Advance Optima
Module Caldos 17

Service Manual 43/24-1004-0 EN

ABB Automation

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Chapter 1: Description of functions

Overview

Introduction

This chapter describes the underlying physical principles and the function of the module components.

Chapter contents

In this chapter you will find the following information:

Physical principles

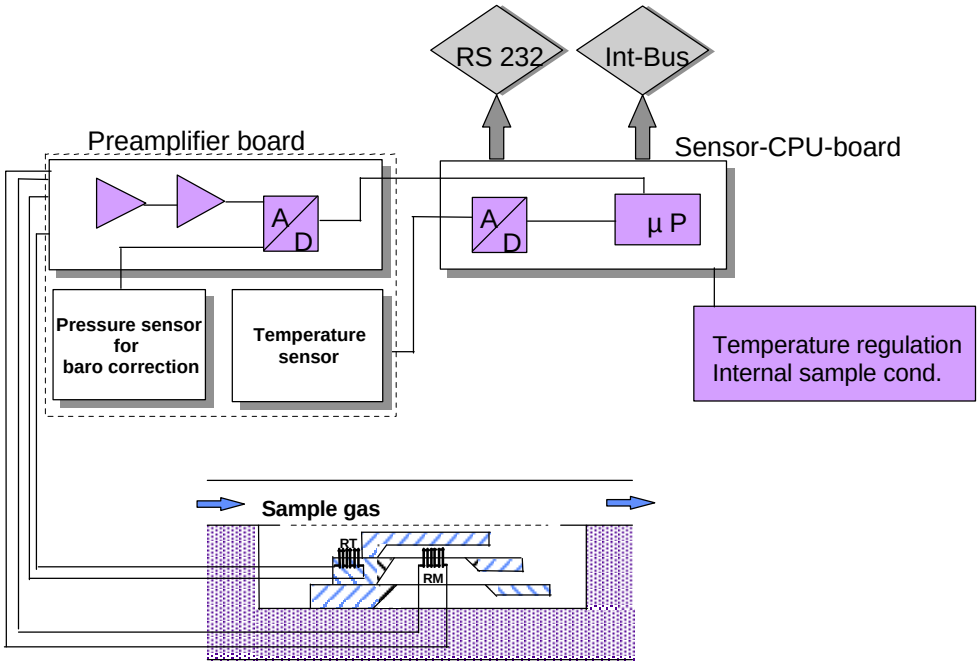
Measurement principle

The measurement technique is based on the differing thermal conductivity of various gases. The sample component's thermal conductivity must differ markedly from that of the associated gas. The composition of the accompanying gas should be relatively consistent.

The detector is a thermal conductivity sensor consisting of three overlapping silicon chips.
The center chip contains a membrane about 2 sq mm in size, on which mobile thin-film resistor (RM) is located and exposed to the sample gas. Its resistance value changes according to the thermal conductivity of the surrounding gases. A circuit produces a current which counters the change in resistance in order to maintain a specific resistance value ratio for a second resistor (RT) located outside the membrane.

The intensity of the current is used to measure the sample component concentration.

Figure 1-1 Signal flow schematic



Signal processing

- The measurement signal from the thermal conductivity sensor is passed to the preamplifier board and digitized by the A/D converter located there.
- The digitized measurement signal is passed to the Sensor-CPU board for processing simultaneously with a pressure correction value and the data contained in the EEPROM.
- The measurement value can be recorded or processed further (e.g. as an mA signal in the central processor electronics) via an RS232 interface or via the internal bus.

Determination of influence values

Pressure

- The preamplifier board has a pressure sensor to take pressure readings.
- It reads either ambient air pressure or the pressure at the sample gas outlet.
- The pressure sensor is an absolute pressure sensor.
- The current air pressure is taken via a hose connection between the pressure sensor and a housing port and is digitized by an A/D converter on the preamplifier board.
- The digitized value is used by the Sensor-CPU board to correct the measurement signal. To achieve this, the current air pressure is compared with the pressure set during calibration.
- In this manner a measurement signal extensively free from the effects of ambient pressure is obtained.

Temperature

- The thermal conductivity sensor is located in a thermostatically controlled stainless steel block with a temperature maintained at a constant 60°C.
- The temperature sensor is on the preamplifier board and reads the chamber temperature.
  The temperature sensor is an NTC resistor. Voltage is passed to the AD converter on the Sensor-CPU board.
- Any thermostat temperature deviation of more than 2K from the set temperature is processed as a status message.
  The temperature control circuit is on the Sensor-CPU board.

Flow rate

- The flow rate through the sample chamber should be approx. 60 l/h. It can be monitored, for example by a pneumatics module.
  The measurement value is only slightly dependent on flow rate, since the sample gas reaches the sensor only by diffusion.

Ex Concept

Being prepared

Chapter 2: Module variants and components

Overview

Introduction

This chapter describes the individual module variants for the rack- and wall-mount versions.
It describes the Sensor-CPU board and its connections.

Chapter contents

In this chapter you will find the following information:

Rack-mount module

Figure 2-1
Module for rack mounting

Features

- Analyzer with hose connection
- No flame barrier possible.

Wall-mount module, direct connection

Figure 2-2
Wall-mount module, direct connection

Features

- Piping connections are possible.
- Flame barriers are possible.

Wall-mount module, hose connection

Figure 2-3
Wall-mount module, hose connection

Gas connection layout

1	Not assigned
2	End-point gas inlet
3	Zero-point gas inlet
4	Sample gas inlet
5	Analyzer purge gas inlet
6	Analyzer purge gas outlet
7	Sample gas outlet
8	Pressure sensor
9	Housing purge gas outlet
10	Housing purge gas inlet

Features

- Analyzer with hose connection
- No flame barrier possible.

Ex-d module

Being prepared

Figure 2-4
Ex-d module

Sensor-CPU board

Sensor-CPU board
Item No.: 0745745

Figure 2-5
Sensor-CPU board

Inputs/Outputs

X1	Internal bus
X2	RS232/Service
X3	RS232
X4	Not applicable to C17
X6	Not applicable to C17
X7	Connection to preamplifier board
X8	Heater
X9	24-VDC supply
X10	Connection to internal PA
X12	Flow rate sensor input
X13	Dongle

Equipment

D24	Flash EPROM with firmware
D18	EEPROM with analyzer data
H1	LED green, power supply
H2	LED yellow, maintenance
H3	LED red, error

☞ The EEPROM D18 contains all analyzer data.

Continued on next page

Sensor-CPU board, *Continued*

Figure 2-6
Pin layout on module

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Sensor-CPU board, *Continued*

Figure 2-6
Sensor-CPU board
pin layout

Plug X1 Internal bus	Socket X2 RS232 Service

Plug X3 RS232	Plug X4 Not relevant to C17

Plug X64 Not relevant to C17	Plug X7

Continued on next page

Sensor-CPU board, *Continued*

Sensor-CPU board pin layout

Plug X8 Heater	Plug X9 24V

Plug X10 Internal PA	Plug X12 Flow rate sensor

Continued on next page

Sensor-CPU board, *Continued*

Sensor-CPU board pin layout

Plug X13 Dongle	

Flame barriers

Figure 2-7
Flame barrier for sample gas
Item No. 0768 493
and
Flame barrier for purge gas
Item No. 0768494

Flame barriers can only be used in the wall-mount, direct connection version.

☞ In the Exd module, the purge gas flame barrier is also used for the barometric correction outlet.

Chapter 3: Analyzer and assemblies

Overview

Introduction

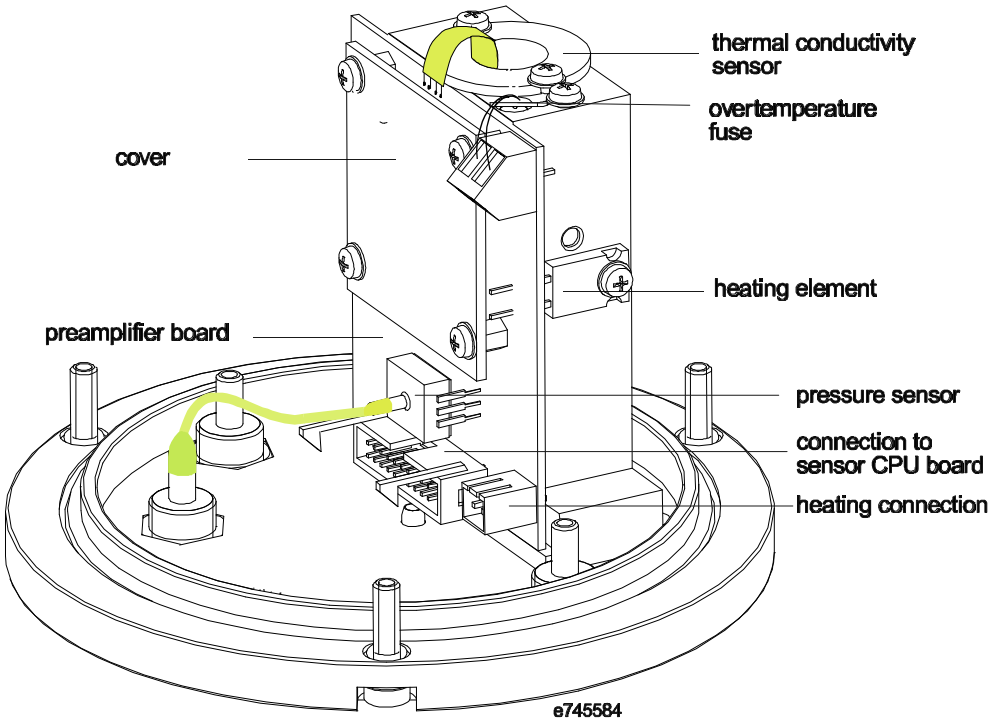
This chapter describes the analyzer and its assemblies (thermal conductivity sensor, jacket, and preamplifier board).

Chapter contents

In this chapter you will find information on the following subjects:

Analyzer, complete

Figure 3-1
Analyzer, complete



Application

All modules use the same analyzer.

Components

Figure 3-2
Thermal conductivity sensor, installed
Item No. 0745875

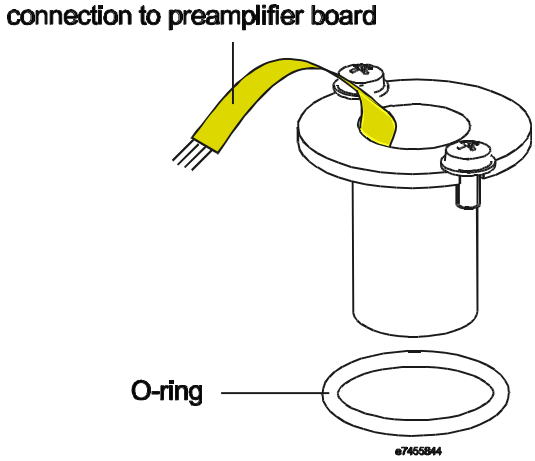
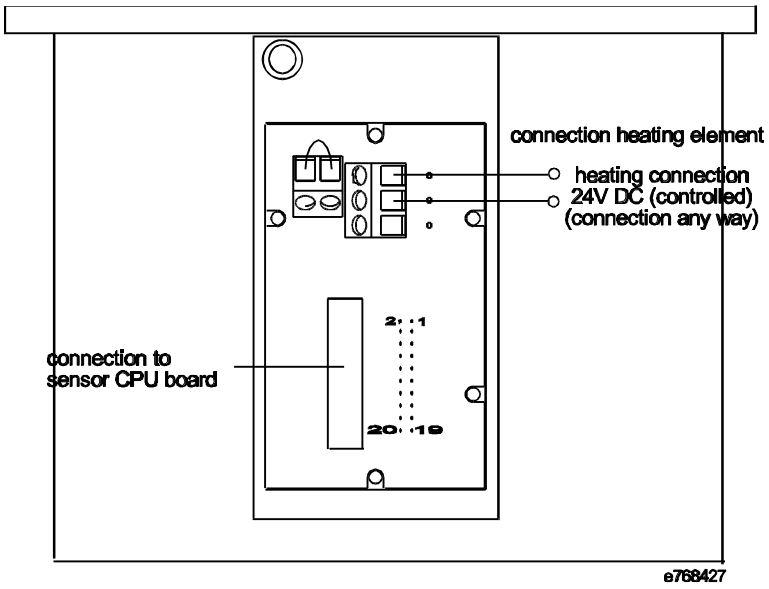


Figure 3-3
Jacket
Item No. 0768427



Specifications

- Heating element 2x25 □□5% (The heater elements are sealed on the preamplifier board. A connection leads to the jacket bushing plate)
- Regulated heater voltage, max. 24 VDC

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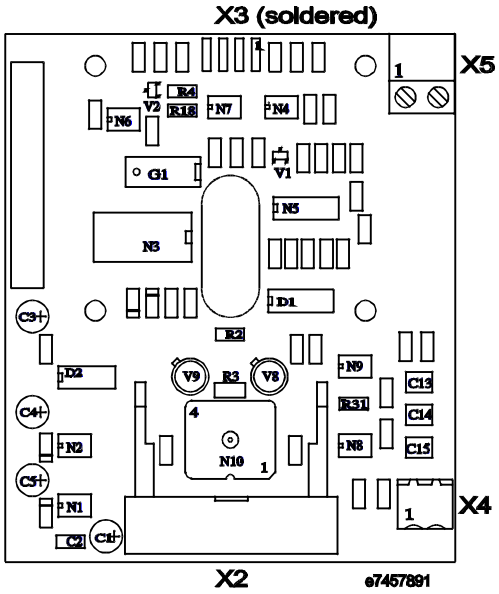
Preamplifier board
Item No. 0745789

Figure 3-4
Preamplifier board



Inputs/Outputs

X2	Connection to Sensor-CPU board
X3	Connection to thermal conductivity sensor (soldered)
X4	Heater connection
X5	Thermal link connection

Figure 3-5
Preamplifier board with heater elements

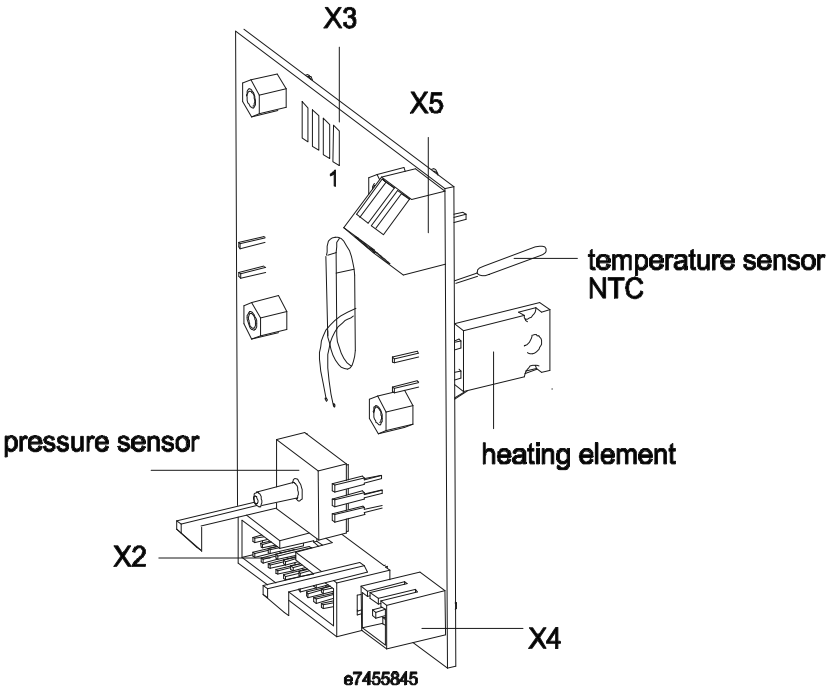


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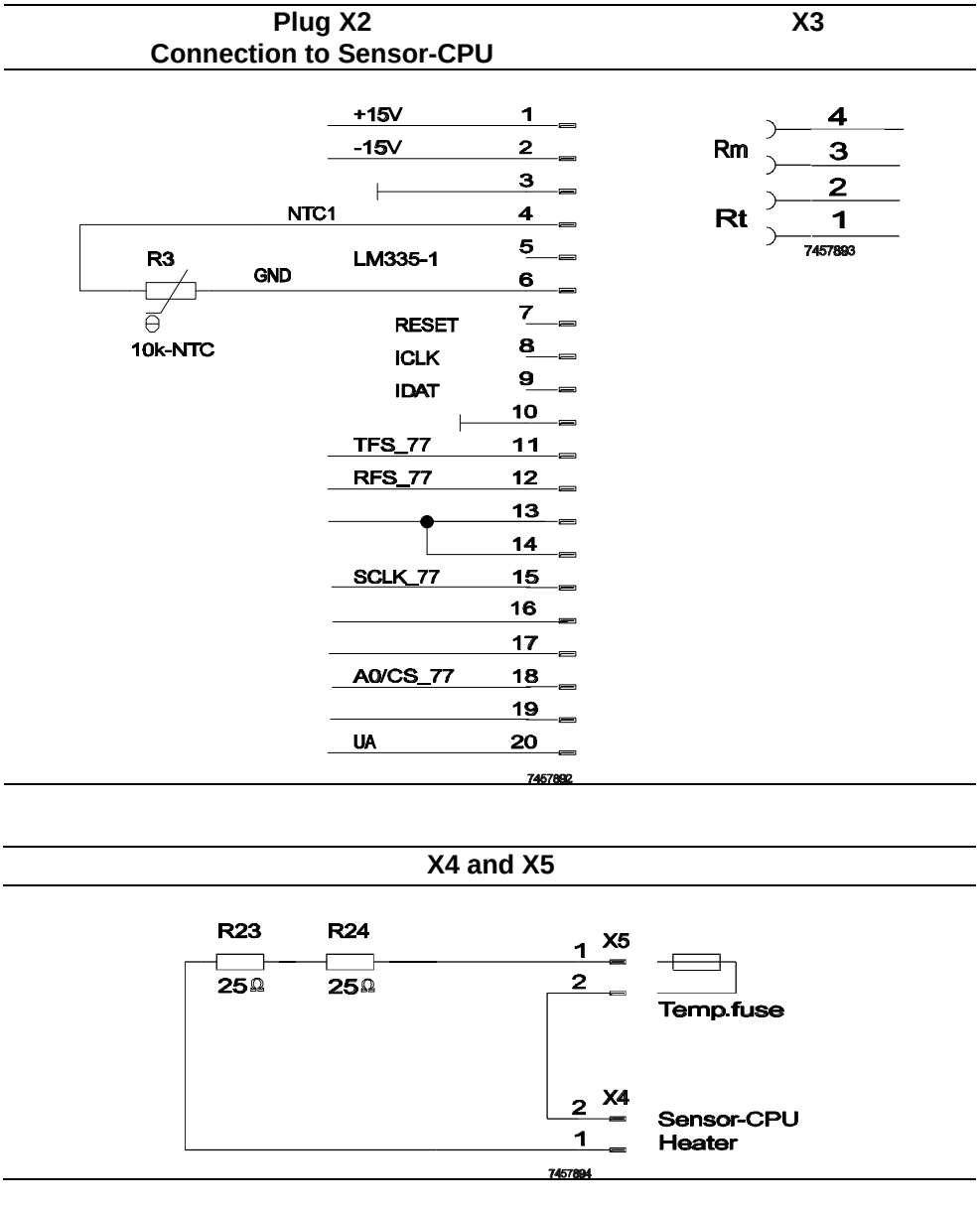
Figure 3-6
Preamplifier board pin layout



Chapter 4: Troubleshooting

Overview

Introduction

This chapter contains information on troubleshooting and repairing the module.

Chapter Contents

In this chapter you will find the following information:

Status Messages

General Status Messages

Error Code		Status Message	Description
0x0001	1	Detector error	No interrupt within the time window
0x0002	2	Overrange	ADC measurement range over/underflow
0x0004	4	Half	Half of the drift range exceeded (Offset or Ampl.)
0x0008	8	Over	Drift range exceeded (Offset or Ampl.)
0x0010	16	Delta Over	Calibration drift exceeded (Offset or Ampl.)
0x0020	32	Floating-point error	An error occurred in measurement value calculation

Pressure Detector Status Messages

General errors except drift errors

Temperature Control Status Messages

Error Code		Status Message	Description
General errors except drift errors			
0x1000	4096	Control deviation 1	First limit value exceeded
0x2000	8192	Control deviation 2	Second limit value exceeded

Flow Sensor Status Messages

General errors except drift errors

C17 Detector Status Messages

Error Code		Status Message	Description
General errors except drift errors			
0x0040	64	Temp. control error	Control deviation 1.1 or Temp. measurement value error
0x0200	512	Pressure comp. error	Error in pressure compensation measurement value
0x0400	1024	CS comp. error	Error in cross-sensitivity compensation measurement value
0x0800	2048	CG comp. error	Error in carrier gas compensation measurement value

Set temperature not reached

Error Message

Plain text for temperature deviation ±2° from set point (60°C)

Status Signal

Possible Cause	Corrective Action
Failed power supply	Check 24 V on jacket bushing board Check connections Connect 24-V power supply  The heater voltage regulator circuit is on the Sensor-CPU board. There is no permanent 24V to the heater. Check connections to Sensor-CPU board.
Defective thermal link	Replace thermal link
Temperature sensor defective on preamplifier board	Check temperature sensor Change preamplifier board
Defective Sensor-CPU board	Replace Sensor-CPU board
Defective heating element	Check heater element resistance Replace preamplifier board
Missing connection to Sensor-CPU board (in jacket)	Establish connection

No measurement signal

Indication / Error messages

No measurement signal for sample gas
No measurement signal during gas change (e.g. N_2/ Air)

Status Messages

Possible Cause	Measures
Power supply voltage not present	Connect 24-V power supply
Failure in thermal conductivity sensor (Sensor defective or contaminated)	Check sensor analog signal Check sensor resistance Replace sensor
Defective preamplifier board	Replace preamplifier board
Defective Sensor-CPU board	Replace Sensor-CPU board
Defective connections between sample chamber, preamplifier board and/or Sensor-CPU board	Establish connection
No gas flow through sample chamber	Check gas path components
Gas path leakage	Repair leaks
Failure in EEPROM	Replace EEPROM and/or reload data set

Measurement signal unstable/Measurement signal implausible

Indications /Error messages

Unstable or implausible measurement signal for sample gas

Status Messages

Possible Cause	Measures
Failure in thermal conductivity sensor Sensor contaminated	Check sensor analog signal Check sensor resistance Replace sensor
Defective preamplifier board	Replace preamplifier board
Defective Sensor-CPU board	Replace Sensor-CPU board
Defective connections between sensor, preamplifier board and/or Sensor-CPU board	Establish connection
Gas path leakage	Repair leaks
Gas path contamination	Clean gas path
Failure in EEPROM	Replace EEPROM and/or reload data set

No flow rate

Error Message / Indication

Status Message

Possible Cause	Measures
Gas path leakage / restriction	Repair leak Clean contamination
Defective flow rate monitoring in sample preparation	Replace flow rate sensor Replace Sensor-CPU board
Sample preparation error	Correct error

Chapter 5: Testing

Overview

Introduction

This chapter describes testing of the primary measurement and influence values on the module.
Special accessories will be described in the appropriate places.

Chapter contents

In this chapter you will find the following information:

Measurement signal (thermal conductivity sensor)

Electrical value: As voltage drop after the op amp

Where? Sensor-CPU board plug X7 pins +20-3

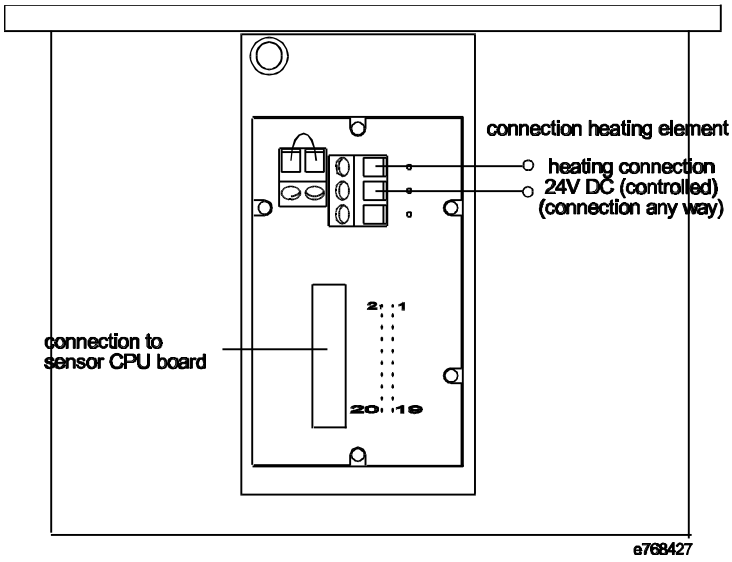
Set point:

Temp. adjustment	U_{air} in V	$U_{air\text{-}nitrogen}$ in mV
1	0,47	1,3
2	0,88	3,2
3	1,00	4,2
4	1,04	4,5

Test points on plug X7 of CPU-Sensor board can be reached via the adapter or on the thermostat core bushing (pin 1 top right)

An adapter must be used for the rack-mount version.

Figure 5-1
Jacket



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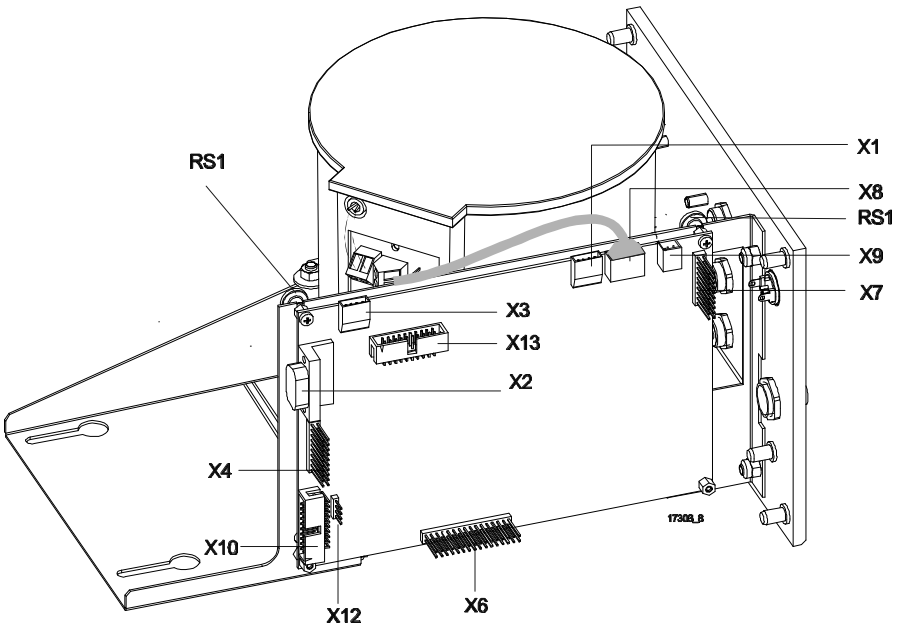
Measurement signal (thermal conductivity sensor), *Continued*

Figure 5-2
Plug designation on the module



Thermal conductivity resistors

Electrical value: Resistance in ohms

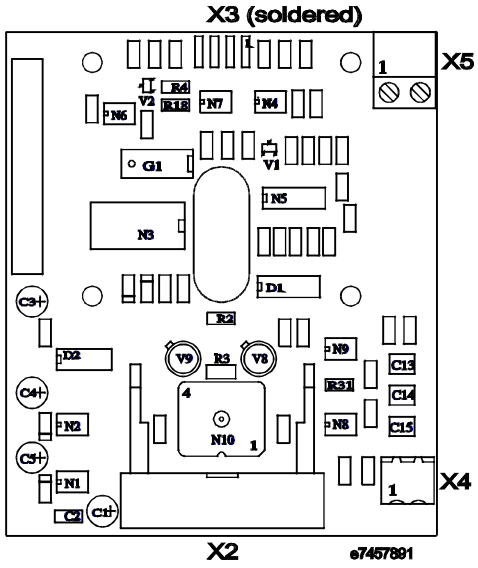
Where? At preamplifier board solder connection X3 in soldered or unsoldered state
R_t pins 1 and 2
R_m pins 3 and 4

Set points: at 20°C approx. R_t = 235 Ω R_m = 200 Ω
at 60°C both resistors are greater by a factor of 1.22.

☞ **The analyzer must be taken out of the jacket.**

Remove plug X9 (24-VDC power supply) on the Sensor-CPU board.

Figure 5-3
Preamplifier board



Thermostat temperature

Electrical value Voltage

Where? Sensor-CPU board plug X7 pins +4-6

Test points on plug X7 of CPU-Sensor board can be reached via the adapter or on the thermostat core bushing (pin 1 top right)

The adapter must be used for the rack-mount version.

Set points: 60°C ± 2K

25°C 1.405 V
55°C 1.034 V
60°C 0.960 V

Figure 5-4
Jacket

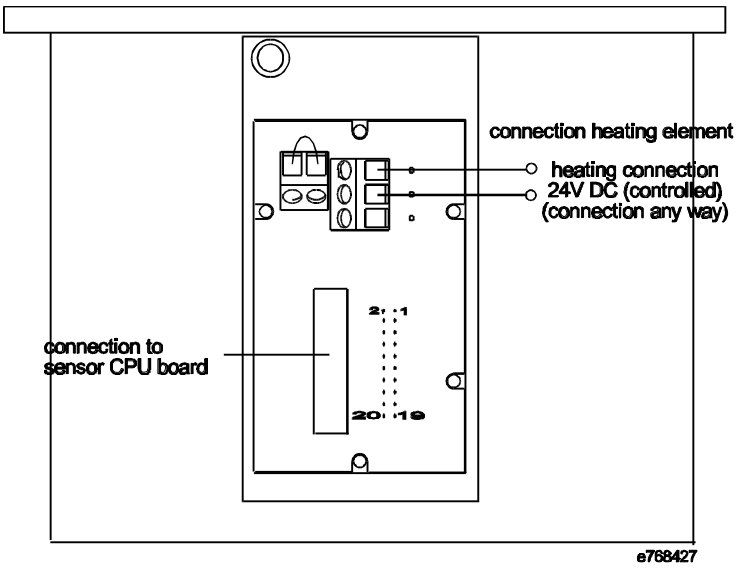


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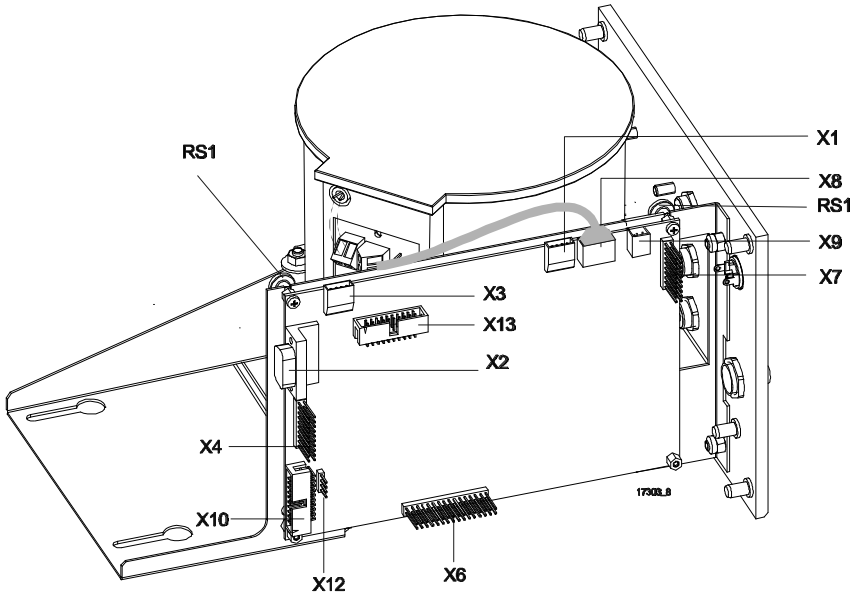
Figure 5-5
Plug designation on module



Temperature sensor

Electrical value — NTC sensor resistance

Where? — Preamplifier board or
Sensor-CPU board plug X7 pins +4-6

Test points on plug X7 of CPU-Sensor board can be reached via the adapter or on the thermostat core bushing (pin 1 top right)

The adapter must be used for the rack-mount version.

Set point:

25°C	10.0 kΩ
55°C	2.99 kΩ
60°C	2.49 kΩ
61°C	2.40 kΩ
64°C	2.16 kΩ

Remove plug X9 (24-VDC power supply) on the Sensor-CPU board.

Figure 5-6
Jacket

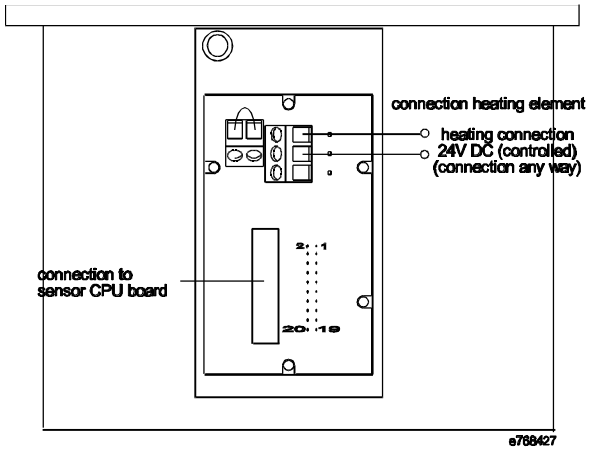


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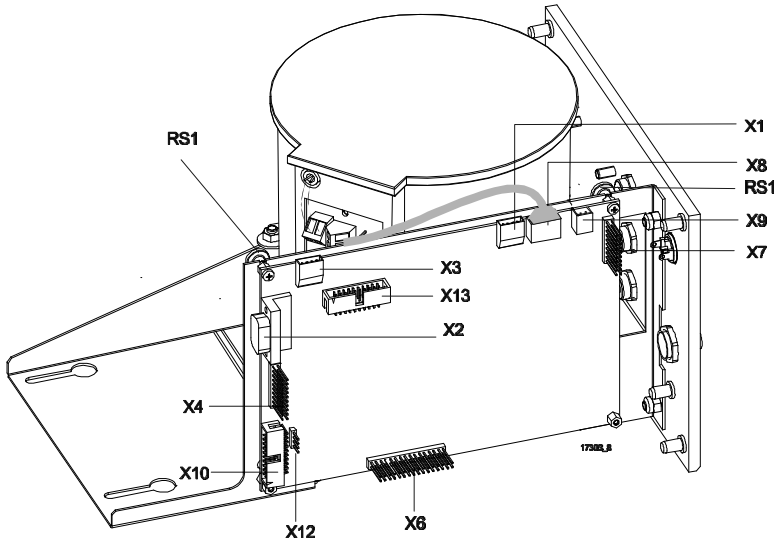
Figure 5-7
Plug designation on module



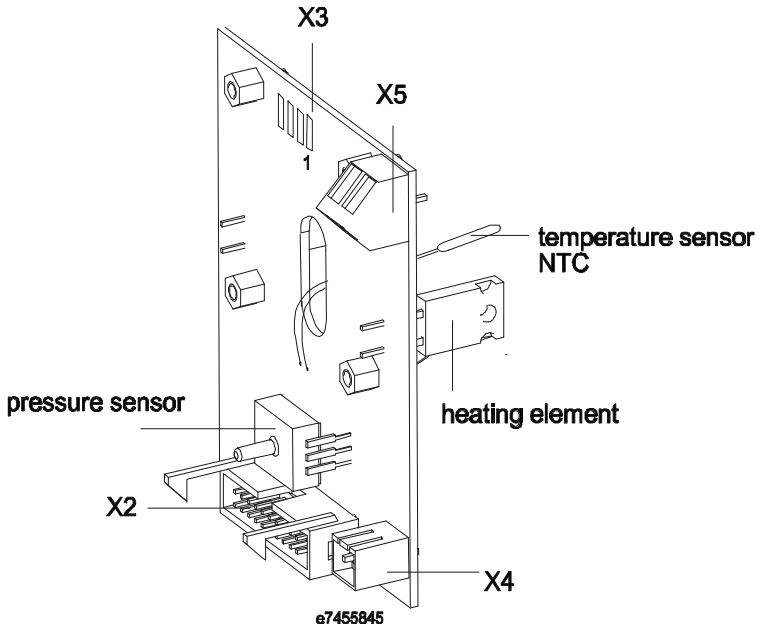
Heating elements

Electrical value Resistance in ohms

Where? Preamplifier board, heating element solder points

Set point: 25 ±5%

Figure 5-8 Preamplifier board with heater elements



Remove plug X9 (24-VDC power supply) on the Sensor-CPU board.

Chapter 6: Component replacement

Overview

Introduction

This chapter describes the steps and procedures for replacing components.

Chapter contents

In this chapter you will find the following information:

Complete module replacement

Removing the module

Step	Action
1	 Disconnect the analyzer system power supply.
2	Turn off the gas supply (sample gas, reference gas) to the analyzer module.
3	Flush the analyzer module.
4	Remove the gas lines from the analyzer module ports.
5	Open the system housing.
6	Remove the wiring connection between the analyzer module and central unit.
7	Remove the analyzer module mounting screws.
8	Remove the analyzer module from the system housing

Installing the module

Reverse the above steps.

 Carry out a seal integrity check before reconnecting the power supply.

Complete analyzer replacement

Analyzer in 19"-rack housing

Step	Action
1	Remove the module from the system housing.
2	Disconnect the hoses from the flange.
3	Remove the three socket-head screws on the flange.
4	Remove the analyzer and flange from the module.

Analyzer in wall housing, hose connection

Step	Action
☞	The module must **not** be removed from the system housing.
1	Remove all hoses from the flange.
2	Remove the three socket-head screws on the flange.
3	Remove the analyzer and flange from the module.

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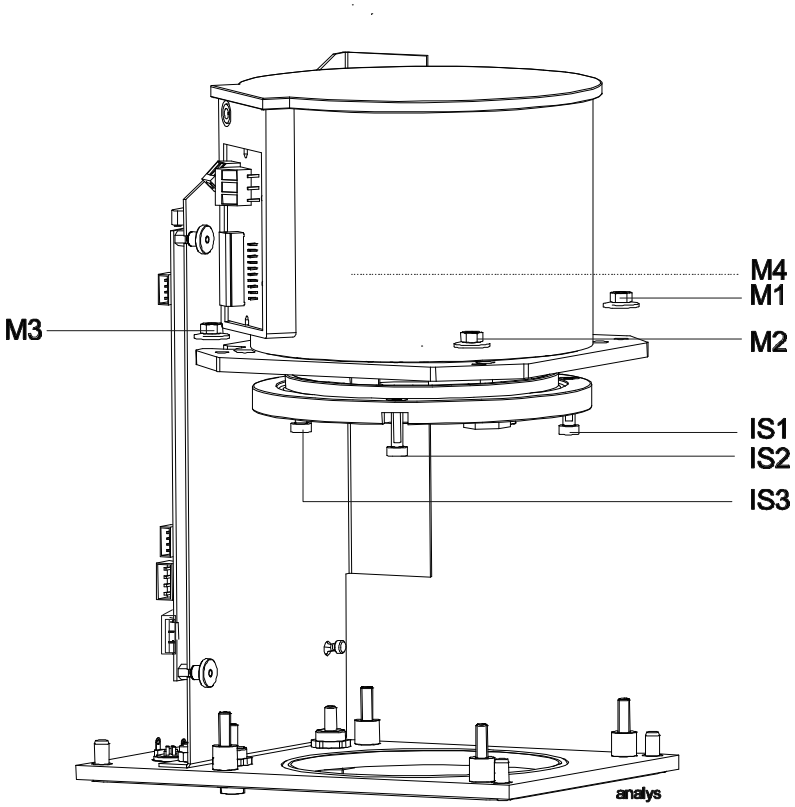
Analyzer in wall housing, direct connection

Figure 6-1 Analyzer in wall housing



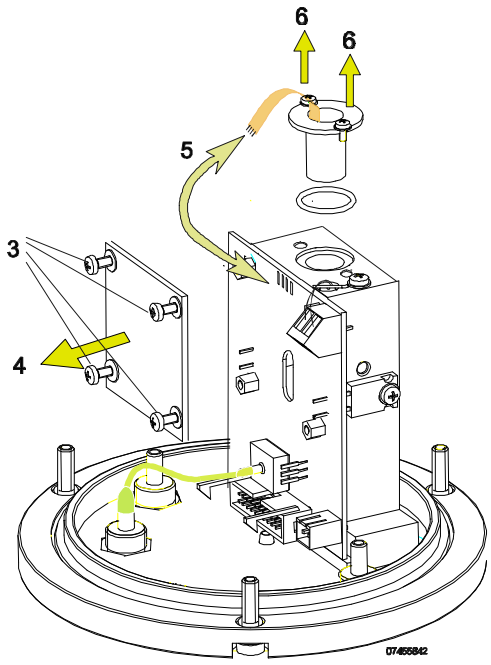
Step	Action
1	Remove the module from the system housing.
2	Remove the 4 M1-4 nuts from the support plate.
3	Remove the three IS1-3 socket-head screws on the flange.
4	Remove the analyzer and flange from the module.

Installing the analyzers

Reverse the above steps to install the analyzers.

Thermal conductivity sensor replacement

Figure 6-2
Analyzer exploded view



Removal

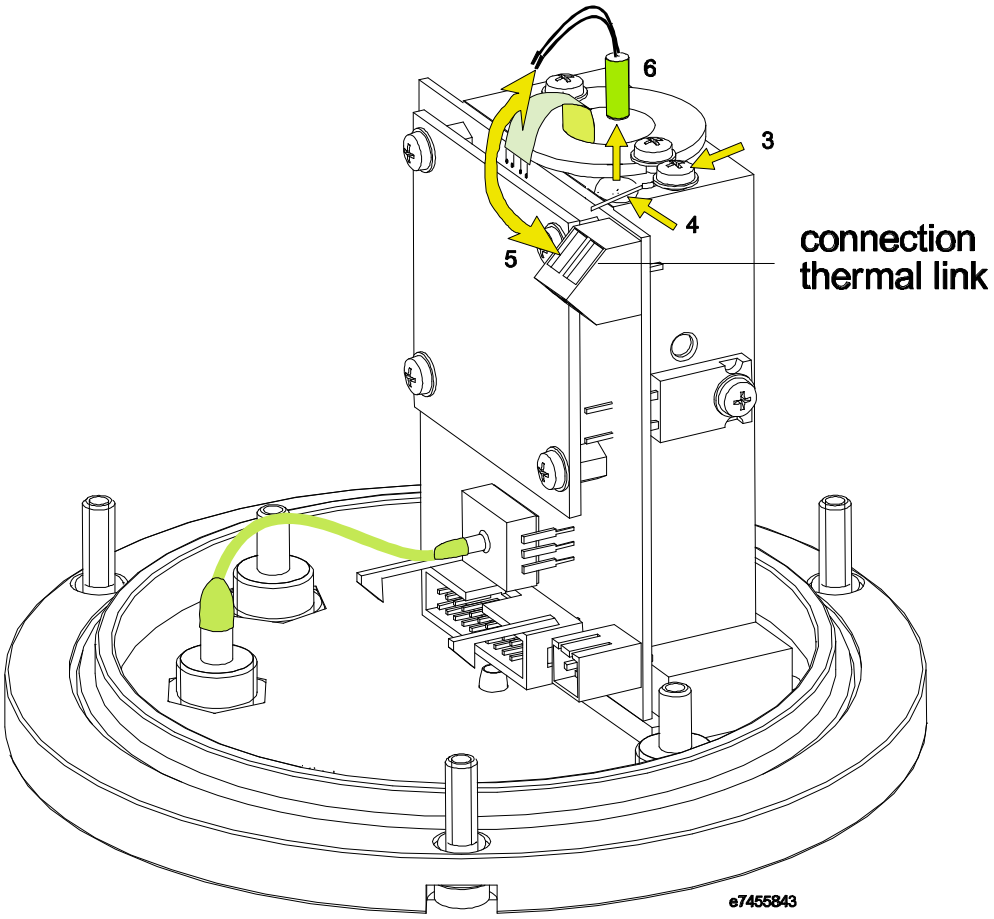
Step	Action
1	Remove the module from the system housing.
2	Remove the analyzer from the housing
3	Remove the four screws from the preamplifier board cover.
4	Remove the cover.
5	Remove the sensor solder connection.
6	Remove the two screws on the thermal conductivity sensor.
7	Remove the thermal conductivity sensor with O ring.

Installation

Reverse the above steps.

Thermal link replacement

Figure 6-3 Analyzer exploded view



Removal

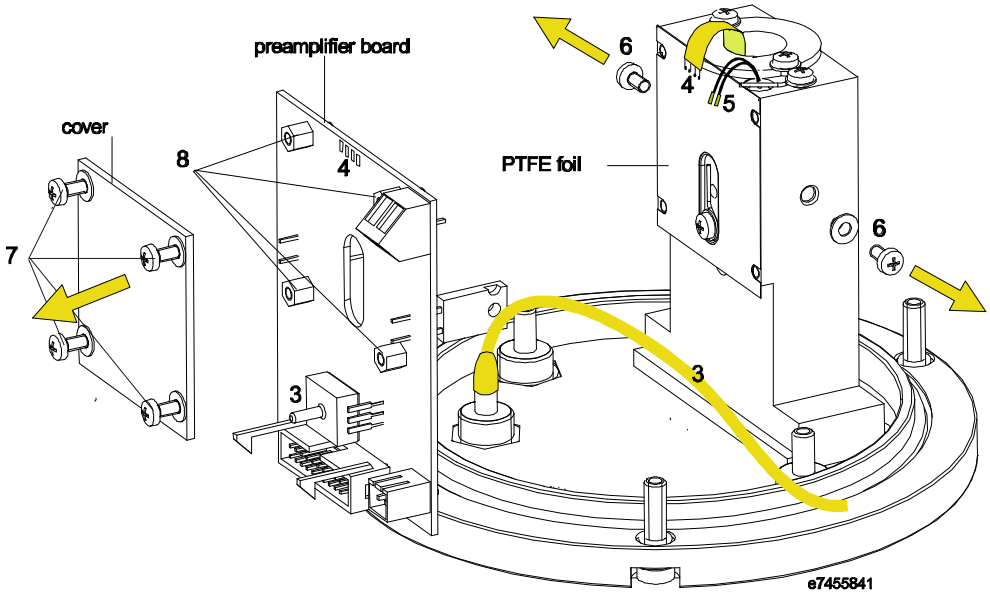
Step	Action
1	Remove the module from the system housing.
2	Remove the analyzer from the module.
3	Remove screw 1.
4	Slide bracket 2 to one side.
5	Remove the thermal link electrical connections.
6	Remove the thermal link.

Installation

Reverse the above steps.

Preamplifier board replacement

Figure 6-4 Analyzer exploded view



Removal

Step	Action
1	Remove the module from the system housing.
2	Remove the analyzer from the module.
3	Remove hose 1 from pressure sensor 1.
4	Remove solder connection 2 between the thermal conductivity sensor and the preamplifier board.
5	Remove electrical connection 3 (thermal link).
6	Remove two screws 4 (heating element fasteners).
7	Remove four screws 5 from the cover and remove the cover.
8	Remove four threaded dowels 6 on the preamplifier board and remove the preamplifier board. At this point the PTFE sheet will fall.

Continued on next page

Preamplifier board replacement, *Continued*

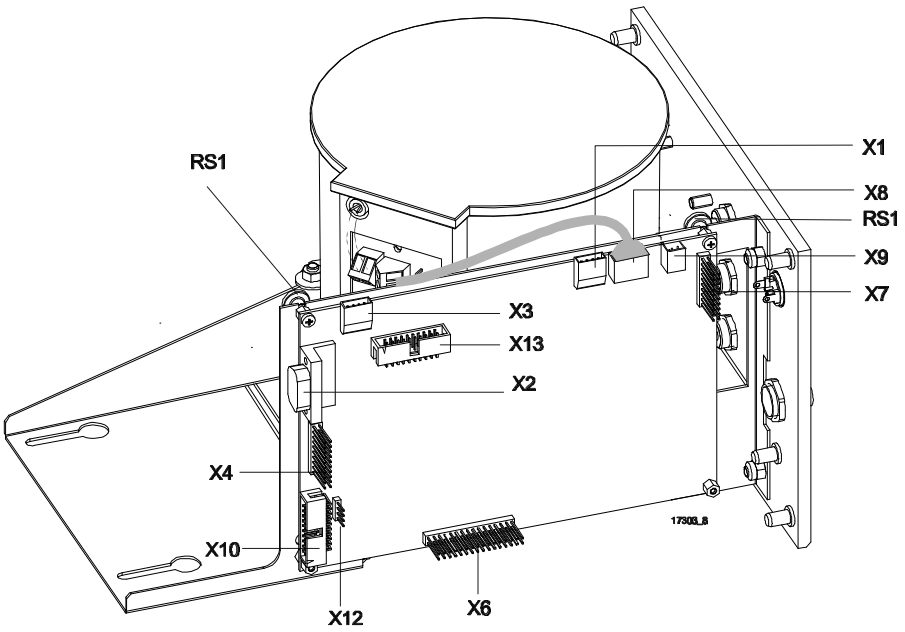
Installation

Reverse the above steps.

When installing the heating element be careful of exerting firm pressure on the chamber.

Sensor-CPU board replacement

Figure 6-5
Module view



Step	Action
1	Remove the module from the system.
2	Remove all connections from the Sensor-CPU board.
3	Remove knurled screws RS1 and RS2.
4	Remove the Sensor-CPU board.

Flame barrier replacement

Being prepared

Chapter 7: Configuration

Overview

Introduction

This chapter contains instructions for configuring an analyzer module with the test and calibration software.
Configuration via the keyboard is described in the operator's manual.

Chapter Contents

This chapter contains the following information:

General

When should calibration be performed with the PC and software?

- To set up new detectors for auxiliary variables, e.g. when installing a flow sensor
- To set-up new sample components
- To change user text
- To change the type of communication
- To change the balance limits for subsequent calibration

Accessories

PC with serial interface
Advance Optima - masserv - test and calibration software
Serial interface connection cable part number 0743091

☞ Configuration can also be carried out via the "Data Set Processing" menu. The entire data set must then be loaded in the EEPROM.

General Data

Serial Number -This serial number can be used for analyzer module Syscon registration as needed.

F4 125 k Baud for CAN bus communication
F5 19200 Baud for communication via a serial interface
F6 Always select NMT communication if the AO central electronics unit is connected.
F7 Do not change
F8 Free-form user text; for example, the sample site name can be entered here.

Analyzer Module Configuration

The following detectors are configured:

Caldos 17 Detector
Detectors for auxiliary variables:
Temperature detector 2 control detector for thermostat (always)
Pressure detector 1 for atmospheric pressure correction (always)
Flow detector 1 for flow monitoring (optional)

Note

Each detector must be configured according to the following plan:

Detector Configuration
Component Configuration
Measurement Range Configuration

☞ **Configuration of a detector is completed only by carrying out the component and measurement range configuration.**

Caldos 17 Detector

Detector Configuration

Detector Configuration
F1 Detector: Caldos 17
F2 Active Component: (can also be done via the keyboard, has no effect on subsequent configuration)
F3 Detector Correction Parameters - Listing of all active correction functions
F4 Correction Function Activation - Activate desired correction function with "+" or deactivate with "-"
Standard Gas Calibration **or** Substitute Gas Calibration
F5 Detector Components - Listing of configured components, opening a new component
Terminology note:
CO_2 in N_2 and CO_2 in Ar are 2 different components!
Standard gas (Stdg) is treated as one component.
F6 Update Mode / Cycle Time - always "cyclical", 5000 ms
F7 Delta Offset / Amplification - Standard setting: 15 / 15
F8 Over Offset / Amplification - Standard setting: 1000 / 50

Continued on next page

Component Configuration

F5 Select Detector Component

Component Configuration

F1 Component Name

F2 Active Measurement Range (can also be done via the keyboard, has no effect on subsequent configuration)

F3 Component Correction Parameters - Listing of all active correction functions

Correction Caldos 17 Detector

F1 Detector Measurement Temperature - Depends on measurement, usually "2"

Pressure Correction - Pressure Detector 1 must be entered, do not change any other parameters.

Offset / Ampl Common - Variable correction parameters are automatically entered during subsequent calibration.

Linearization

If known, the linearization parameters of the measurement range to be linearized are entered:

F1 Lin. Para A - First linearization parameter

F2 Lin. Para B - Second linearization parameter

F3 Lin. Start - Start of linearized range

F4 Lin. End - End of linearized range

Physical measurement value - do not change values entered

Low pass - Enter low pass time, normally 1 s

F4 Activate Correction Functions:

Caldos 17 Detector Correction

Pressure Correction

Offset/Ampl. Common

Linearization

Physical Measurement Value

Low pass

Normally all correction functions are activated!

F5 Component Measurement Range

Listing of all configured measurement ranges

The last measurement range entered is the reference range for initial calibration. All other measurement ranges are derived from this one.

A measurement range must also be established for the standard gas. The standard gas measurement ranges are configured as follows:

N_2	0 - 10,000 rTC (relative thermal conductivity)
Air	0 - 10 070 rTC
H_2	0 - 60 000 rTC

F6 Autorange Active, down, up, enter the applicable "up" and "down" values for active autoranging, the defaults are 20 / 100

F7 Update Mode / Cycle Time - always cyclical, 500 ms

Continued on next page

Linearization Parameters

All of the following linearization parameters apply to the 0-100 Vol% linearization limits.
The smallest possible measurement range is 0-0.3 H_2 in N_2

Component	Lin A	Lin B	Sensitivity
Air in N_2	1.1304	0.7442	+347
O_2 in N_2	0.9558	0.9028	1956
CO in N_2	0.8746	1.1434	-15074
CO_2 in N_2	1.1494	0.7311	-13522
He in N_2	2.5771	0.3880	124017
H_2 in N_2	1.9945	0.5014	146135
CO in N_2	0.9174	1.3864	-1521
CH_4 in N_2	0.9797	1.0207	18641
C_4H_{10} in N_2	0.5766	1.4890	-8889
C_3H_8 in N_2	0.7788	1.0334	-5472
SO_2 in N_2	0.8705	0.9745	-30771
H_2S in N_2	0.7776	1.7943	-19239

Measurement Range Configuration

F5 Select Measurement Range

Measurement Range Configuration

As a rule, 0-100 Vol% is set-up as the reference measurement range and the other ranges (up to four per component) are derived from it.
F1 Measurement Range - The reference measurement range appears here
F2 Autorange possible - The selection is yes or no
F3 Measurement Range Correction Parameters - Listing of active correction functions - Offset / Ampl singl - do not change!
F4 Activate Correction Functions - normally Offset / Ampl singl. is configured - do not change!
F5 Variable measurement range - always enter "No"
F6 Var. Measurement Range Start - variable start of measurement range
F7 Var. Measurement Range End - variable end of measurement range

Temperature Detector

General

Temperature control detector 2 is always configured.

The control parameters should not be changed. They are used to control the Caldos 17 analyzer thermostat.

The temperature control 2 detector is not calibrated!

Detector Configuration

Detector Configuration
F1 Detector type: Temperature detector 2 control
F2 Active Component: T-Re. N
F3 Detector Correction Parameter: None
F4 Activate Correction Functions: Function not available
F5 Detector Components: T-Re. N
F6 Update Mode / Cycle Time - always "cyclical", 5000 ms
F7 Delta Offset / Amplification - Standard setting: 75 / 25
F8 Over Offset / Amplification - Standard setting: 150 / 50
F9 Classification: Auxiliary variable selection
Auxiliary variable indications (then temperature readout appears on screen)

Component Configuration

F5 Select Detector Component

Component Configuration
F1 Component Name: T-Re. N
F2 Active Measurement Range: 0-100°C
F3 Component Correction Parameters - Listing of all active correction functions
Standard:
Physical measurement value - do not change
Control parameters - **Do not change!!**

F1 KP	500.00000
F2 KI	0.00500
F3 KD	0.00000
F4 Set value	60.0000
F5 Max output	4136
F6 Min output	0
F7 Limit 1	2
F8 Limit 2	10

Measurement Range Configuration

F5 Component Measurement Range

Measurement Range Configuration
F1 Measurement Range: 0-100°C
F2 Autorange possible: No
F3 Measurement Range Correction Parameters - Listing of active correction functions - Offset / Ampl singl - do not change!
F4 Activate Correction Functions - normally Offset / Ampl singl. is configured - do not change!
F5 Variable measurement range - always enter "No"
F6 Var. Measurement Range Start - not applicable
F7 Var. Measurement Range End - not applicable

Pressure Detector

General

The pressure detector is used to measure current barometric pressure.
The current air pressure is used to correct the measurement signal.

Pressure detector 1 must be configured.
The pressure detector must be calibrated after configuration.

Detector Configuration

Detector Configuration
F1 Detector Type: Pressure detector 1
F2 Active Component: Air pressure
F3 Detector Correction Parameter: None
F4 Activate Correction Functions: Function not available
F5 Detector Components: Air pressure
F6 Update Mode / Cycle Time - always "cyclical", 5000 ms
F7 Delta Offset / Amplification - Standard setting: 75 / 25
F8 Over Offset / Amplification - Standard setting: 150 / 50
F9 Classification: Auxiliary variable selection
Auxiliary variable indications (then temperature readout appears on screen)

Component Configuration

F5 Select Detector Component
Component Configuration
F1 Component Name: Air pressure
F2 Active Measurement Range: 0-1250 hPa
F3 Component Correction Parameters - Listing of all active correction functions
Standard:
Physical measurement value - do not change
Low-pass non-linear filtering
F4 Activate Correction Parameters
Physical Measurement Value
Low-pass non-linear filtering
Normally all correction parameters are activated!
F5 Component Measurement Range: 0-1250 hPa
F6 Autorange active: No
F7 Update Mode / Cycle Time - always cyclical, 5000 ms

Measurement Range Configuration

F5 Component Measurement Range
Measurement Range Configuration
F1 Measurement Range: 0-1250 hPa
F2 Autorange possible: No
F3 Measurement Range Correction Parameters - Listing of active correction functions - Offset / Ampl singl - do not change!
F4 Activate Correction Functions - normally Offset / Ampl singl. is configured - do not change!
The Ampl value entered applies to the type of pressure sensor used!
The offset must be calibrated.
F5 Variable measurement range - always enter "No"
F6 Var. Measurement Range Start - not applicable
F7 Var. Measurement Range End - not applicable

Flow Detector

General

The internal pneumatic module's flow detector can be used to monitor flow through the analyzer (approx. 60 l/h). Depending on the flow detector location, configure flow detector 1 or 2.
If there is only 1 flow detector located in the pneumatic module, it is flow detector 1.

The flow detector for throughput monitoring (approx. 60 l/h) has a measurement range of 0-100 l/h.

After configuration, an initial calibration is required!

Detector Configuration

Detector Configuration
F1 Detector Type: Flow Detector 1
F2 Active Component: Flow
F3 Detector Correction Parameter: None
F4 Activate Correction Functions: Function not available
F5 Detector Components: Flow
F6 Update Mode / Cycle Time - always "cyclical", 5000 ms
F7 Delta Offset / Amplification - Standard setting: 75 / 25
F8 Over Offset / Amplification - Standard setting: 150 / 50
F9 Classification: Auxiliary variable selection
Auxiliary variable indications (then temperature readout appears on screen)

Component Configuration

F5 Select Detector Component
Component Configuration
F1 Component Name: Flow
F2 Active Measurement Range: 0-100 l/h
F3 Component Correction Parameters - Listing of all active correction functions
Standard:
Physical measurement value - do not change
F4 Activate Correction Parameters
Physical Measurement Value
Low-pass time
Normally the physical measurement value is activated!
F5 Component Measurement Range: 0-100
F6 Autorange active: No
F7 Update Mode / Cycle Time - always cyclical, 5000 ms

Measurement Range Configuration

F5 Component Measurement Range
Measurement Range Configuration
F1 Measurement Range: 0-100 l/h
F2 Autorange possible: No
F3 Measurement Range Correction Parameters - Listing of active correction functions - Offset / Ampl singl - do not change!
F4 Activate Correction Functions - normally Offset / Ampl singl. is configured - do not change!
F5 Variable measurement range - always enter "No"
F6 Var. Measurement Range Start - not applicable
F7 Var. Measurement Range End - not applicable

Chapter 8: Calibration

Overview

Introduction

This chapter contains instructions for calibrating (initial and subsequent calibration) detector measurement and auxiliary variables

Chapter Contents

This chapter contains the following information:

Caldos 17 Detector Initial Calibration

When should an initial calibration be carried out?

- When the measurement task (sample component) needs to be changed
- As needed after a sensor change

Accessories

- PC with serial interface
- Advance Optima - masserv - test and calibration software
- Serial interface connection cable part number 0743091
- Test gases, test hoses
- Flow meter

Preparation

- Check gas path seal integrity
- Make electrical connections
- The analyzer module should be installed in the area of application and protected from vibration
- The analyzer temperature must have reached its set value (64°C) and be constant.
- Test gas flow rates are to be set between 30 and 60 l/h and kept constant ±5 l/h
- Connect the PC to the analyzer module
- Start the calibration and test software

Test

- Test all detectors (the measurement values must be stable and regularly updated)
- Status message 0 for all detectors

Performing the standard gas initial calibration

The standard gas initial calibration takes place at the detector level.
The standard gas raw measurement value is calculated and scaled to a value representing thermal conductivity.

☞ **Standard gas calibration must be performed before initial calibration of the measurement ranges.**

Test and calibration software
Main menu
F3 Analyzer Menu
F1 Analyzer Calibration
Select Caldos 17 Detector
Select Component Standard Gas
Select Standard Gas Calibration (do not select Initial Calibration!!)
F1 Input Standard Gas Set Point
N_2 10 000
Air 10 070
H_2 60 000
F2 Start initial calibration

Continued on next page

Caldos 17 Detector Initial Calibration, *continued*

Performing the initial calibration: Measurement Ranges

Analyzer calibration is performed only in the reference measurement range - i.e. the last measurement range configured. It must be carried out for each component configured.

☞ **Standard gas calibration must take place before initial calibration of the measurement ranges.**

Test and calibration software
Main Menu
F3 Analyzer Calibration
- F1 Analyzer Calibration
- Select Caldos 17 Detector
- Select Component
- Select initial calibration (= start and end-point balancing)
  - F1 Input start-point gas concentration
  - F2 Input end-point gas concentration
  - F3 Start calibration
- Select Linearization
  - F1 Enter linearization parameter A
  - F2 Enter linearization parameter B
  - F3 Linearization range start point
  - F4 Linearization range end point

☞ **Once data are received by the analyzer module, the initial calibration can no longer be canceled.**

Pressure Detector Initial Calibration

When should an initial calibration be carried out?

After changing the pressure sensor (preamplifier board)

Accessories

The pressure detector can be calibrated via the unit keyboard or with a PC and test and calibration software. Both methods are based on the same calculation and valuation procedures.

Calibration with the PC:

- PC with serial interface
- Advance Optima - masserv - test and calibration software
- Serial interface connection cable part number 0743091
- Pressure gauge for the barometric air pressure
- Flow meter

Preparation

- Make electrical connections
- The analyzer module should be installed in the area of application and protected from vibration
- Connect the PC to the analyzer module
- Start the calibration and test software

Test

- Test all detectors (the measurement values must be stable and regularly updated)
- Status message 0 for all detectors

Performing the initial calibration

Only the pressure detector's zero point is calibrated!

Test and calibration software
Main Menu
F3 Analyzer Calibration
    F1 Analyzer Calibration
    Select pressure detector 1
    Select component Air pressure
    Select measurement range 0-1100 mbar
    Select initial calibration
        F1 Input start point set value (current barometric pressure)
        F5 Start subsequent calibration of start point

The use of F3 requires 2 different pressures and therefore is not effective in this case.

☞ **Once data are received by the analyzer module, the initial calibration can no longer be canceled.**

Flow Detector Initial Calibration

When should an initial calibration be carried out?

After changing the flow sensor
In case of the following error: Pump out → flow detector does not indicate "Zero"

Accessories

- PC with serial interface
- Advance Optima - masserv - test and calibration software
- Serial interface connection cable part number 0743091
- Test Gas
- Flow meter

Preparation

- Check gas path seal integrity
- Make electrical connections
- The analyzer module should be installed in the area of application and protected from vibration
- Test gas flow rates are to be set between 30 and 60 l/h and kept constant ±5 l/h
- Connect the PC to the analyzer module
- Start the calibration and test software

Test

- Test all detectors (the measurement values must be stable and regularly updated)
- Status message 0 for all detectors

Performing the initial calibration

Test and calibration software
Main Menu
F3 Analyzer Calibration
F1 Analyzer Calibration
Select flow detector 1 or 2
Select component flow
Select measurement range 0-100 l/h
Select initial calibration
F1 Input start-point set value 0 (corresponds to no flow)
F2 Input end-point set value e.g. 50 l/h (corresponds to full flow)
F3 Start calibration

Shut off flow for zero-point calibration (e.g. pump off)
For end-point calibration, flow is measured at the sample gas outlet and the end-point is entered as a set value.

☞ **Once data are received by the analyzer module, the initial calibration can no longer be canceled.**

Temperature Detector Initial Calibration

☞ The pressure detector should not be calibrated.

Chapter 9: Parts Catalog

Parts Catalog
Caldos 17 analyzer module

Part number Part No.	Designation	Additional information
24704-4-0745875	Thermal conductivity sensor	Installed
94372-4-0650424	O ring	On sensor
24704-4-0768427	Jacket	Without heater
24505-4-0745836	Thermal link	
24704-4-0768493	Flame barrier	For sample gas
24704-4-0768494	Flame barrier	for purge gas
24604-4-0801923	Connector set	
24705-4-0801945	Connections	Internal bus, external and internal
24504-4-0801938	Plug, 24 V	Installed, with contact strip
24704-4-0745789	Circuit board	Preamplifier
24504-4-0745745	Circuit board	Sensor-CPU board
20404-4-0743091	Connection	Module/PC

ABB Automation
Analytical Division
Stierstaedter Strasse 5, D-60488 Frankfurt am Main
Phone +49-69-79 30-40, Fax +49-69-79 30-45 66
E-Mail analytical-mkt.deapr@de.abb.com, http://www.abb.com/analytical

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