection Type	IP 54
	Dimensions	see dimensional drawing (Figure 1, page 6)
	Weight	Approx. 28 kg

Electrical Safety

Test	per EN 61010-1:2001
Protection Class	I
Overvoltage Category/ Pollution Level	Power supply: III/2 Signal inputs and outputs: II/2
Safe Isolation	The electronics module power supply is galvanically isolated from other circuits by means of reinforced or double insulation. Protective extra low voltage (PELV) on low-voltage side

Electromagnetic Compatibility

Noise Immunity	Tested to EN 61326-1:2006. Inspection severity: Industrial area, fulfills at least the rating “continuously monitored operation” to Table 2 of EN 61326.
Emitted Interference	Tested to EN 61326-1:2006, EN 61000-3-2:2006 and EN 61000-3-3:1995 + A1:2001 + A2:2005. Limit value class B for interference field strength and interference voltage is met.

Electrical Equipment in Explosion Hazard Zones: Installation, Maintenance and Repair Notes

Installation per EN 60079-14	The electrical device shall be installed according to EN 60079-14 “Electrical Equipment in Gas Explosion Hazard Areas”, Part 14: “Electrical Equipment in Explosion Hazard Areas”.
Potential Compensation	The requirements of EN 60079-14 shall be observed.
Electrostatic Charges	Avoid electrostatic discharges.
Monitoring and Inspection	The condition of electrical systems in explosion risk areas must be monitored. As necessary, and at least every three years, the system shall be inspected by a qualified electrician if it is not under continuous monitoring by a responsible engineer.
Work on Electrical Systems	The power supply must be disconnected before performing any work on electrical systems in explosion risk areas. The breaker is to be fitted with an appropriate label, e.g. “Do Not Turn On – Risk of Explosion”. This does not apply to devices that are opened during operation, e.g. registration apparatus, or to devices which have been expressly type certified for such operation.
Work on Intrinsically Safe Circuits	Work may be performed on intrinsically safe circuits in explosion risk areas even while power is connected. However, the electrical characteristics (inductance, capacitance, current and voltage) of test equipment should be noted when such equipment is activated. Special attention is required if work is carried out on intrinsically safe circuits set up in conjunction with Zone 0 areas.
Explosion Risk	The explosion risk should be eliminated prior to carrying out any repair work.
Personnel Qualifications	Repair work should only be performed by qualified personnel.
Original Parts	Only original parts should be used for repairs.
Testing Prior to Recommissioning	If repair work is carried out on components of electrical equipment, on which the explosion protection depends, an expert must check and certify that the essential explosion protection characteristics of the apparatus correspond to the construction and design of the apparatus described in the certificate before it is returned to service.
Manufacturer’s Repairs	Repairs can also be carried out by the manufacturer, e.g. on site by an ABB Service employee or at the manufacturer’s facility. In this case the repair carried out and the subsequent inspection will be shown on the device identification plate. An inspection by an expert is not required in such a case.

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