

# Continuous Gas Analyzers AO2000 Series

AO2040-CU Ex Central Unit in Category 2G

## Operator's Manual

42/24-13 EN Rev. 3



# Table of Contents

|  | Page |
|--|------|
| Preface  | 3    |
| General Safety Information   | 4    |
| Special Safety Instructions for Handling the AO2040-CU Ex Central Unit       | 5    |
| <b>Chapter 1</b>   |      |
| <b>Installation</b>  |      |
| Unpacking and Installing the AO2040-CU Ex Central Unit                       | 6    |
| Dimensional Diagram  | 7    |
| Connecting the Ignition Suppression Gas Line                                 | 8    |
| Connecting Electrical Lines – Safety Instructions                            | 9    |
| Electrical Connections   | 10   |
| Connecting Electrical Leads  | 11   |
| AO2040-CU Ex Central Unit Electrical Equipment                               | 12   |
| AO2060-... Analyzer Module Connection  | 13   |
| Connecting Non-Intrinsically Safe Signal Leads                               | 15   |
| Connecting Condensate Monitor  | 16   |
| Connecting Flow Monitor  | 17   |
| Connecting Peripheral Devices (Current Signal 0(4)–20 mA)                    | 18   |
| Connecting Solenoid Valve  | 19   |
| Connecting Switching Contact Circuits  | 20   |
| Connecting Status Signal, Potential Compensation and Power Supply            | 21   |
| <b>Chapter 2</b>   |      |
| <b>Operation and Maintenance</b>   |      |
| AO2040-CU Ex Central Unit Start-Up   | 22   |
| Inspection and Maintenance   | 24   |
| <b>Appendix</b>  |      |
| AO2040-CU Ex Central Unit: Application and Design                            | 25   |
| Pressurized Enclosure System   | 26   |
| Operating Specifications   | 27   |
| Declaration of Conformity (Extract)  | 28   |
| EC Type Examination Certificate  | 33   |
| Electrical Equipment in Explosion Hazard Zones: Legal Principles             | 36   |
| Electrical Equipment in Explosion Hazard Zones: Installation Notes           | 37   |
| Electrical Equipment in Explosion Hazard Zones: Maintenance and Repair Notes | 38   |
| Index  | 39   |

# 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.

## Supplementary Documentation

| Title   | Publication No. |
|---|-----------------|
| AO2060-Caldos15, -Caldos17, -Magnos106, -Uras14<br>Category 2G Analyzer Modules – Operator's Manual | 42/24-12 EN     |

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## Additional Information on the Internet

Additional information on ABB Analytical products and services is available on the Internet at <http://www.abb.com/analytical>.

## 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, "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  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 or

ABB Service, Telephone: +49-180-5-12 35 80, Fax: +49-6 21-3 81-51 35,  
E-mail: [callcenter.automation@de.abb.com](mailto:callcenter.automation@de.abb.com)

# Special Safety Instructions for Handling the AO2040-CU Ex Central Unit

|   |   |
|---|---|
| <b>Observe Safety Precautions</b>                                       | Before starting any work on the AO2040-CU Ex central unit, observe all explosion-protection safety precautions.   |
| <b>Do Not Work Where There is a Risk of Explosion</b>                   | 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.  |
| <b>Potential Compensation Connection</b>                                | The connection to the local potential compensation point must be made before all other connections.   |
| <b>Risks of Loss of Potential Compensation Continuity</b>               | 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.  |
| <b>Proper Operating Voltage</b>   | Be sure the AO2040-CU Ex central unit voltage setting matches the line voltage before connecting the power supply.  |
| <b>Risks Involved in Opening the Covers</b>                             | 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.  |
| <b>Risks Involved in Working with an Open AO2040-CU Ex Central Unit</b> | 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.  |
| <b>Risks of Charged Capacitors</b>                                      | 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.  |
| <b>Use of Proper Fuses</b>  | Only fuses of the specified type and rated current should be used as replacements. Never use patched fuses. Do not short-circuit the fuse holder contacts.  |
| <b>When Safe Operation can no Longer be Assured</b>                     | <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"><li>• If the central unit is visibly damaged</li><li>• If the central unit no longer operates</li><li>• After prolonged storage under adverse conditions</li><li>• After severe transport stresses</li></ul> |

## Unpacking and Installing the AO2040-CU Ex Central Unit



Follow and note

- The instructions and notes in the “Gas Analyzer Installation” chapter in the AO2000 Series operator’s manual,
- The following special instructions and notes and
- The notes in the “Electrical Equipment in Explosion Hazard Zones” sections in the Appendix.



### 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 (publication no. 42/24-13 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 27)



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

### Ambient Temperature

Operation +5 to +50 °C  
Storage and Transport -25 to +65 °C

### AO2040-CU Ex Central Unit Installation

4 M8 or M10 bolts (not supplied) are needed to install the AO2040-CU Ex central unit.

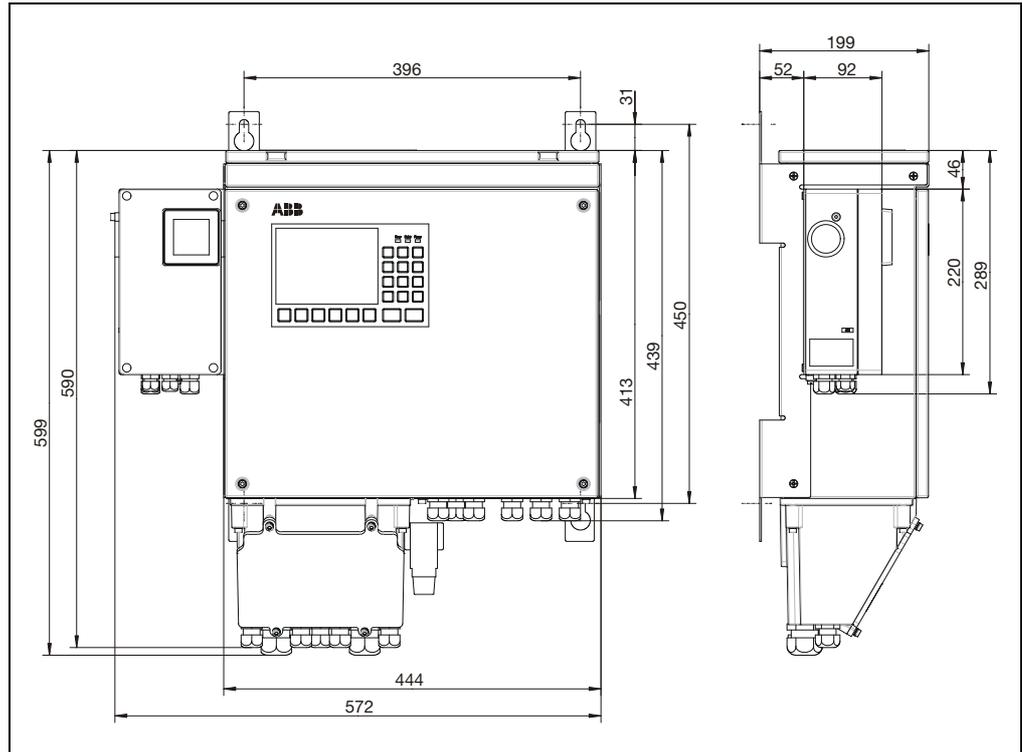


Note the additional space requirements

- Beneath the AO2040-CU Ex central unit for connection lines (approx. 10 cm) and
- To the left of the AO2040-CU Ex central unit for the ignition suppression gas exhaustion (approx. 3 cm).

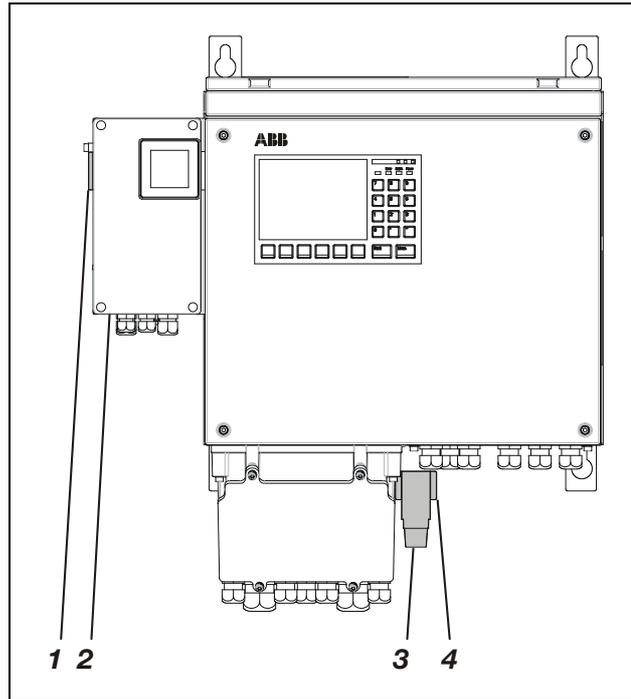
# Dimensional Diagram

**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 27).

**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  $p_e = 250\text{--}500\text{ kPa}$  ( $= 2.5\text{--}5\text{ bar}$ ). 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    | Install the delivered compressed air conditioning filter as near as possible in front of the ignition suppression gas valve <b>3</b> and connect it to the ignition suppression gas inlet <b>4</b> (DIN ISO G 1/4).<br> Take care that the cable openings of the signal, control and interface wiring remain accessible. |
| 2    | Connect the ignition suppression gas line to the ignition suppression gas inlet of the compressed air conditioning filter.<br> 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.  |

## 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 an electrical device under ElexV. Therefore, such work should only be carried out by an employee of the manufacturer or an Ex expert. 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. 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.

#### 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 ER144A/Ex and Contrans I 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.

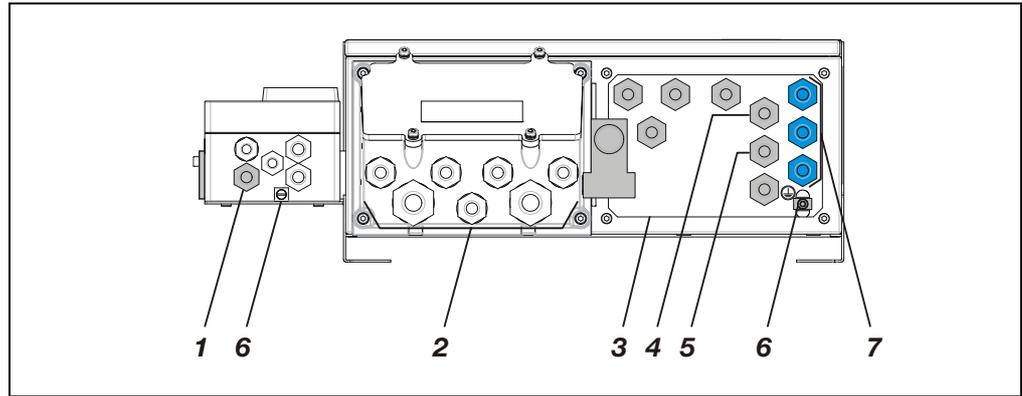
#### Compromising Explosion Protection

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



Follow and note

- The instructions and notes in the “Electrical Connection” chapter in the AO2000 Series operator’s manual,
- The following special instructions and notes and
- The notes in the “Electrical Equipment in Explosion Hazard Zones” sections in the Appendix.

## 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 14 for special notes and instructions) |

## Permissible Cable Diameters

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

## Inserting the Cable in the Housing

| Step | Action   |
|------|--|
| 1    | Remove the cap nut on the threaded connector and remove both seal rings.   |
| 2    | Slide the cap nut <b>1</b> and seal rings over the cable.<br>6-8 mm OD Cable: Use seal rings <b>2</b> and <b>3</b> .<br>8-12 mm OD Cable: Use seal ring <b>2</b> only. |
|      |  |
| 3    | Pass the cable through the intermediate openings <b>4</b> in the housing.  |
| 4    | Tighten cap nut <b>1</b> (torque to 2.5 Nm).   |

## 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).

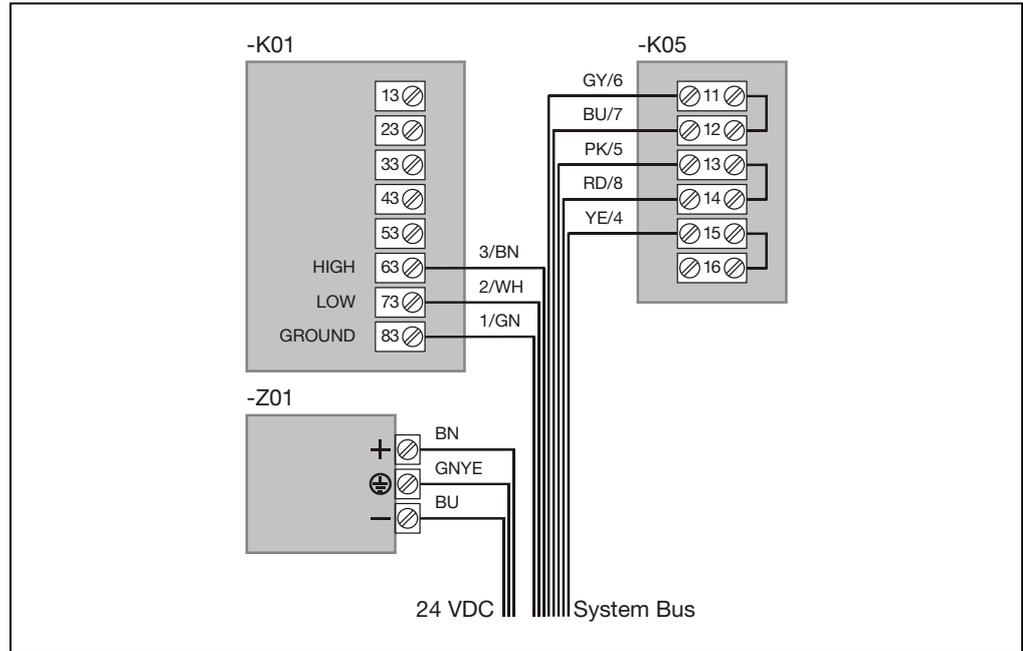
## AO2040-CU Ex Central Unit Electrical Equipment

| Device                               | Description  | For Connection, See |
|--------------------------------------|--|---------------------|
| -K01<br>-K02<br>-K03<br>-K04         | Isolation relays (-K01 standard, -K02 through -K04 optional) for system bus and non-intrinsically safe signal leads, maximum load 30 VDC/0.4 A   | Page 15             |
| -K05                                 | Terminal strip for connecting the 8-wire AO2060-... analyzer module system bus cable leads not connected to isolation relay -K01   | Page 13             |
| -Z01                                 | Line filter for connecting the 3-wire AO2060-... analyzer module 24 VDC cable  | Page 13             |
| -B01                                 | Pressurized enclosure system control unit, power supply (230 VAC or 115 VAC, non-adjustable) status signal $p_e < 1.2$ hPa   | Page 21             |
| -B02                                 | ER 144A/Ex isolation amplifier (option) for condensate monitor, intrinsically safe connection, EEx ia IIC input current circuit, electrical specifications per EC type certification TÜV No. 00 ATEX 1604                        | Page 16             |
| -B03.1<br>-B03.2                     | Contrans I V17131-530 isolation amplifier (option) for flow monitor, intrinsically safe connection, EEx ia IIB/IIC or EEx ib IIB/IIC input current circuit, electrical specifications per EC type certification PTB 99 ATEX 2119 | Page 17             |
| -B04.1<br>-B04.2<br>-B04.3<br>-B04.4 | Contrans I V17153-510 passive isolator (option) for current output, intrinsically safe connection, EEx ib IIB/IIC output current circuit, electrical specifications per EC type certification PTB 00 ATEX 2017X                  | Page 18             |
| -B05.1<br>-B05.2<br>-B05.3           | Contrans I V17132-520 valve control unit (option) for solenoid valves, intrinsically safe connection, EEx ib IIC output current circuit, electrical specifications per EC type certification PTB No. Ex-96.D.2013                | Page 19             |
| -B06.1<br>-B06.2                     | Contrans I V17133-510 isolation relay (option) for switch contact, intrinsically safe connection, EEx ia IIB/IIC or EEx ib IIB/IIC switch contact circuit, electrical specifications per EC type certification PTB 99 ATEX 2067X | Page 20             |

# AO2060-... Analyzer Module Connection

**Figure 4**

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



**AO2060-... Analyzer Module Connecting Cables**

The following cables are factory-connected to the AO2060-... analyzer module:

- 10 meter system bus cable (8 x 0.5 mm<sup>2</sup>) and
- 10 meter 24 VDC connecting cable (3 x 2.5 mm<sup>2</sup>).

The cables are routed through pressure-tight cable passages.

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

Normally the following connections are made (see Figure 4):

- System bus cable to isolation relay -K01 and to terminal strip -K05 and
- 24 VDC connecting cable to line filter -Z01.

**Use of a Connection Box**

A connection box should be used if the AO2060-... analyzer module cable is too short or multiple AO2060-... analyzer modules are to be connected to the AO2040-CU Ex central unit.

For additional information and connecting diagrams see the AO2060-... analyzer modules operator's manual (publication number 42/24-12 EN).

**System Bus Termination Resistor**

In the AO2040-CU Ex central unit, the system bus termination resistor is attached to the electronics module.

**Total Length of System Bus Wiring**

The total system bus wiring length should not exceed 350 meters.

*Continued on next page*

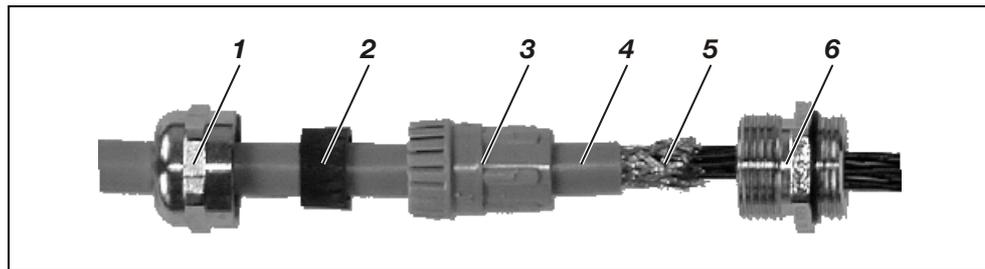


**CAUTION!**

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!

**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 <b>1</b> , seal ring <b>2</b> and plastic insert <b>3</b> over the system bus cable <b>4</b> . |



|   |   |
|---|---|
| 4 | Bend the shield braid <b>5</b> outward and fold it back over the plastic insert <b>3</b> .  |
| 5 | Push the system bus cable into the intermediate opening <b>6</b> 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 <b>3</b> and seal ring <b>2</b> in the intermediate opening <b>6</b> until it engages.   |
| 7 | Securely tighten the cap nut <b>1</b> .   |
| 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.

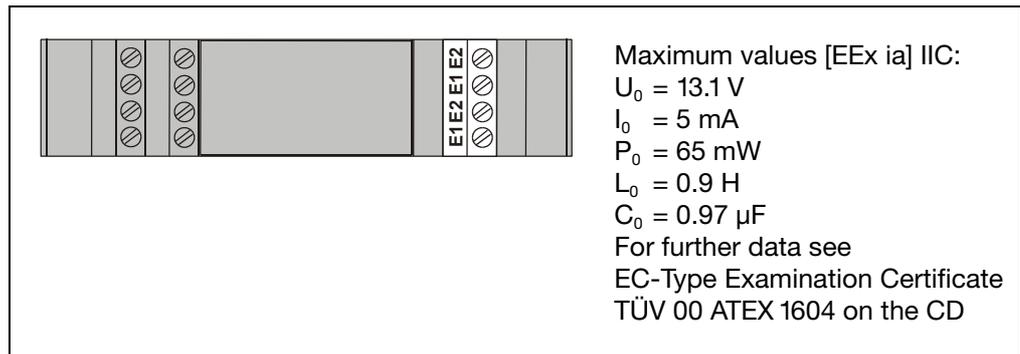
The following isolation relay connection example is based on a standard system controller (connections -X07, -X08) and I/O board and I/O module (connections -X11 to -X13 or -X20 to -X29) pin layout.

## Example

| Device Side Connection                 | Pins | User Side Function |   |
|--|------|--------------------|---|
| <b>Isolation Relay -K04 (Option)</b>   |      |                    |   |
| Ethernet -X08/10TT+                    | 14   | <b>13</b>          | 10TT+   |
| -X08/10TT-                             | 24   | <b>23</b>          | 10TT-   |
| -X08/10TR+                             | 34   | <b>33</b>          | 10TR+   |
| -X08/10TR-                             | 44   | <b>43</b>          | 10TR-   |
| DI4 -X2y/1                             | 54   | <b>53</b>          | DI4 -   |
| DI4 -X2y/2/3                           | 64   | <b>63</b>          | DI4 +/GND   |
| DI3 -X2y/5                             | 74   | <b>73</b>          | DI3 -   |
| DI3 -X2y/6/4                           | 84   | <b>83</b>          | DI3 +/GND   |
|  |      |                    | Ethernet  |
|  |      |                    | if a digital I/O module is installed on -X2y layout acc. to standard function block application |
| <b>Isolation Relay -K03 (Option)</b>   |      |                    |   |
| DI2 -X2y/7                             | 14   | <b>13</b>          | DI2 -   |
| DI2 -X2y/8/9                           | 24   | <b>23</b>          | DI2 +/GND   |
| DI1 -X2y/11                            | 34   | <b>33</b>          | DI1 -   |
| DI1 -X2y/12/10                         | 44   | <b>43</b>          | DI1 +/GND   |
| DO4 -X2y/15                            | 54   | <b>53</b>          | DO4 Common  |
| DO4 -X2y/13                            | 64   | <b>63</b>          | DO4 NO  |
| DO3 -X2y/16                            | 74   | <b>73</b>          | DO3 Common  |
| DO3 -X2y/14                            | 84   | <b>83</b>          | DO3 NO  |
|  |      |                    | if a digital I/O module is installed on -X2y layout acc. to standard function block application |
| <b>Isolation Relay -K02 (Option)</b>   |      |                    |   |
| DO2 -X2y/21                            | 14   | <b>13</b>          | DO2 Common  |
| DO2 -X2y/19                            | 24   | <b>23</b>          | DO2 NO  |
| AO- -X2z/4                             | 34   | <b>33</b>          | Ground Ch. 4  |
| AO2+ -X2z/3                            | 44   | <b>43</b>          | Meas. value Ch. 4   |
| AO- -X2z/2                             | 54   | <b>53</b>          | Ground Ch. 3  |
| AO1+ -X2z/1                            | 64   | <b>63</b>          | Meas. value Ch. 3   |
| AO- -X2x/4                             | 74   | <b>73</b>          | Ground Ch. 2  |
| AO2+ -X2x/3                            | 84   | <b>83</b>          | Meas. value Ch. 2   |
|  |      |                    | if a second analog output module is installed on -X2z   |
|  |      |                    | if an analog output module is installed on -X2x   |
| <b>Isolation Relay -K01 (Standard)</b> |      |                    |   |
|  | 14   | <b>13</b>          |   |
| DO1 -X2y/20                            | 24   | <b>23</b>          | DO1 NO  |
| DO1 -X2y/22                            | 34   | <b>33</b>          | DO1 Common  |
| AO- -X2x/2                             | 44   | <b>43</b>          | Ground Ch. 1  |
| AO1+ -X2x/1                            | 54   | <b>53</b>          | Meas. value Ch. 1   |
| HIGH -X07/3                            | 64   | <b>63</b>          | System Bus HIGH (Wire 3/brown)  |
| LOW -X07/2                             | 74   | <b>73</b>          | System Bus LOW (Wire 2/white)   |
| GND -X07/1                             | 84   | <b>83</b>          | System Bus GROUND (Wire 1/green)  |
|  |      |                    | layout acc. to standard function block application  |
|  |      |                    | if an analog output module is installed on -X2x   |

# Connecting Condensate Monitor

**Figure 5**  
**ER 144A/Ex (-B02)**  
**Connection Diagram**



## Description

The ER 144A/Ex isolation amplifier is designed for single-channel operation and has two floating relay outputs (changer). It operates according to the closed-circuit principle. Penetration of condensates triggers an electrical switching process with a latching function. An LED on the switch unit front panel indicates unit activity. A reset button is used to restore function after the problem has been corrected. A second LED is used to indicate if a connecting lead has been interrupted.

## Connecting Signal Leads

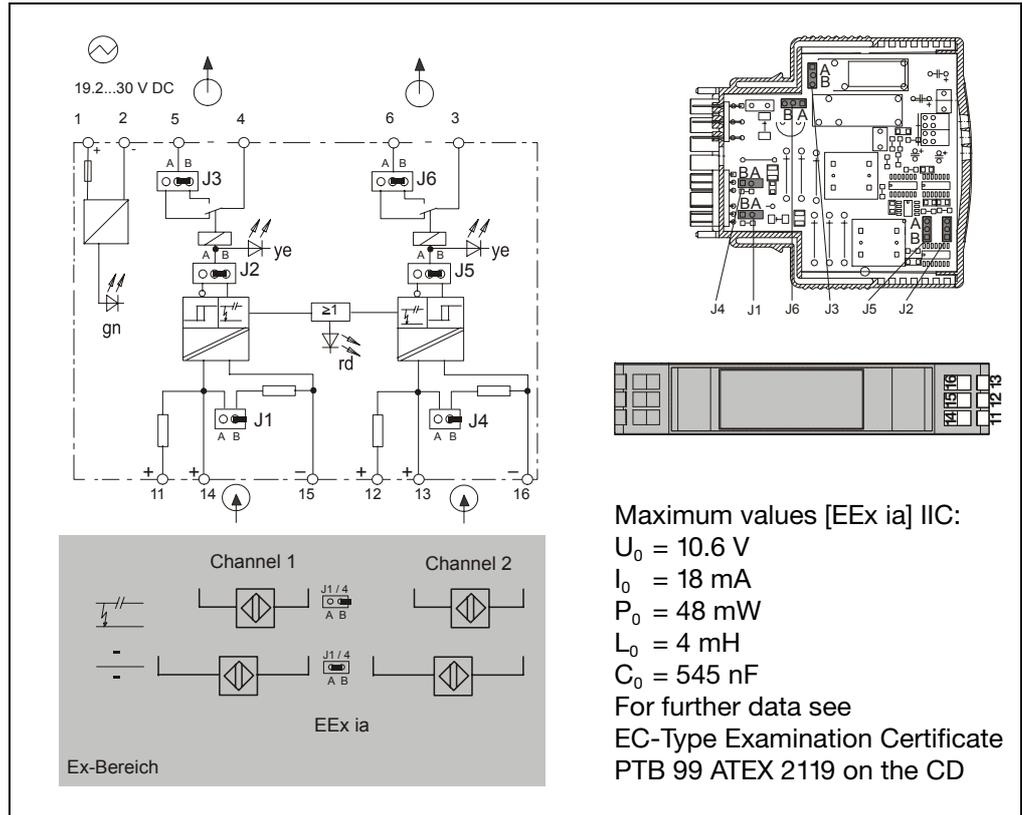
Route the condensate monitor's intrinsically safe signal leads through a bright blue cable connection and connect them to the terminals E1 and E2 on the right side of the ER 144A/Ex isolation amplifier.

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

# Connecting Flow Monitor

Figure 6

**Contrans I  
Type V17131-530  
(-B03.1, -B03.2)  
Circuit and  
Connection Diagram**



**Description**

The Contrans I type V17131-530 is a monostable isolation amplifier. Flow monitors with ring initiator and raised lower stop (i.e. with a fixed rotameter receiver) must be connected to it. Flow monitors without a raised lower stop are not suitable.

**Connecting  
Signal Leads**

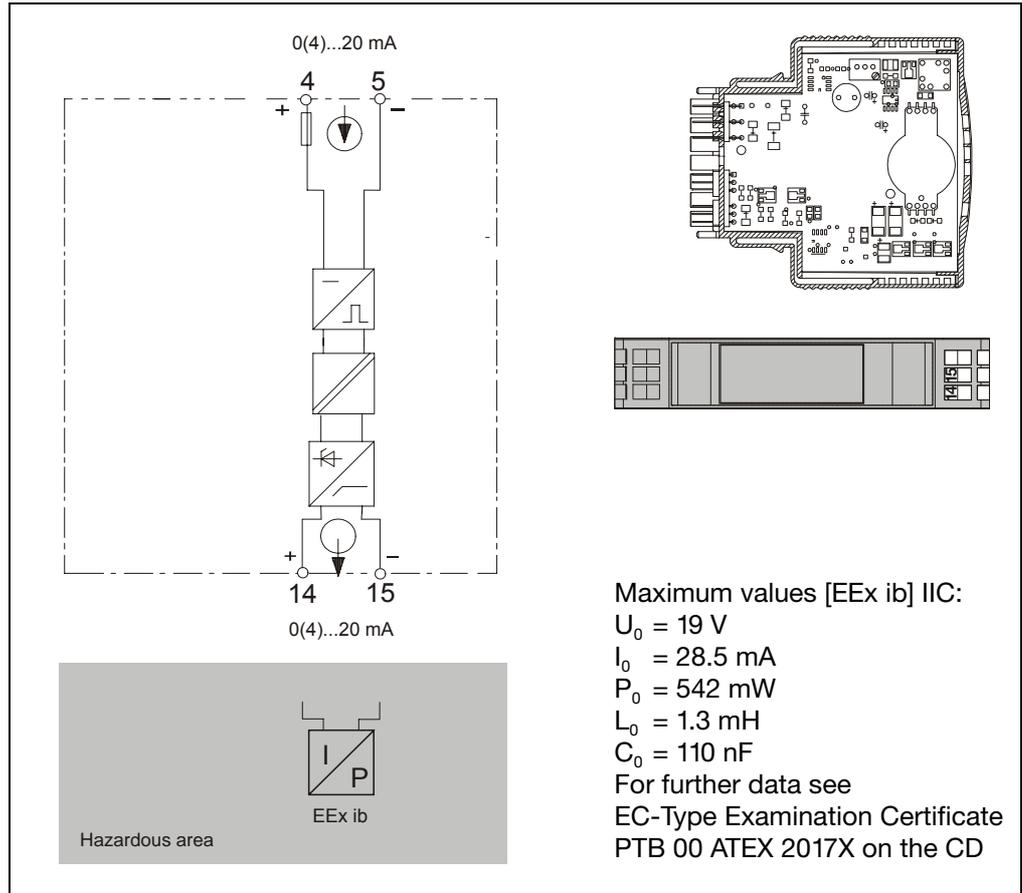
Route the flow monitor's intrinsically safe signal leads through a bright blue cable connection and connect them to the terminals 11–16 on the right side of the Contrans I isolation amplifier.

Depending on the function desired, connect the flow monitor according to the arrangement shown in the following table and Figure 6. Pay careful attention to polarity.

| Monitoring for Shorts and Interrupted Circuits | Connection to Pins |           |
|--|--------------------|-----------|
|  | Channel 1          | Channel 2 |
| Yes (factory-set)                              | 14 and 15          | 13 and 16 |
| No (can be configured with jumpers J1 and J4)  | 11 and 15          | 12 and 16 |

# Connecting Peripheral Devices (Current Signal 0(4)–20 mA)

**Figure 7**  
**Contrans I**  
**Type V17153-510**  
**(-B04.1 to -B04.4)**  
**Circuit and**  
**Connection Diagram**



**Description**

The Contrans I type V17153-510 passive isolator galvanically isolates a current signal 0(4)–20 mA.

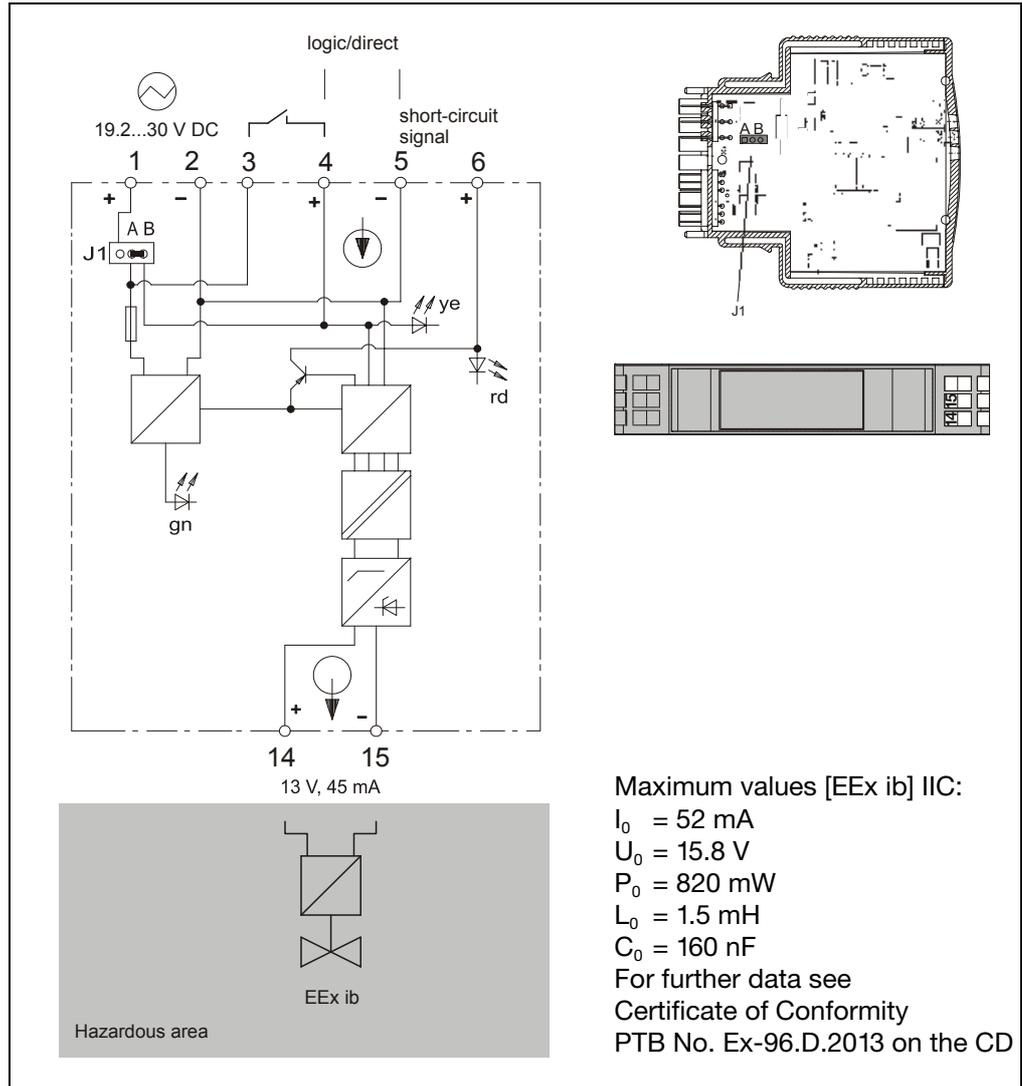
**Connecting Signal Leads**

Route the intrinsically safe signal leads to the peripheral devices through a bright blue cable connection and connect them to the terminals 14 and 15 on the right side of the Contrans I passive isolator. Pay careful attention to polarity.

# Connecting Solenoid Valve

Figure 8

**Contrans I  
Type V17132-520  
(-B05.1 to -B05.3)  
Circuit and  
Connection Diagram**



**Description**

The Contrans I type V17132-520 valve control unit controls intrinsically safe solenoid valves and acoustical and optical indicators. Input and output are galvanically isolated.

**Connecting  
Signal Leads**

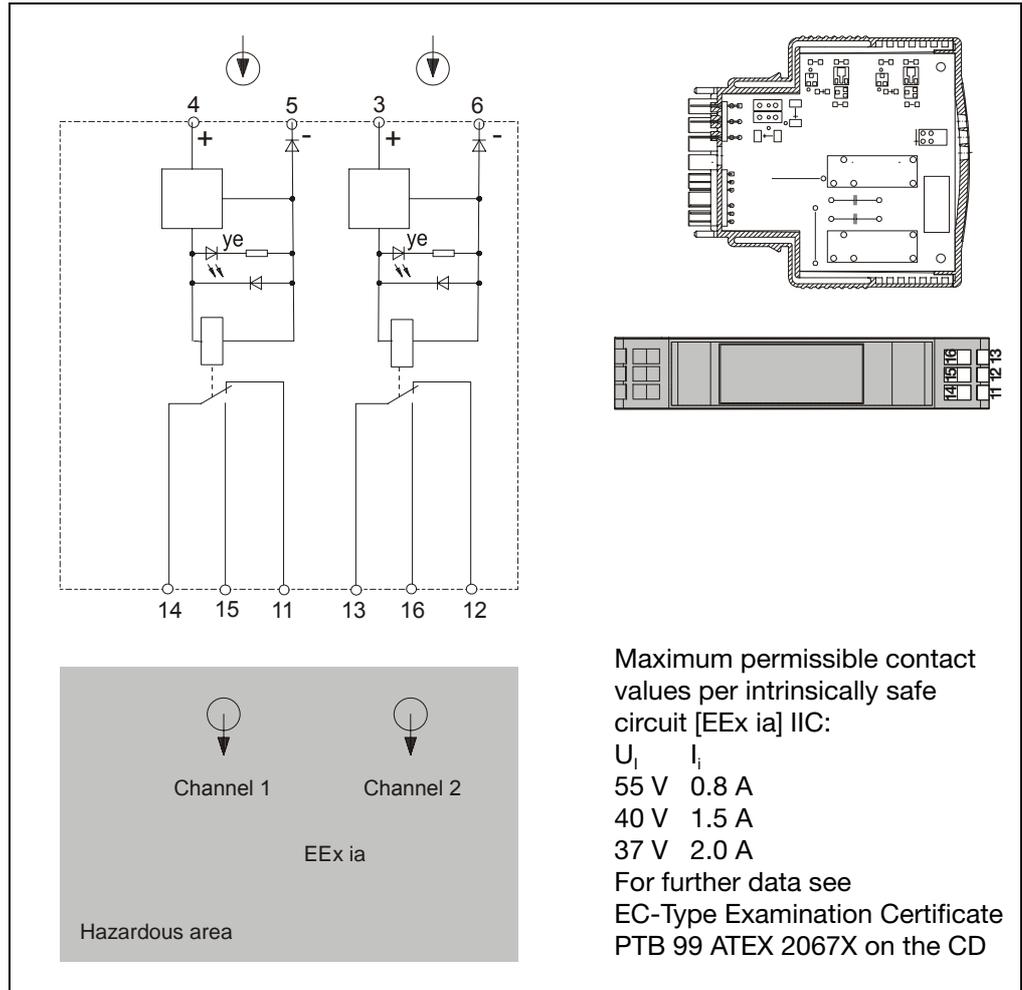
Route the solenoid valve's intrinsically safe signal leads through a bright blue cable connection and connect them to the terminals 14 and 15 on the right side of the Contrans I valve control unit. Pay careful attention to the maximum values (13 V, 45 mA) and the polarity.

| Contrans I Valve Control Unit Labeling | Function   |
|--|------------|
| -B05.1                                 | Sample gas |
| -B05.2                                 | Zero gas   |
| -B05.3                                 | Span gas   |

# Connecting Switching Contact Circuits

Figure 9

**Contrans I  
Type V17133-510  
(-B06.1, -B06.2)  
Circuit and  
Connection Diagram**



**Description**

The Contrans I type V17133-510 switching relay is used for galvanic isolation of control signals, adjustment to different voltage levels and level transformation.

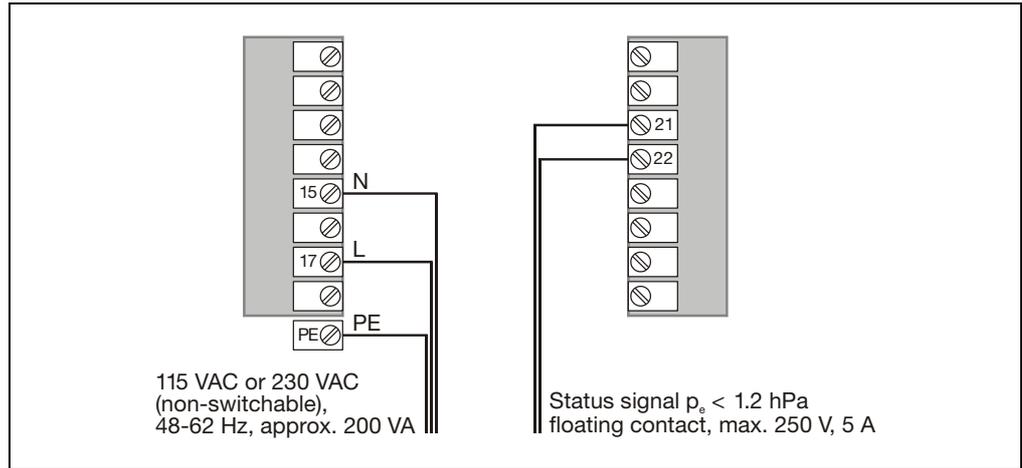
**Connecting  
Signal Leads**

Route the switching contact circuit's intrinsically safe signal leads through a bright blue cable connection and connect them to the terminals 11–16 on the right side of the Contrans I switching relay.

# Connecting Status Signal, Potential Compensation and Power Supply

Figure 10

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 mm<sup>2</sup>.

### Connecting the Status Signal

Connect the minimum housing internal pressure underflow status signal (see "Pressurized Enclosure System" section, page 26) 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).<br> Power consumption approx. 190 VA   |
| 3    | Install a 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 10).<br> 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



Follow and note

- The instructions and notes in the “Gas Analyzer Start-Up” chapter in the AO2000 Series operator’s manual,
- The following special instructions and notes and
- The notes in the “Electrical Equipment in Explosion Hazard Zones” sections in the Appendix.

### 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 11)  | <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 8)                                | <input type="checkbox"/> |
| All electrical lines properly routed, secured and connected? (see “Connecting Electrical Leads – Safety Instructions” section, page 9 and “Connecting Electrical Leads” section, page 11)                   | <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*



The sample gas supply should be turned on only after warm-up phase and calibration.

## 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  $p_e > 500$  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. |



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



### CAUTION!

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



Follow and note

- The instructions and notes in the “Inspection and Maintenance” chapter in the AO2000 Series operator’s manual,
- The following special instructions and notes and
- The notes in the “Electrical Equipment in Explosion Hazard Zones” sections in the Appendix.

## 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 22.

## AO2040-CU Ex Central Unit: 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 per EN 50016 “Pressurized Enclosure with Leak Loss Compensation”. 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.

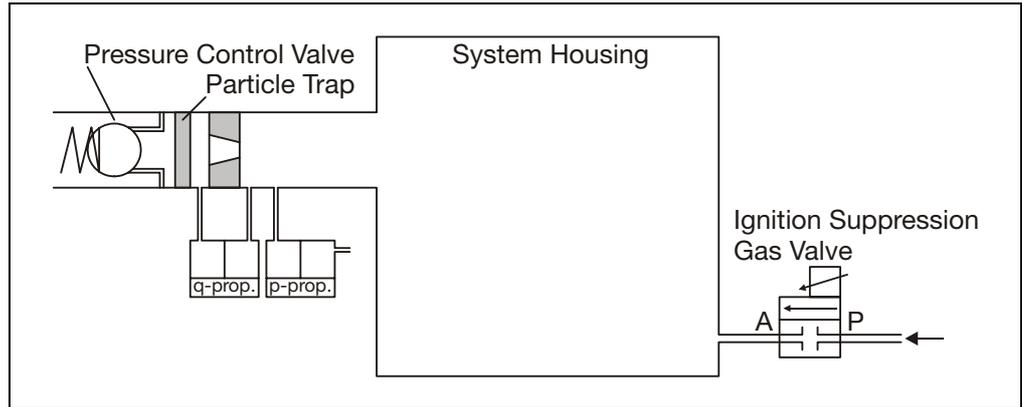


The system controller does not have a battery backup for use in case of power outages.

# Pressurized Enclosure System

Figure 11

**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 27).

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

|                              |   |   |
|------------------------------|---|---|
| <b>EC Type Certification</b> | DMT 03 ATEX E 006   |   |
| <b>Designation</b>           |  II 2G EEx ped [ib] IIC T4 |   |
| <b>Level of Protection</b>   | Device Group  | II  |
|                              | Category  | 2 G   |
| <b>Explosion Protection</b>  | Ignition Protection Type  | Pressurized enclosure “p” with leak loss compensation   |
|                              | Explosion Group   | IIC   |
|                              | Temperature Class   | T4  |
| <b>Ambient Temperature</b>   | Operation   | +5 to +50 °C  |
|                              | Storage and Transport   | -25 to +65 °C   |
| <b>Power Supply</b>          | Input Voltage   | 230 VAC or 115 VAC (non-switchable), 48 to 62 Hz  |
|                              | Power Consumption   | Approx. 190 VA  |
| <b>Signal Circuits</b>       | Intrinsically Safe Circuits   | Connection via ER 144A/Ex or Contrans I modules (e.g. condensation monitor or flow rate monitor); connection data are shown on the modules EC Type Certifications (see CD-ROM). |
|                              | Non-Intrinsically Safe Circuits   | Connection via isolation relays (e.g. measurement signals, status signals), max. 30 VDC/0.4 A   |
| <b>Gas Data</b>              | 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 ER 144A/Ex or Contrans I  |
|                              | 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 $1 \text{ mg/m}^3$ , max. pressure dew point $+3 \text{ }^\circ\text{C}$ )          |
| <b>Housing</b>               | Design  | Wall-mount housing  |
|                              | Housing Protection Type   | IP 54   |
|                              | Dimensions  | see Dimensional Drawing (Figure 1, page 7)  |
|                              | Weight  | Approx. 28 kg   |



## Konformitätserklärung Declaration of Conformity



**ABB Automation Products GmbH**  
**60488 Frankfurt am Main**  
**Germany**

erklärt, dass das Produkt  
*declares that the product*

Geräteart: **Kontinuierliche Gasanalysatoren**  
*Device: Continuous Gas Analyzers*

Typbezeichnung: **AO2000 Serie**  
*Type: AO2000 Series*

Produktnummer: siehe Anhang 1, 4-8  
*Product No.: see Annex 1, 4-8*

mit den Vorschriften folgender Europäischer Richtlinien übereinstimmt:  
*complies with the requirements of the European Directives:*

EG-Richtlinie 89/336/EWG **EMV**  
*EC Directive 89/336/ECC EMC*

EG-Richtlinie 73/23/EWG **Niederspannung**  
*EC Directive 73/23/ECC Low Voltage*

Weitere Angaben über die Einhaltung dieser Richtlinien enthalten die Anhänge 2 und 3  
*Further information about compliance with the Directives is given in the Annexes 2 and 3*

EN 60825-1 **Sicherheit von Lasereinrichtungen (nur für Laser-Analysatormodul LS25)**  
*Safety of Laser Products (only for Laser analyzer module LS25)*

EG-Richtlinie 94/9/EG **Geräte und Schutzsysteme zur bestimmungsgemäßen Verwendung  
in explosionsgefährdeten Bereichen**  
*EC-Directive 94/9/EC Equipment and protective systems intended for use in potentially explosive atmospheres*

Nur für Ausführungen gemäß Anhang 4-8.  
*Only for instruments according to Annexes 4-8*

**ABB Automation Products GmbH**

Frankfurt, 30. September 2004

(Leiter Qualitätssicherung)  
*(Head of Quality Management)*

(Leiter Entwicklung)  
*(Head of Development)*

Die Anhänge sind Bestandteil dieser Erklärung.  
*Annexes are part of this declaration.*

Diese Erklärung bescheinigt die Übereinstimmung mit den genannten Richtlinien, beinhaltet jedoch keine  
Zusicherung von Eigenschaften im rechtlichen Sinne.

*This declaration certifies conformance with the above mentioned Directives. Affirmation of attributes in a legal sense is not included.*

Die Sicherheitshinweise in der mitgelieferten Produktdokumentation sind zu beachten.  
*Safety notes given in the product documentation have to be observed.*

Registrier-Nr. CT001/97

Seite/Page 1 von/of 9

Ausgabe/Edition 11

*Continued on next page*



## Anhang 1 zur Konformitätserklärung (Produktnummern)

*Annex 1 of declaration of conformity (product no.)*

Geräteart: **Kontinuierliche Gasanalysatoren**  
 Device: **Continuous Gas Analyzers**

Typbezeichnung: **AO2000 Serie**  
 Type: **AO2000 Series**

| Produkt-Nr.:<br><i>Product No.:</i> | Modul                     | Produktnummer             |
|-------------------------------------|---------------------------|---------------------------|
|                                     | Systemgehäuse             | 24311 - 0 - ◊◊◊◊◊◊000000◊ |
|                                     | Elektronikmodul           | 24411 - 0 - 5◊◊◊◊◊◊◊◊◊◊◊◊ |
|                                     | Pneumatikmodul            | 24171 - 0 - ◊◊◊◊◊◊◊◊0000◊ |
|                                     | IR-Analysatormodul        | Uras14                    |
|                                     | UV-Analysatormodul        | Limas11UV                 |
|                                     | IR-Analysatormodul        | Limas11IR                 |
|                                     | WL-Analysatormodul        | Caldos15                  |
|                                     | WL-Analysatormodul        | Caldos17                  |
|                                     | O2-Analysatormodul        | Magnos106                 |
|                                     | O2-Analysatormodul        | Magnos17                  |
|                                     | FID-Analysatormodul       | MultiFID14                |
|                                     | FID-Analysatormodul       | MultiFID14NMHC            |
|                                     | O2-Spuren-Analysatormodul | ZO23                      |
|                                     | Laser-Analysatormodul     | LS25                      |

◊ = Ziffern ohne Einfluss auf die Konformitätserklärung  
*Digit not important for this declaration*  
 0 = Stelle nicht belegt  
*Digit not used*

*Continued on next page*



## Anhang 2 zur Konformitätserklärung (EMV)

*Annex 2 of declaration of conformity (emc)*

Geräteart: **Kontinuierliche Gasanalysatoren**  
 Device: **Continuous Gas Analyzers**

Typbezeichnung: **AO2000 Serie**  
 Type: **AO2000 Series**

Produkt-Nr.: siehe Anhang 1  
 Product No.: *see Annex 1*

Die Übereinstimmung des bezeichneten Produktes mit den Anforderungen der Richtlinie 89/336/EWG wird nachgewiesen durch die vollständige Einhaltung der folgenden harmonisierten Europäischen Normen:  
*Conformance of the product with Directive 89/336/ECC is given according to the following harmonized European standards:*

|  |                |                  |
|--|----------------|------------------|
| Störfestigkeit:                        | EN 61326-1     | 1997             |
| <i>Electromagnetic Susceptibility:</i> | EN 61326/A1+A2 | A1:1998, A2:2001 |
| Störaussendung:                        | EN 61326-1     | 1997             |
| <i>Electromagnetic Disturbances:</i>   | EN 61326/A1+A2 | A1:1998, A2:2001 |
|  | EN 61000-3-2   | 1998 + A14:2000  |
|  | EN 61000-3-3   | 1995             |

Prüfergebnisse:  
*Test results:*

| <b>Festigkeit gegen elektromagnetische Störungen</b><br><i>Electromagnetic Susceptibility</i>      | <b>Norm</b><br><i>Standard</i> | <b>Prüfschärfe* Industrieller Bereich</b><br><i>Test level industrial environment</i> |
|--|--------------------------------|---|
| Entladung statischer Elektrizität<br><i>electrostatic discharge</i>                                | EN 61000-4-2                   | Kontakt / Luft<br>4 kV / 8 kV   |
| Burst<br>auf AC Versorgung <i>on AC mains supply</i><br>auf Signalleitungen <i>on signal lines</i> | EN 61000-4-4                   | 2 kV<br>1 kV  |
| Gestrahltes HF-Feld<br><i>radiated electromagnetic field</i>                                       | EN 61000-4-3                   | 10 V/m  |
| Leitungsgeführte HF-Störungen<br><i>conducted high frequency disturbances</i>                      | EN 61000-4-6                   | 10 V  |
| Spannungsunterbrechung AC-Versorgung<br><i>voltage interruption AC mains supply</i>                | EN 61000-4-11                  | 0,5 Periode / 100 %   |
| Surge<br>auf AC Versorgung <i>on AC mains supply</i><br>auf Signalleitungen <i>on signal lines</i> | EN 61000-4-5                   | 2 kV<br>1 kV  |
| <b>Störaussendung</b><br><i>Electromagnetic Disturbances</i>                                       | <b>Norm</b><br><i>Standard</i> | <b>Prüfergebnisse</b><br><i>Test Results</i>  |
| Störfeldstärke<br><i>radiated interference field strength</i>                                      | EN 61326-1<br>EN 61326/A1      | Klasse B / Class B  |
| Störspannungen<br>auf AC-Versorgung <i>on AC mains supply</i>                                      | EN 61326-1<br>EN 61326/A1      | Klasse B / Class B  |
| Oberschwingströme <i>harmonic current</i>  | EN 61000-3-2                   | Klasse A / Class A  |
| Spannungsschwankungen, Flicker<br><i>Voltage change, flicker</i>                                   | EN 61000-3-3                   | eingehalten   |

\* Erfüllt mind. Bewertung „kontinuierlicher überwachter Betrieb“ nach Tabelle 2 der EN 61326-1  
*Performance criteria "continuous checked working" acc. Table 2 of EN 61326-1*

Registrier-Nr. CT001/97

Seite/Page 3 von/of 9

Ausgabe/Edition 11

*Continued on next page*



## Anhang 3 zur Konformitätserklärung (Niederspannungsrichtlinie)

*Annex 3 of declaration of conformity (low voltage directive)*

Geräteart: **Kontinuierliche Gasanalysatoren**  
*Device: Continuous Gas Analyzers*

Typbezeichnung: **AO2000 Serie**  
*Type: AO2000 Series*

Produkt-Nr.: siehe Anhang 1  
*Product No.: see Annex 1*

Die Übereinstimmung des bezeichneten Produktes mit den Anforderungen der Richtlinie 73/23/EWG wird nachgewiesen durch die vollständige Einhaltung der folgenden harmonisierten Europäischen Normen:  
*Conformance of the product with the requirements of Directive 73/23/ECC is approved by compliance with the following harmonized European standards:*

EN 61010-1: 2001 Sicherheitsbestimmungen für elektrische Mess-, Steuer-, Regel- und Laborgeräte  
*Safety Requirements for electrical equipment for measurement, control, and laboratory use*

Prüfergebnisse:  
*Test results:*

|  | Im Gehäuse mit internem Netzteil<br><i>Enclosure with internal power supply</i> | Im Gehäuse ohne internes Netzteil<br><i>Enclosure without internal power supply</i> | Zentraleinheit in Kategorie 2G<br><i>Central unit in category 2G</i> |
|--|---|---|--|
|  | ohne FID-Analysatormodul<br><i>w/o FID analyzer module</i>                      | mit FID-Analysatormodul<br><i>with FID analyzer module</i>                          |  |
| Gerät der Schutzklasse<br><i>Equipment class</i>                               | I   | I   | III  |
| Überspannungskategorie<br><i>Installation category</i>                         |   |   |  |
| Netzeingang <i>mains circuit</i>   | III   | II  | II   |
| übrige Stromkreise <i>other circuits</i>                                       | II  | II  | II   |
| Verschmutzungsgrad<br><i>Pollution degree</i>                                  | 2   | 2   | 2  |
| Prüfspannungen<br><i>Test voltages</i>   |   |   |  |
| Netzkreise gegen Sekundärkreise<br><i>Mains circuits to secondary circuits</i> | 3,7 kV;<br>50 Hz, 1 min   | 2,3 kV;<br>50 Hz, 1 min   | 2,3 kV;<br>50 Hz, 1 min  |
| Netzkreise gegen Schutzerde<br><i>Mains circuits to protective earth</i>       | 2,2 kV;<br>50 Hz, 1 min   | 1,35 kV;<br>50 Hz, 1 min  | 1,35 kV;<br>50 Hz, 1 min   |

Luft- und Kriechstrecken zwischen den berührungsgefährlichen Netzkreisen und den übrigen nicht berührungsgefährlichen Stromkreisen entsprechen den Anforderungen der verstärkten oder doppelten Isolierung (sichere elektrische Trennung).

*Clearance and creepage distance between hazardous life mains circuits and non hazardous life other circuits are comply with requirements reinforced or double insulation (safe electrical separation).*

Die „übrigen Stromkreise“ sind PELV-Stromkreise (Funktionskleinspannung mit sicherer Trennung).

*The other circuits are PELV circuits (Protected extra low voltage with safe separation).*



## Anhang 8 zur Konformitätserklärung (Produktnummern)

*Annex 8 of declaration of conformity (product no.)*

Geräteart: **Zentraleinheit in Kategorie 2G**  
*Device: Central Unit in Category 2G*

Typbezeichnung: **AO2040-CU Ex**  
*Type: AO2040-CU Ex*

Die Zentraleinheit Typ AO2040-CU Ex dient zur Steuerung und Verwaltung von Mess- und Regelvorgängen in Verbindung mit den Analysatormodulen AO2060-\*.  
*The central unit type AO2040-CU Ex operates measure and control processes in combination with analyzer modules AO2060-\**

EG-Baumusterprüfbescheinigung: DMT 03 ATEX E 006  
*EC-Type Examination Certificate:*

Benannte Stelle: Deutsche Montantechnologie GmbH (0158)  
*Notified Body: D-45307 Essen*

Geräte-Kennzeichnung: II 2G EEx ped [ib] IIC T4  
*Apparatus Code:*

Angewandte Normen: EN 50014:1997 + A1 - A2  
*Standards: EN 50016:1995  
 EN 50018:2000  
 EN 50019:2000  
 EN 50020:1994*

| Produkt-Nr.:        | Modul                           | Produktnummer        |
|---------------------|---------------------------------|----------------------|
| <i>Product No.:</i> | Systemgehäuse<br><i>Housing</i> | 24311-0-521◇◇000000◇ |

◇ = Ziffern ohne Einfluss auf die Konformitätserklärung  
*Digit not important for this declaration*  
 0 = Stelle nicht belegt  
*Digit not used*



## Translation

### (1) **EC-Type Examination Certificate**

- (2) **- Directive 94/9/EC -**  
**Equipment and protective systems intended for use**  
**in potentially explosive atmospheres**

- (3) **DMT 03 ATEX E 006**

- (4) **Equipment: Central Unit Type AO2040-Cu Ex**

- (5) **Manufacturer: ABB Automation Production GmbH**

- (6) **Address: D 60488 Frankfurt/Main**

- (7) The design and construction of this equipment and any acceptable variation thereto are specified in the schedule to this type examination certificate.

- (8) The certification body of Deutsche Montan Technologie GmbH, notified body no. 0158 in accordance with Article 9 of the Directive 94/9/EC of the European Parliament and the Council of 23 March 1994, certifies that this equipment has been found to comply with the Essential Health and Safety Requirements relating to the design and construction of equipment and protective systems intended for use in potentially explosive atmospheres, given in Annex II to the Directive.  
The examination and test results are recorded in the test and assessment report BVS PP 03.2003 EG.

- (9) The Essential Health and Safety Requirements are assured by compliance with:

|                     |                           |
|---------------------|---------------------------|
| EN 50014:1997+A1-A2 | General requirements      |
| EN 50016:1995       | Pressurized apparatus "p" |
| EN 50018:2000       | Flameproof enclosure "d"  |
| EN 50019:2000       | Increased safety "e"      |
| EN 50020:1994       | Intrinsic safety "i"      |

- (10) If the sign "X" is placed after the certificate number, it indicates that the equipment is subject to special conditions for safe use specified in the schedule to this certificate.

- (11) This EC-Type Examination Certificate relates only to the design, examination and tests of the specified equipment in accordance to Directive 94/9/EC.  
Further requirements of the Directive apply to the manufacturing process and supply of this equipment. These are not covered by this certificate

- (12) The marking of the equipment shall include the following:

**II 2G EEx ped [ib] IIC T4**

### **Deutsche Montan Technologie GmbH**

Essen, dated 09. January 2003

Signed: **Jockers**

DMT-Certification body

Signed: **Eickhoff**

Head of special services unit

page 1 of 3 to DMT 03 ATEX E 006  
This certificate may only be reproduced in its entirety and without change  
Am Technologiepark 1, 45307 Essen, Telefon (0201)172-1416, Telefax (0201)172-1716

*Continued on next page*



(13) Appendix to

(14) **EC-Type Examination Certificate**

**DMT 03 ATEX E 006**

(15) 15.1 Subject and type

Central unit type AO2040-Cu Ex

15.2 Description

The central unit operates measure and control processes in combination with the analyser modules AO2060-\*

15.3 Parameters

15.3.1 Electrical data

|   |                            |
|---|----------------------------|
| Supply voltage                                    | AC 115 / 230 V, 48...62 Hz |
| Power consumption                                 | 190 VA                     |
| Signal circuits to the terminals increased safety | to 30 V / 0,4 A            |

The terminal parameters of the intrinsically safe circuits shall be taken from the certificates of the isolation amplifier.

15.3.2 Pneumatic data

|   |      |      |
|---|------|------|
| Internal volume   | 36   | l    |
| Minimum purge flow  | 1,0  | l/s  |
| Minimum purge time  | 4    | min  |
| Minimum purge time with built in ER144/A/Ex or Contrans I | 13,5 | min  |
| Minimum overpressure                                      | 0,8  | mbar |
| Maximum over-pressure                                     | 15   | mbar |

(16) Test and assessment report

BVS PP 03.2003 EG as of 09.01.2003

(17) Special conditions for safe use

None

*Continued on next page*



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We confirm the correctness of the translation from the German original.  
In the case of arbitration only the German wording shall be valid and binding.

45307 Essen, 09.01.2003  
BVS-Wit/Mi A20020736

**Deutsche Montan Technologie GmbH**

  
DMT-Certification body

  
Head of special services unit

# Electrical Equipment in Explosion Hazard Zones: Legal Principles

**ElexV** Set-up, installation and operation of the explosion-protection versions of the AO2000 Series Continuous Gas Analyzers in the Federal Republic of Germany is covered by the 13 December 1996 “Regulations on Electrical Equipment in Explosion Hazard Zones” (ElexV).

## **Classification of Explosion Hazard Zones**

Areas in which flammable gases, vapors or fogs pose a risk of explosion are classified as zones. Zones are distinguished by their respective probability of containing explosive atmospheres:

Zone 0 Covers areas in which explosive atmospheres occur continuously or on a long-term basis.

Zone 1 Covers areas in which explosive atmospheres may occasionally be present.

Zone 2 Covers areas in which explosive atmospheres are infrequently present or occur only for short periods of time.

## **Operation of Electrical Equipment in Category 2G in Zone 1**

Only electrical equipment in category 2G with an EC type certification may be used in Zone 1 explosion hazard areas.

## **Operation of Electrical Equipment in Category 3G in Zone 2**

Electrical equipment in category 3G used in Zone 2 explosion hazard areas must have

- An EC type certification or
- A manufacturer’s certificate of suitability for use in Zone 2

## **Manufacturer’s Certification**

By affixing a label the manufacturer confirms that unit testing was successfully completed and that the product is in accordance with the documentation submitted to the testing office.

# Electrical Equipment in Explosion Hazard Zones: Installation Notes

|   |   |
|---|---|
| <b>Installation per EN 60079-14 (VDE 0165/1 Part 1)</b> | The electrical device shall be installed according to EN 60079-14 (VDE 0165 Part 1) “Electrical Equipment in Gas Explosion Hazard Areas”, Part 14: “Electrical Equipment in Explosion Hazard Areas”.  |
| <b>Potential Compensation</b>                           | The requirements of EN 60079-14 and DIN VDE 0100 Part 410 “Protection Against Electrical Shock” and Part 540 “Grounding, Protective Leads and Potential Compensation Leads” shall be observed.  |
| <b>Electrostatic Charges</b>                            | Avoid electrostatic discharges. Observe the “Guidelines for Avoiding Ignition Risks Due to Electrostatic Discharges” published by the Executive Committee for the Industrial Professional/Trade Associations.   |
| <b>Testing Prior to Initial Use</b>                     | <p>The operator is required to have the electrical system tested for proper operation by a qualified electrician prior to using the unit for the first time.</p> <p>If the manufacturer or installer certifies that the electrical system meets ElexV requirements, no inspection prior to initial use is required.</p> |

# Electrical Equipment in Explosion Hazard Zones: Maintenance and Repair Notes

|  |  |
|--|--|
| <b>Monitoring and Inspection</b>             | <p>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.</p>   |
| <b>Work on Electrical Systems</b>            | <p>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”.</p> <p>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.</p>                 |
| <b>Work on Intrinsically Safe Circuits</b>   | <p>Work may be performed on intrinsically safe circuits in explosion risk areas even while power is connected.</p> <p>However, the electrical characteristics (inductance, capacitance, current and voltage) of test equipment should be noted when such equipment is activated.</p> <p>Special attention is required if work is carried out on intrinsically safe circuits set up in conjunction with Zone 0 areas.</p> |
| <b>Explosion Risk</b>                        | <p>The explosion risk should be eliminated prior to carrying out any repair work.</p>  |
| <b>Personnel Qualifications</b>              | <p>Repair work should only be performed by qualified personnel.</p>  |
| <b>Original Parts</b>                        | <p>Only original parts should be used for repairs.</p>   |
| <b>Testing Prior to Returning to Service</b> | <p>If repairs are made on components in an electrical device necessary for explosion protection, prior to any return to service a qualified person shall inspect this device and certify that its explosion protection features are in compliance with the type and design requirements as stated in the device’s certification documentation.</p>   |
| <b>Manufacturer’s Repairs</b>                | <p>Repairs can also be carried out by the manufacturer, e.g. on site by an ABB Service employee or at the manufacturer’s facility.</p> <p>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.</p>   |

# Index

|                                     | Page |  | Page    |
|-------------------------------------|------|--|---------|
| Ambient Temperature                 | 27   | Ignition Suppression Gas                       | 8, 26   |
| Cable Connections                   | 11   | Connection                                     | 8       |
| Condensate Monitor                  |      | Installation                                   | 6       |
| Connecting to Isolation Amplifier   | 16   | Installation Check                             | 22      |
| Connecting                          |      | Installation Site                              | 6       |
| 24 VDC Cable                        | 14   | Intended Operation                             | 25      |
| Condensate Monitor                  | 16   | Isolation Relays                               |         |
| Current Signal 0(4)–20 mA           | 18   | Connecting Non-Intrinsically Safe Signal Leads | 15      |
| Electrical Leads                    | 11   | Items Included                                 | 6       |
| Ex Analyzer Module                  | 13   | Operating Specifications                       | 27      |
| Flow Monitor                        | 17   | Potential Compensation                         | 37      |
| Ignition Suppression Gas Line       | 8    | Connecting                                     | 21      |
| Non-Intrinsically Safe Signal Leads | 15   | Power Supply                                   | 27      |
| Potential Compensation              | 21   | Connecting                                     | 21      |
| Power Supply                        | 21   | Preliminary Purge                              | 26      |
| Solenoid Valve                      | 19   | Pressurized Enclosure System                   | 26      |
| Status Signal                       | 21   | Connecting the Status Signal                   | 21      |
| Switching Contact Circuits          | 20   | Overriding                                     | 24      |
| System Bus Cable                    | 14   | Positive Pressure Monitoring                   | 26      |
| Current Signal 0(4)–20 mA           |      | Status Signal Output                           | 26      |
| Connecting to Passive Isolator      | 18   | Safety Information                             | 4, 5, 9 |
| Declaration of Conformity           | 28   | Solenoid Valve                                 |         |
| Description                         | 25   | Connecting to Valve Control Unit               | 19      |
| Dimensional Diagram                 | 7    | Start-Up                                       | 22      |
| EC Type Examination Certificate     | 33   | Switching Contact Circuits                     |         |
| Electrical Connections              | 10   | Connecting to Switching Relay                  | 20      |
| Electrical Equipment                | 12   | System Bus                                     |         |
| Explosion Hazard Zones              | 36   | Connecting                                     | 14      |
| Flow Monitor                        |      | Termination Resistor                           | 13      |
| Connecting to Isolation Amplifier   | 17   | Total Length of Wiring                         | 13      |
|                                     |      | Technical Data                                 | 27      |

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Printed in the Fed. Rep. of Germany (10.04)

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