Analyze^{IT}

Continuous Gas Analyzer
AO2000-Caldos17

Thermal Conductivity Gas Analyzer
in the Version for Monitoring Hydrogen-Cooled Turbo Generators

Operator's Manual
(Condensed Version)   41/24-1021 EN Rev. 2

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ABB

Contents

Preface

Content of the Operator's Manual (Condensed Version)

This operator's manual (condensed version) is an extract from the comprehensive operator's manual for the AO2000 Series Continuous Gas Analyzers. It contains the essential information you will need to operate the AO2000-Caldos17 Thermal Conductivity Gas Analyzer in the Version for Monitoring Hydrogen-Cooled Turbo Generators.

Symbols Used in this Manual

Identifies safety information to be heeded during gas analyzer operation in order to avoid risks to the operator.

Identifies specific information on operation of the gas analyzer as well as on the use of this manual.

Switching the Sample Component

Figure 1

Front View of the Central Unit
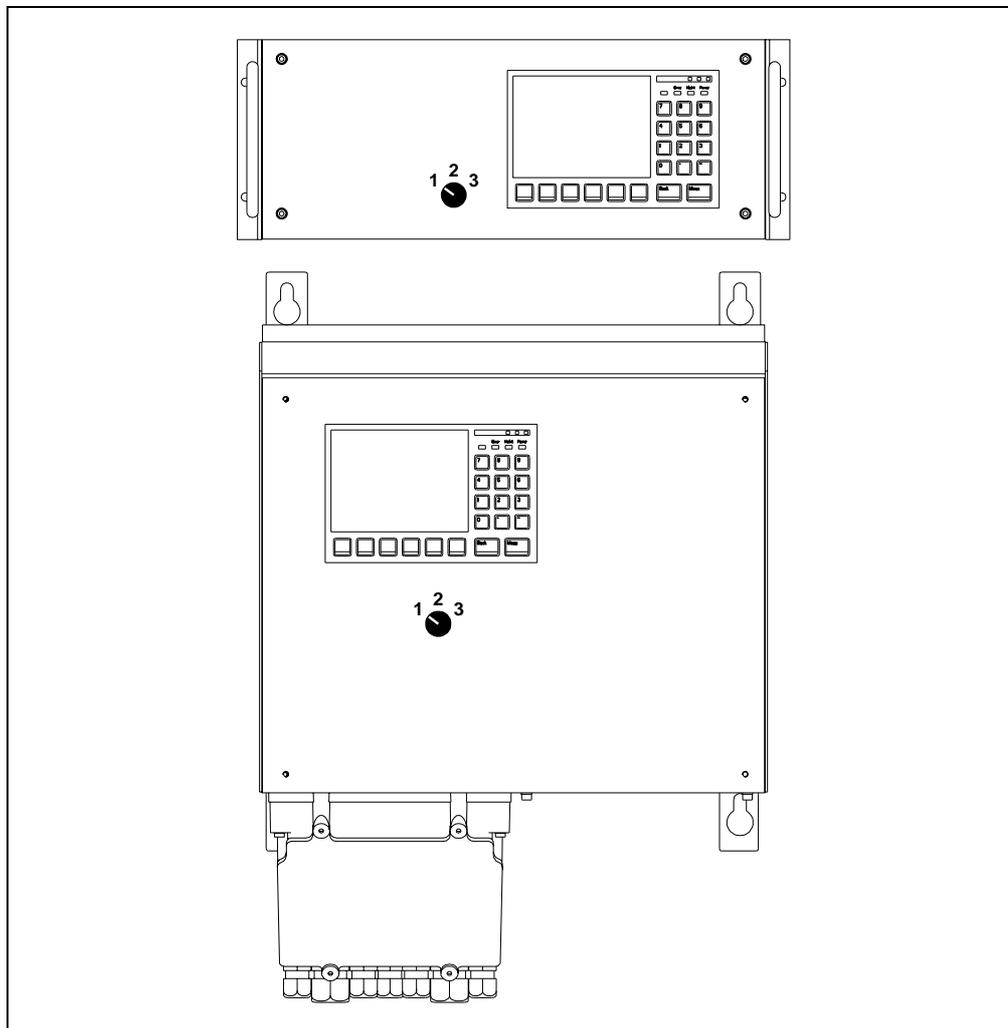
Switching the Sample Component	Switch Position	Sample Component	Turbo Generator Operating State	
	1 **2** 3	0...100 Vol.-% CO_2 or Argon in Air	Filling:	Displacement of air by CO_2 or Argon
			Emptying:	Displacement of CO_2 or Argon by air
	1 **2** 3	100...0 Vol.-% H_2 in CO_2 or Argon	Filling:	Displacement of CO_2 or Argon by H_2
			Emptying:	Displacement of H_2 by CO_2 or Argon
	1 **2** 3	80...100 Vol.-% H_2 in Air	Working:	Monitoring of H_2 purity

Operation

Figure 2

Display and Control Unit

Screen with

Menu Line

Information Field

Softkey Line

Status LED's

Numeric Keypad

Softkeys   Cancel Keys
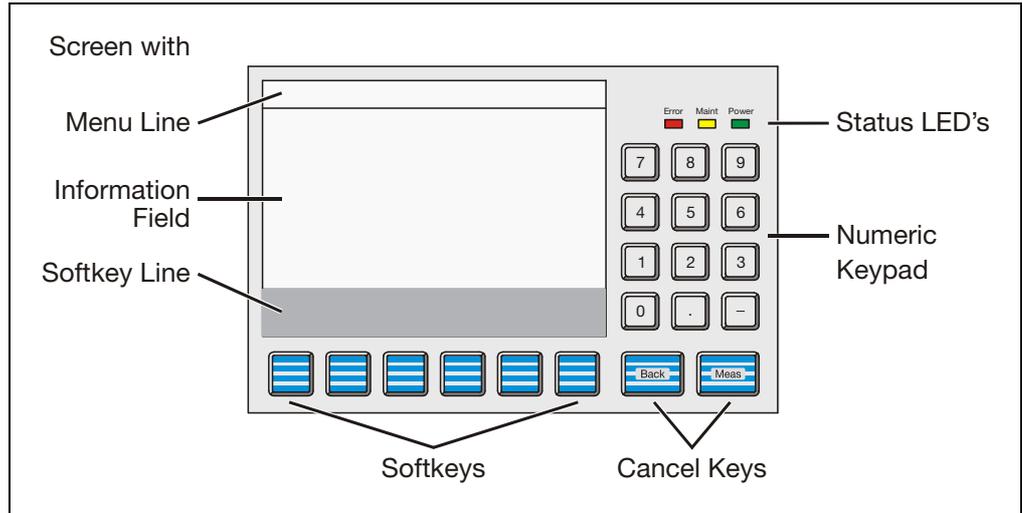
Status LED's   The three LED's next to the screen indicate the gas analyzer's status.

Power   Green LED: The power supply is on.

Maint   Yellow LED: The "Maintenance Request" status signal is active.

Error   Red LED: The "Failure" status signal or the overall status signal is active.

Cancel Keys   The "Back" and "Meas" keys located under the numeric keypad are designated as cancel keys.

Back   The "Back" key allows the operator to cancel a function or menu item and to return to the previous menu level.

Meas   The "Meas" key allows the operator to cancel a function or menu item and to return to the measured value display in measurement mode.

Only entries confirmed with the ENTER key are stored; unconfirmed items are not accepted.

Continued on next page

Softkeys   The six keys under the screen and the softkey line at the lower edge of the screen are known as softkeys.

A softkey is the combination of the key and its designation in the softkey line.

A softkey does not have any set function, but is assigned a function for a given situation as shown in the softkey line of the screen.

Pressing a softkey is the equivalent of pressing the key assigned to the function; this process is illustrated by the quasi-three-dimensional softkey representation on the screen.

Softkeys are also called keys in this manual.

The Softkeys in Measurement Mode

The softkeys [MENU] and [>>] appear in measurement mode.

The [STATUS MESSAGE] softkey also appears if an error occurs.

[MENU]   The MENU key is used to call the main menu and switch to menu mode when in measurement mode.

[>>]   The >> key allows the operator to scroll to the next display "page". This key only allows forward scrolling.

The "Back" key is used for backward scrolling.

[STATUS MESSAGE]   The STATUS MESSAGE key appears in measurement mode if an "Failure" or "Maintenance request" condition arises.

This key allows the operator to call up the status message log and view the status messages.

The user can also call up a detailed display for any message in the log.

The Softkeys in Menu Mode

In menu mode, a series of softkeys appears on the softkey line. Their descriptions and functions depend on the specific situation.

In menu mode the standard softkeys have the following functions:

The operator uses these two arrow keys to move the selection cursor up or down in a menu or list to choose menu items.

The item selected is reversed, i.e. appearing as bright characters on a dark background.

The operator uses these two keys to move the selection cursor left or right, e.g. into or out of a submenu or to select an item in a subordinate list.

The item selected is reversed, i.e. appearing as bright characters on a dark background.

The operator can use the BACKSPACE key to delete characters to the left of the cursor (as in a PC keyboard).

The operator can use the CLEAR key to delete all characters in a selected field.

The operator can use the ENTER key to:
• Call up menu items for processing
• Start functions
• Confirm entries, e.g. parameter settings

The ENTER key is always at the right margin of the softkey line.

The operator can use the HELP key to access context-sensitive help. The screen will then show a help message explaining the menu item selected.

The operator can use the "Back" key to clear the help message.

Menu Tree

```
Menu
 |
 | _ Calibrate                              ↓
 | |                                        | _ Maintenance/Test
 | | _ Manual calibration                   | |
 | |                                        | | _ System
 | | _ Automatic calibration               | | | _ Atm. pressure
 |                                          | | | _ Display test
 | _ Configure                             | | | _ Keyboard test
 | |                                        | |
 | | _ Component specific                   | | _ Analyzer spec. adjustm.
 | | | _ Measurement range                  | | | _ Pump
 | | | _ Filter                             | | | _ Atm. press. anlz
 | | | _ Autorange                          | | | _ Calibration reset
 | | | _ Alarm values                       | | | _ Basic calibration
 | | | _ Active component                   | | | _ Cross sensitivity adjustm.
 | | | _ Module text                        | | | _ Carrier gas adjustm.
 | |                                        |
 | | _ Calibration data                     | _ Diagnostics/Information
 | | | _ Manual calibration                 |
 | | | _ Automatic calibration              | _ System overview
 | | | _ Ext. controlled cal.               |
 | | | _ Output current response            | _ Module specific
 | |                                        | | _ Raw values
 | | _ Function blocks                      | | _ Auxiliary raw values
 | | | _ Miscellaneous                      | | _ Status
 | | | _ Inputs                             | | _ Controller values
 | | | _ Outputs                            |
 | | | _ Mathematics                        | _ Logbook
 | | | _ Multiplexer/Demultiplexer
 | | | _ Measurement
 | | | _ Sample system
 | | | _ Calibration/Correction
 | |
 | | _ System
 |   | _ Date/Time
 |   | _ Language
 |   | _ Change password
 |   | _ Setup system modules
 |   | _ Save configuration
 |   | _ Status signals
 |   | _ Network
 |   | _ Display
 ↓
```

Manual Calibration

	Step	Action	Input/Key

Manual Calibration	1	Select the `Manual Calibration` menu.
		
		ⓘ Substitute gas calibration using sample component 2 (100...0 Vol.-% H_2 in CO_2/Argon) must be set as calibration method.
		Zero: 100 Vol.-% H_2
		Span: 0 Vol.-% H_2
			MENU
			↓
			`Calibrate`
			ENTER
			↓
			`Manual Calibration`
			ENTER

		Zero calibration:	
	2	Select `Zero gas` menu item.	`Zero Gas` **ENTER**
	3	Turn on the zero gas supply (H_2) and confirm.	**ENTER**
	4	If necessary, change the test gas concentration [1] according to the specification on the H_2 cylinder with the numeric keypad (example).	`99.9` `Vol%` **ENTER**
	5	When the measurement value indication stabilizes, initiate zero calibration.	**ENTER**
	6	Accept the calibration result (forward to step 7) or repeat calibration [2] (back to step 4) or reject calibration (back to step 5).	**ENTER** or **REPEAT** or ⬛ Back
		Span calibration:	
	7	Select `Span gas` menu item.	`Span gas` **ENTER**
	8	Turn on the span gas supply when `H2:C02` is displayed: CO_2 when `H2:Ar` is displayed: Argon and confirm.	**ENTER**
	9	If necessary, change the test gas concentration [1] with the numeric keypad.	`0.0` `Vol%` **ENTER**
	10	When the measurement value indication stabilizes, initiate span calibration.	**ENTER**
	11	Accept the calibration result (forward to step 12) or repeat calibration [2] (back to step 9) or reject calibration (back to step 10).	**ENTER** or **REPEAT** or ⬛ Back
	12	Return to measurement value readout.	⬛ Meas

1) The initialized test gas concentration is shown as the set point.

2) It may be necessary to repeat calibration if the measurement value is still not stable after calibration has been started. The subsequent process is based on the measurement value obtained in the previous calibration.

Calibration Reset

When should a calibration reset be performed?

A calibration reset should be performed if the gas analyzer can no longer be calibrated by normal means. A possible cause of this is calibration of the gas analyzer with the wrong test gases.

Calibration Reset

Step	Action	Input/Key

1	Select `Calibration reset` menu item.	`MENU`
		↓
		`Maintenance/Test`
		`ENTER`
		↓
		`Analyzer spec.`
		`adjustm.`
		↓
		`Calibration`
		`reset`
		`ENTER`

2	Select component.	∧ or ∨ `ENTER`

3	Start calibration reset.	`CAL RESET`
		↓
		`YES`

4	Enter password for access level 1.	`471100` `ENTER`
5	The system performs the calibration reset.	`CAL RESET`
6	Return to measurement value readout.	Meas

ℹ The gas analyzer should be calibrated after a calibration reset.

Selecting the User Interface Language

Selecting Language

Step	Action	Input/Key
1	Select Language menu item.	MENU ↓ Configure ENTER ↓ System ↓ Language ENTER
2	Select language.	< or > ENTER
3	Enter password for access level 2. The system is loading the new language.	081500 ENTER
4	Return to measurement value readout.	Meas

Changing the Password

Changing the Password	Step	Action	Input/Key

	1	Select `Change password` menu item.	`MENU`
			↓
			`Configure`
			`ENTER`
			↓
			`System`
			↓
			`Change password`
			`ENTER`

	2	Use the arrow keys to select the user group for which the password is to be changed (for example).	`Maintenance` `ENTER`
	3	Use the numeric keypad to enter the old 6-digit password (for example).	`471100` `ENTER`
	4	Use the numeric keypad to enter the new 6-digit password (for example).	`471200` `ENTER`
	5	Re-enter the new password (for example).	`471200` `ENTER`
	6	Return to measurement value readout.	Meas

Password Setting

The default passwords are shown in the following table. User-specific passwords can be entered into the right column.

User Groups	Access to Password Levels	Default Passwords	User-specific Passwords
Every user	0	None	
Maintenance team	0, 1	471100	
Specialist team	0, 1, 2	081500	

Part 2   Description

Configuration

Sample Components and Measurement Ranges	No.	Measurement ranges, sample components and associated gas
	1	0...100 Vol.-% CO_2 or Argon in air
	2	100...0 Vol.-% H_2 in CO_2 or Argon
	3	80...100 Vol.-% H_2 in air (80/85/90...100 Vol.-% or 100...90/85/80 Vol.-% according to order)

Input and Output Signals

Status signal output	Single status output via digital outputs on the digital I/O module "Status signals/Externally controlled calibration" (see Fig. 5)
Sample component switch over and feed back	Digital inputs and outputs on the digital I/O module "Measuring range control" (see Fig. 6)
Current output	Analog output AO1 on the analog output module, current range 4...20 mA (see Fig. 8)

Indication   1 decimal place

Time Constant   T90 = 15 sec.

Calibration   Substitute gas calibration using sample component 2
(100...0 Vol.-% H_2 in CO_2/Argon)
Zero: 100 Vol.-% H_2
Span: 0 Vol.-% H_2

Analyzer Module Dimensional and Connection Diagram

Figure 3

Analyzer Module Dimensional and Connection Diagram

(Dimensions in mm)
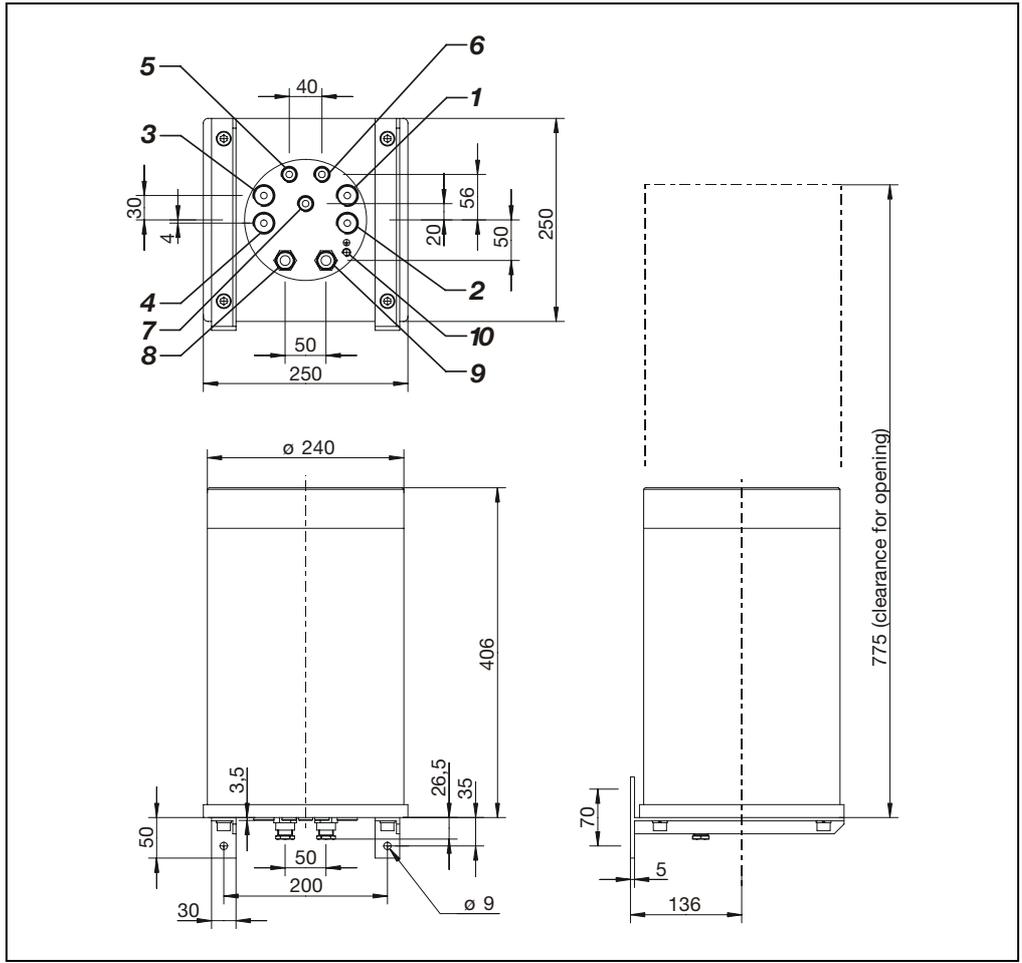
Gas Connections:
1 Sample gas inlet
2 Sample gas outlet
3 Vent opening [2]
4 Vent opening [2]
5 Purge gas inlet [1]
6 Purge gas outlet [1]
7 Pressure sensor

Electrical Connections:
8 System bus
9 24 VDC
10 Potential compensation

1) Option
2) only in version for sample gas under positive pressure

Electronics Module Connections

Figure 4

Electronics Module Connections
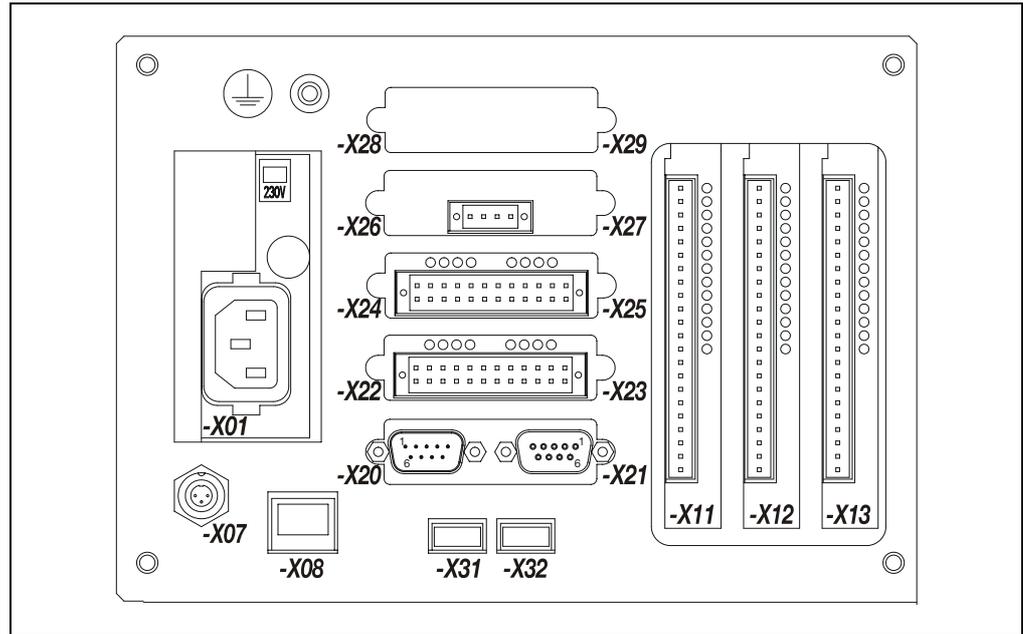
-X01	115/230 VAC power supply connection
-X07	System bus connection
-X08	Ethernet 10/100BASE-T interface
-X20/-X21	RS232/RS485 module (option)
-X22/-X23	Digital I/O module "Status signals/Externally controlled calibration" (see Figures 5 and 7)
-X24/-X25	Digital I/O module „Measuring range control" (see Figures 6 and 7)
-X26/-X27	Analog output module (see Figure 8)
-X31, -X32	not used
-X11...-X13	I/O boards (options)
⏚	Potential compensation connection

Connection Diagrams

Figure 5

Digital I/O Module "Status Signals/ Externally Controlled Calibration" Connection Diagram

1	DI4 -	Abgleich Endpunkt
2	+	Adjust End Point
3	GND	
5	DI3 -	Abgleich Nullpunkt
6	+	Adjust Zero Point
4	GND	
7	DI2 -	Autokalibrierung sperren
8	+	Inhibit Automatic Calibration
9	GND	
11	DI1 -	Autokalibrierung starten
12	+	Start Automatic Calibration
10	GND	
13	DO4 NO	Externes Magnetventil
15	C	External Solenoid Valve
17	NC	
14	DO3 NO	Wartungsbedarf
16	C	Maintenance Request
18	NC	
19	DO2 NO	Funktionskontrolle
21	C	Maintenance Mode
23	NC	
20	DO1 NO	Ausfall
22	C	Failure
24	NC	

Figure 6

Digital I/O Module "Measuring Range Control" Connection Diagram

1	DI4 -	nicht belegt	
2	+	not used	
3	GND		
5	DI3 -	Messkomponenten-Umschaltung	H_2:Luft
6	+	Sample Component Switchover	H_2:Air
4	GND		
7	DI2 -	Messkomponenten-Umschaltung	H_2:CO_2 oder H_2:Argon
8	+	Sample Component Switchover	H_2:CO_2 or H_2:Argon
9	GND		
11	DI1 -	Messkomponenten-Umschaltung	CO_2:Luft oder Argon:Luft
12	+	Sample Component Switchover	CO_2:Air or Argon:Air
10	GND		
13	DO4 NO	nicht belegt	
15	C	not used	
17	NC		
14	DO3 NO	Messkomponenten-Rückmeldung	H_2:Luft
16	C	Sample Component Feedback	H_2:Air
18	NC		
19	DO2 NO	Messkomponenten-Rückmeldung	H_2:CO_2 oder H_2:Argon
21	C	Sample Component Feedback	H_2:CO_2 or H_2:Argon
23	NC		
20	DO1 NO	Messkomponenten-Rückmeldung	CO_2:Luft oder Argon:Luft
22	C	Sample Component Feedback	CO_2:Air or Argon:Air
24	NC		

Connection Diagrams, *continued*

Figure 7

Digital I/O Modules Pin Layout

DI4 DI3 DI2 DI1   DO4 DO3 DO2 DO1

| 1 | 3 | 5 | 7 | 9 | 11 | 13 | 15 | 17 | 19 | 21 | 23 |
| 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 22 | 24 |
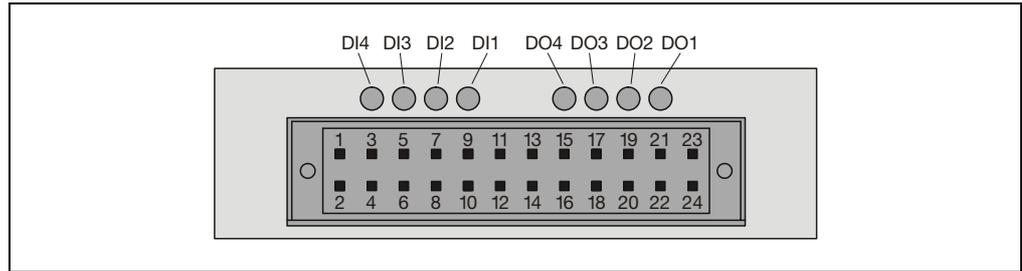
Figure 8

Analog Output Module Pin Layout and Connection Diagram

1 2 3 4

1	AO1 +	0/4 to 20 mA, max. 750 Ω
2	-	
3	AO2 +	0/4 to 20 mA, max. 750 Ω
4	-	
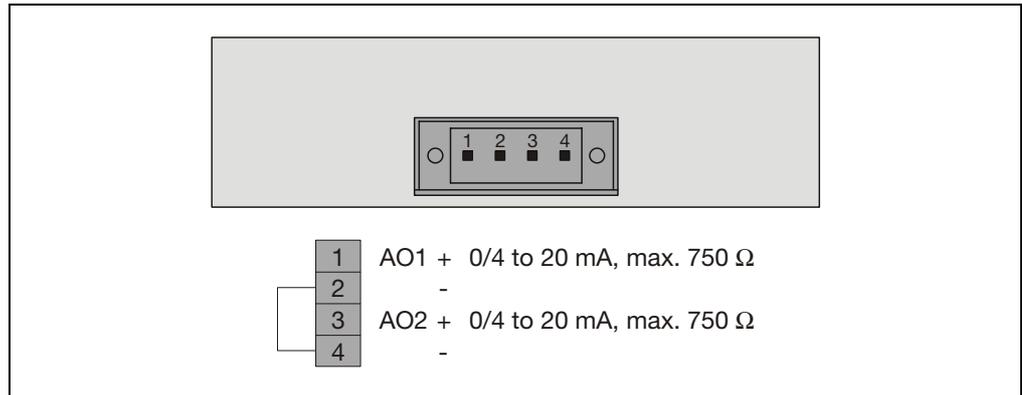
System Bus and 24 VDC Connections

Figure 9

**System Bus and
24 VDC Connections**
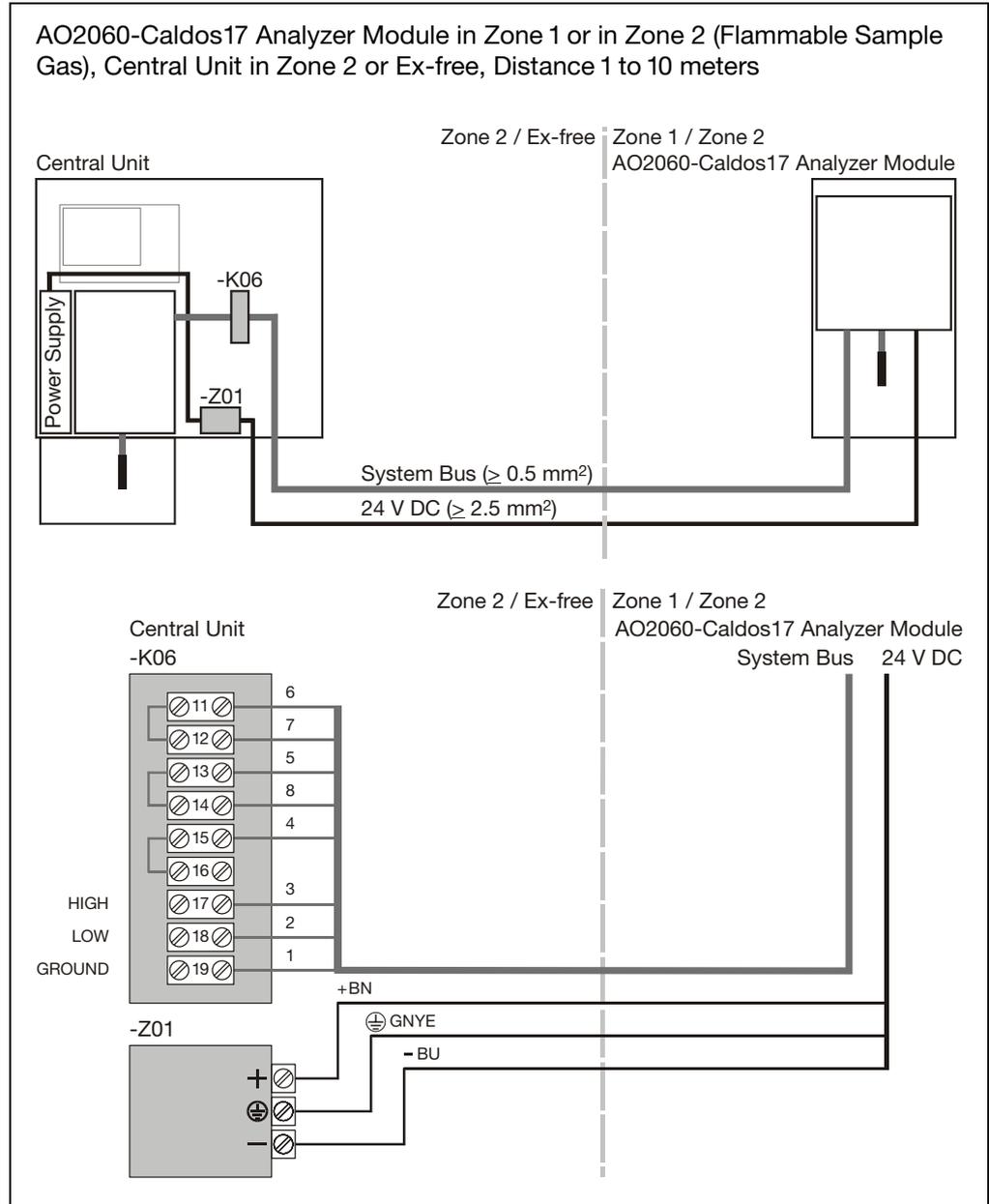
AO2060-Caldos17 Analyzer Module in Zone 1 or in Zone 2 (Flammable Sample Gas), Central Unit in Zone 2 or Ex-free, Distance 1 to 10 meters

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