# OXYMAT 6
Gas Analyzers for the Determination of Oxygen

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<td>Ordering data</td>
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<td>Documentation</td>
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<td>Conditions of sale and delivery</td>
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<td>Export regulations</td>
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</tr>
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</table>
OXYMAT 6

General

Application

The OXYMAT 6 gas analyzers are based on the paramagnetic alternating pressure method and are used to measure oxygen in gases.

Special applications

Besides the standard combinations special applications concerning material of the gas path, material of sample cells are also available on request.

Application examples

Measurement of O₂
• For boiler control in firing systems
• In safety-relevant areas
• As a reference variable for emission measurements according to TA-Luft, 13. and 17. BImSchV
• In the automotive industry (engine test systems)
• Warning equipment
• In chemical plants
• In ultra-pure gases for quality monitoring
• Version to analyze flammable and non-flammable gases or vapors for use in hazardous areas (zone 1 and zone 2). (Use in hazardous areas of zone 0 is not permissible.)

Essential characteristics

• Four freely-parameterizable measuring ranges, also with zero offset, all measuring ranges linear
• Electrically isolated signal output selectable as 0/2/4 to 20 mA (also inverted)
• Autoranging or manual range switching possible; remote switching is also possible
• Storage of measured values possible during adjustments
• Time constants selectable within wide limits (static/dynamic noise suppression); i.e. the response time of the analyzer can be matched to the respective application
• Simple handling using menu-based operation
• Short response time
• Low long-term drift
• Two-stage access code to prevent unintentional and unauthorized inputs
• Internal pressure sensor for correction of pressure variations in sample gas (range 500 to 2000 hPa absolute)
• External pressure sensor can be connected for correction of variations in sample gas pressure (up to 3000 hPa absolute), only with piping as the gas path
• Automatic range calibration can be parameterized
• Operation based on NAMUR Recommendation
• Measuring-point selection for up to 6 measuring points (programmable)
• Measuring point identification
• Measuring range identification
• Monitoring of sample gas and/or reference gas (option)
• Monitoring of reference gas with reference gas connection 2000 to 4000 hPa (option)
• Different smallest spans (0.5 %, 2.0 % or 5.0 % O₂), depending on version
• Customer-specific analyzer options such as e.g.:
  - Customer acceptance
  - Tag labels
  - Drift recording
  - Clean for O₂ service
  - Kalrez gaskets
• Analyzer section with flow-type compensation circuit (option): a flow is passed through the compensation branch to reduce the vibration dependency in the case of highly different densities of the sample and reference gases
• Simple analyzer exchange since electric connections are easy to remove.
• Sample cell for use in presence of highly corrosive sample gases.

19” unit: essential characteristics

• 19” unit with 4 HU for installation
  - in swing frame
  - in cabinets, with or without slide rails
• Front panel for service can be hinged down (laptop connection)
• Internal gas paths: flexible tube made of Viton or pipe made of titanium
• Gas connections for sample gas input and output and for reference gas: pipe diameter 6 mm or 1/4”

Field unit: essential characteristics

• Two-door housing with gas-tight separation of analyzer and electronics sections
• Each half of the enclosure can be purged separately
• Analyzer section and piping can be heated up to 130 °C (option)
• Gas path and pipe connections made of stainless steel (type No. 1.4571) or titanium
• Purging gas connections: pipe diameter 10 mm or 3/8”
• Gas connections for sample gas input and output and for reference gas: clamping ring connection for pipe diameter 6 mm or 1/4”
• Simple analyzer exchange since electric connections are easy to remove.
**Display and control panel**
- Large LCD panel for simultaneous display of:
  - Measured value (digital and analog displays)
  - Status line
  - Measuring ranges
- Contrast of LCD panel adjustable using menu
- Permanent LED backlighting
- Washable membrane keyboard with five softkeys
- Menu-based operation for configuration, test functions, calibration
- User help in plain text
- Graphic display of concentration trend; programmable time intervals
- Operating software in two languages: German/English, English/French, French/English, Spanish/English, Italian/English.

**Inputs and outputs**
- One analog output for measured value
- Two analog inputs programmable (correction of cross interferences or external pressure sensor)
- Six binary inputs freely configurable (e.g. for range switching, processing external signals from sample conditioning)
- Six relay outputs freely configurable (failure, maintenance request, maintenance switch, limit alarm, external solenoid valves)
- Extension with eight additional binary inputs and eight additional relay outputs for automatic calibration with up to four calibration gases.

**Communication**
- RS 485 present in basic unit (connection at the rear; with 19" unit also possibility of connection behind the front plate).

**Options**
- AK interface for the automotive industry with extended functions
- Converter to RS 232
- Converter to TCP/IP Ethernet
- Linking to networks via PROFIBUS-DP/-PA interface
- SIPROM GA software as service and maintenance tool
**General**

**Mode of operation**

In contrast to almost all other gases, oxygen is paramagnetic. This property is utilized as the measuring principle by the OXYMAT 6 gas analyzers.

Oxygen molecules in an inhomogeneous magnetic field are drawn in the direction of increased field strength due to their paramagnetism. When two gases with different oxygen concentrations meet in a magnetic field, a pressure difference is produced between them.

In the case of OXYMAT 6, one gas (1, Fig. 2) is a reference gas (N₂, O₂ or air), the other is the sample gas (5). The reference gas is introduced into the sample cell (6) through two channels (3). One of these reference gas streams meets the sample gas within the area of a magnetic field (7). Because the two channels are connected, the pressure, which is proportional to the oxygen concentration, causes a cross flow. This flow is converted into an electric signal by a microflow sensor (4).

The microflow sensor consists of two nickel grids heated to approx. 120 °C which form a Wheatstone bridge together with two supplementary resistors. The pulsating flow results in a change in the resistance of the Ni grids. This results in a bridge offset which depends on the oxygen concentration in the sample gas. Because the microflow sensor is located in the reference gas stream, the measurement is not influenced by the thermal conductivity, the specific heat or the internal friction of the sample gas. This also provides a high degree of corrosion resistance because the flow sensor is not exposed to the direct influence of the sample gas.

By using a magnetic field with alternating strength (8), the effect of the background flow in the microflow sensor is not detected, and the measurement is thus independent of the instrument orientation.

The sample cell is directly in the sample path and has a small volume. The microflow sensor thus responds quickly, resulting in a very short response time for the OXYMAT 6.

Vibrations frequently occur at the place of measurement and may falsify the measured signal (noise). A further microflow sensor (10) through which no gas passes acts as a vibration sensor. Its signal is applied to the measured signal as compensation.

If the density of the sample gas deviates by more than 50 % from that of the reference gas, the compensation microflow sensor (10) is flushed with reference gas just like the measuring sensor (4).

**Note:**

The sample gas have to enter the analyzer dustless. Condensate in the cells must be avoided. That is why the most measuring tasks require an appropriate gas preparation.

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**Fig. 2  OXYMAT 6, mode of operation**

1. Reference gas inlet
2. Restrictors
3. Reference gas channels
4. Microflow sensor for measurement
5. Sample gas inlet
6. Sample cell
7. Paramagnetic effect
8. Electromagnet with alternating field strength
9. Sample gas and reference gas outlet
10. Microflow sensor in compensation system (without flow)
**General**

**Reference gases, cross interferences**

### Reference gases

<table>
<thead>
<tr>
<th>Measuring range (0 to . . . % v/v O₂)</th>
<th>Recommended reference gas</th>
<th>Reference gas pressure</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 to . . . % v/v O₂</td>
<td>N₂</td>
<td>2000 to 4000 hPa above sample gas pressure (max. 5000 hPa absolute)</td>
<td>The reference gas flow is set automatically to 5 to 10 ml/min (up to 20 ml/min when also flowing through compensation branch).</td>
</tr>
<tr>
<td>. . . to 100 % v/v O₂ (suppressed zero with full-scale value 100 % v/v O₂)</td>
<td>O₂</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Around 21 % v/v O₂ (suppressed zero with 21 % v/v O₂ within the span)</td>
<td>Air</td>
<td>100 hPa with respect to sample gas pressure which may vary by max. 50 hPa around the atmospheric pressure</td>
<td></td>
</tr>
</tbody>
</table>

Table 1 Reference gases for OXYMAT 6

### Correction of zero error / Cross interferences

<table>
<thead>
<tr>
<th>Residual gas (concentration 100 % v/v)</th>
<th>Zero deviation in % v/v O₂ absolute</th>
<th>Residual gas (concentration 100 % v/v)</th>
<th>Zero deviation in % v/v O₂ absolute</th>
</tr>
</thead>
<tbody>
<tr>
<td>Organic gases</td>
<td></td>
<td>Inert gases</td>
<td></td>
</tr>
<tr>
<td>Acetic acid CH₃COOH</td>
<td>-0.64</td>
<td>Argon Ar</td>
<td>-0.25</td>
</tr>
<tr>
<td>Acetylene C₂H₂</td>
<td>-0.29</td>
<td>Helium He</td>
<td>+0.33</td>
</tr>
<tr>
<td>1,2 butadiene C₂H₄</td>
<td>-0.65</td>
<td>Krypton Kr</td>
<td>-0.55</td>
</tr>
<tr>
<td>1,3 butadiene C₃H₆</td>
<td>-0.49</td>
<td>Neon Ne</td>
<td>+0.17</td>
</tr>
<tr>
<td>iso-butane C₄H₁₀</td>
<td>-1.30</td>
<td>Xenon Xe</td>
<td>-1.05</td>
</tr>
<tr>
<td>n-butane C₅H₁₀</td>
<td>-1.26</td>
<td></td>
<td></td>
</tr>
<tr>
<td>t-butene C₅H₁₂</td>
<td>-0.96</td>
<td></td>
<td></td>
</tr>
<tr>
<td>iso-butene C₅H₁₀</td>
<td>-1.06</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cyclo-hexane C₆H₁₂</td>
<td>-1.84</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dichlorodifluoromethane (R12) CCl₂F₂</td>
<td>-1.32</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ethane C₂H₆</td>
<td>-0.49</td>
<td></td>
<td></td>
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<tr>
<td>Ethylene C₂H₄</td>
<td>-0.22</td>
<td></td>
<td></td>
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<tr>
<td>n-heptane C₇H₁₆</td>
<td>-2.4</td>
<td></td>
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<td>n-hexane C₆H₁₄</td>
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<tr>
<td>Methane CH₄</td>
<td>-0.18</td>
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<tr>
<td>Methanol CH₃OH</td>
<td>-0.31</td>
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<tr>
<td>n-octane C₈H₁₈</td>
<td>-2.78</td>
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<tr>
<td>n-pentane C₅H₁₂</td>
<td>-1.68</td>
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</tr>
<tr>
<td>iso-pentane C₅H₁₂</td>
<td>-1.49</td>
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<tr>
<td>Propane C₃H₈</td>
<td>-0.87</td>
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<td></td>
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<tr>
<td>Propylene C₃H₈</td>
<td>-0.64</td>
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<td></td>
</tr>
<tr>
<td>Trichlorofluoromethane (R11) CCl₃F</td>
<td>-1.63</td>
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<td></td>
</tr>
<tr>
<td>Vinyl chloride C₃H₅Cl</td>
<td>-0.77</td>
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</tr>
<tr>
<td>Vinyl fluoride C₂H₃F</td>
<td>-0.55</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1,1 vinylidene chloride C₂H₂Cl₂</td>
<td>-1.22</td>
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<td></td>
</tr>
<tr>
<td>Anorganic gases</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ammonia NH₃</td>
<td>-0.20</td>
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<tr>
<td>Carbon dioxide CO₂</td>
<td>-0.30</td>
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<td></td>
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<tr>
<td>Carbon monoxide CO</td>
<td>+0.07</td>
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<td></td>
</tr>
<tr>
<td>Chlorine Cl₂</td>
<td>-0.94</td>
<td></td>
<td></td>
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<tr>
<td>Dinitrogen monoxide N₂O</td>
<td>-0.23</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hydrogen H₂</td>
<td>+0.26</td>
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</tr>
<tr>
<td>Hydrogen bromide HBr</td>
<td>-0.76</td>
<td></td>
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</tr>
<tr>
<td>Hydrogen chloride HCl</td>
<td>-0.35</td>
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<td></td>
</tr>
<tr>
<td>Hydrogen fluoride HF</td>
<td>-0.10</td>
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<tr>
<td>Hydrogen iodide HI</td>
<td>-1.19</td>
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<tr>
<td>Hydrogen sulphide H₂S</td>
<td>-0.44</td>
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<td></td>
</tr>
<tr>
<td>Oxygen O₂</td>
<td>+100</td>
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</tr>
<tr>
<td>Nitrogen N₂</td>
<td>0.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nitrogen dioxide NO₂</td>
<td>+20.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nitrogen oxide NO</td>
<td>+42.94</td>
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<td></td>
</tr>
<tr>
<td>Sulphur dioxide SO₂</td>
<td>-0.20</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sulphur hexafluoride SF₆</td>
<td>-1.05</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Water H₂O</td>
<td>-0.03</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 2 Zero error due to diamagnetism or paramagnetism of residual gases with nitrogen as the reference gas at 60 °C and 1000 hPa absolute (according to IEC 1207/3)

**Conversion to other temperatures:**

The zero errors mentioned in Table 2 must be multiplied with a correction factor (k):
- with diamagnetic gases: \( k = \frac{333 \, K}{(\nu \, [°C] + 273 \, K)} \)
- with paramagnetic gases: \( k = \left[\frac{333 \, K}{(\nu \, [°C] + 273 \, K)}\right]² \)

(all diamagnetic gases have a negative zero error).
## Versions - Wetted parts

### Standard

<table>
<thead>
<tr>
<th>Gas path</th>
<th>19&quot; unit</th>
<th>Field unit</th>
<th>Explosion-protected field unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>with hoses</td>
<td>Nipple Hose Sample cell Stub sample cell Restrictor O-rings</td>
<td>SS, type No. 1.4571 Viton SS, type No. 1.4571 SS, type No. 1.4571 PTFE (Teflon)</td>
<td>—</td>
</tr>
<tr>
<td>with pipes</td>
<td>Nipple Pipe Sample cell Restrictor O-rings</td>
<td>Titanium Titanium SS, type No. 1.4571 or tantalum Titanium Viton or FFKM (Kalrez)</td>
<td>—</td>
</tr>
<tr>
<td>with pipes</td>
<td>Nipple Pipe Sample cell Restrictor O-rings</td>
<td>SS, type No. 1.4571 SS, type No. 1.4571 SS, type No. 1.4571 or tantalum SS, type No. 1.4571 Viton or FFKM (Kalrez)</td>
<td>—</td>
</tr>
<tr>
<td>with pipes</td>
<td>Nipple Pipe Sample cell Restrictor O-rings</td>
<td>Hastelloy C22 Hastelloy C22 1.4571 or Tantal Hastelloy C22 FKM (Viton) or Kalrez</td>
<td>—</td>
</tr>
</tbody>
</table>

Further versions (e.g. with Hastelloy C) available as special application.

### Options

| Flowmeter | Metering pipe Float Float limit Elbows | Duran glass Duran glass, black Teflon Viton | — | — |
| Pressure switch | Membrane Enclosure | Viton PA 6.3T | — | — |
Communications

The gas analyzers of series 6, ULTRAMAT 6, ULTRAMAT/OXYMAT 6, OXYMAT 6, OXYMAT 61 and CALOMAT 6, as well as the ULTRAMAT 23 offer the following communications facilities:

- Serial RS 485 interface present as standard with internal communications bus (ELAN) which permits communication between the analyzers and – with multi-channel analyzers – from one channel to the other via the serial interface even without a PC for e.g. information on the process gas pressure and compensation of the influences of interfering gases.
- **SIPROM GA**, a software tool especially for servicing and maintenance tasks. All functions of the analyzers, whether an individual device or where several are networked together, can be remote controlled and monitored using SIPROM GA.
- **PROFIBUS-DP/-PA** is the leading field bus on the market. All Siemens gas analyzers are suitable for PROFIBUS when equipped with an optional plug-in card (retrofitting also possible) and satisfy the binding “Device profile for analyzers” defined by the **PNO** (PROFIBUS user organization). Central access to the analyzers in the system is possible using the **SIMATIC PDM** operator input software.

![Typical design of an RS 485 network](image)

### Interface parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level</td>
<td>RS 485</td>
</tr>
<tr>
<td>Baud rate</td>
<td>9600</td>
</tr>
<tr>
<td>Data bits</td>
<td>8</td>
</tr>
<tr>
<td>Stop bit</td>
<td>1</td>
</tr>
<tr>
<td>Parity</td>
<td>None</td>
</tr>
<tr>
<td>No echo mode</td>
<td></td>
</tr>
</tbody>
</table>

### Ordering information

**SIPROM GA** software

German/English selectable during installation, comprising 1 CD, with installation instructions, software product certificate and registration form

<table>
<thead>
<tr>
<th>Order No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>A5E000-54148</td>
<td>Interface description (German)</td>
</tr>
<tr>
<td>C79451-Z1589-U1</td>
<td>RS 485/RS 232 converter</td>
</tr>
<tr>
<td>C79451-A3364-D61</td>
<td>RS 485/Ethernet converter</td>
</tr>
<tr>
<td>6XV1 830-OEH10</td>
<td>SIMATIC cable/bus cable</td>
</tr>
<tr>
<td>6EST 972-0BB11-0XA0</td>
<td>SIMATIC bus connector</td>
</tr>
<tr>
<td>6EST 972-0BB11-0XA0</td>
<td>9-pin D/sub plug</td>
</tr>
<tr>
<td>6EST 972-0A01-0XA0</td>
<td>Repeater (see also Catalog CA 01 or IK PI)</td>
</tr>
</tbody>
</table>

**Firmware retrofitting sets for older analyzers:**

- **ULTRAMAT 23** (prior to SW version 2.06) All languages
  - GERMAN
  - ENGLISH
  - FRENCH
  - SPANISH
  - ITALIAN

- **ULTRAMAT 6** (prior to SW version 4.1)
  - GERMAN
  - SPANISH
  - ITALIAN

- **OXYMAT 6** (prior to SW version 4.1)
  - GERMAN
  - SPANISH
  - ITALIAN
The term "Field bus" describes a digital communications system with which distributed field devices in a plant are networked together via one single cable, and connected at the same time to programmable controllers or to a process control system. PROFIBUS is the leading field bus on the market. The PROFIBUS-DP version is widely used for production automation because of its high transmission rate for relatively small data quantities per device, whereas PROFIBUS-PA particularly takes into account the features required for process engineering, e.g. large data quantities and application in potentially explosive atmospheres.

User benefits can be found in the extremely high potentials for cost savings in all areas of the plant, covering configuring and commissioning, operation and maintenance, and up to later plant extensions.

Operation of the gas analyzers from a control system or separate PC is possible using the SIMATIC PDM (Process Device Manager) operator input tool which is software executing under Windows 95/98/NT and which can also be incorporated into the SIMATIC PCS 7 process control system. This permits clear display of both the incorporation of devices into the system and the complex parameter structure of the analyzers, permitting operation to be carried out simply by clicking.

The PROFIBUS user organization (PNO) is an independent international institution, and represents the interests of many vendors and users. In addition to services such as consultation, training and device certification, its prime task is the further development, standardization and promotion of the PROFIBUS technology. The definition of a binding functionality for a device class in a profile is a prerequisite for the uniform response of devices from different vendors, the so-called interoperability. The profile for analyzers was defined as binding at the end of 1999, thus guaranteeing the interaction of all PROFIBUS-based devices in a plant.

This profile defines the functionality of the analyzers in a block model: e.g. the physical block describes the measuring procedure, analyzer and vendor names, serial number and operation state (operation, maintenance). Various functional blocks contain the execution of specific functions such as the processing of measured values or alarms. The transducer blocks describe the functionality of the actual measuring procedure and its control, e.g. preprocessing of a measured value, correction of cross interferences, characteristics, measuring ranges as well as switching and control procedures. Protocols define the data transmission between the stations on the bus. A differentiation is made between cyclic and acyclic services. Cyclic services are used to transmit time-critical data such as measured values and statuses. The acyclic services permit the scanning or modification of device parameters during operation. All gas analyzers of Series 6, ULTRAMAT 6, ULTRAMAT/OXYMAT 6, OXYMAT 6/61 and CALOMAT 6, as well as the ULTRAMAT 23, are suitable for PROFIBUS when fitted with the optional plug-in card (retrofitting also possible, see Ordering information).
Gas and electrical connections

Gas connections: stubs 6 mm or ¼"

1. Gas sampling device (heated if required)
2. Sample gas line (heated if required)
3. Gas cooler
4. Coarse filter
5. Fine filter
6. Sample gas pump
7. Control valve, flow regulator
8. Flowmeter
9. Reference gas cylinder e.g. N₂ with reduction valve and pressure gauge
10. Condensation drain

Fig. 5 OXYMAT 6, 19" unit, gas and electrical connections shown at top, typical installation shown at bottom
Gas paths

- **Internal gas paths, gas flow diagrams, basic layout**

Fig. 6  Gas path OXYMAT 6E with reference gas connection 100 hPa

Fig. 7  Gas path OXYMAT 6E with reference gas connection 3000 to 4000 hPa
Pin assignment

Connector SUB-D 9F (RS 485)

- GND
- M
- +5 V
- 1
- 2
- 3
- 4
- 5
- 6
- 7
- 8
- 9

Possibility for connection of bus terminating resistors to pins 7 and 9.

Connector SUB-D 15F

- GND
- M
- 1
- 2
- 3
- 4
- 5
- 6
- 7
- 8
- 9
- 10
- 11
- 12
- 13
- 14
- 15

Floating analog outputs (also with respect to one another), $R_L \leq 750$ $\Omega$

Pressure correction
Pressure correction
Interfering gas correction
Interfering gas correction

Non-floating analog inputs, 0 to 20 mA/500 $\Omega$ or 0 to 10 V (low-resistance)

Connector SUB-D 25F

- GND
- M
- 1
- 2
- 3
- 4
- 5
- 6
- 7
- 8
- 9
- 10
- 11
- 12
- 13
- 14
- 15
- 16
- 17
- 18
- 19
- 20
- 21
- 22
- 23
- 24
- 25

Floating via opto isolator

$V_O = 0$ V (0 to 4.5 V)

$V_I = 24$ V (13 to 33 V)

Contact loading
max. 24 V/1 A, AC/DC; relay contacts shown: de-energized relay coil

Note:
Cable and plug must be shielded and connected to chassis potential.

Fig. 8  OXYMAT 6, 19" unit, pin assignment
OXYMAT 6
19" unit

Electrical connection

Pin assignment

Fig. 9 OXYMAT 6, 19" unit, pin assignment of Autocal board and PROFIBUS connectors
### Technical data

#### General
- **Measuring ranges**: 4, switchable internally and externally; autoranging is also possible
- **Smallest possible measuring span**: 0.5 % v/v, 2 % v/v or 5 % v/v O₂
- **Largest possible measuring span**: 100 % v/v O₂ (25 % v/v O₂ for a pressure beyond 2000 hPa)
- **Measuring ranges with suppressed zero**: Any zero point is possible between 0 to 100 % v/v as long as a suitable reference gas is used
- **Position of use**: Front panel vertical
- **Conformity**: CE identification EN 50081-1, EN 50082-2

#### Design, enclosure
- **Degree of protection**: IP 20 according to EN 60529
- **Dimensions**: see Fig. 10
- **Weight**: Approx. 13 kg

#### Electrical characteristics
- **Power supply**: 100 to 120 V AC (rated range 90 V to 132 V), 48 to 63 Hz or 200 to 240 V AC (rated range 180 V to 264 V), 48 to 63 Hz
- **Power consumption**: Approx. 35 VA
- **EMC interference immunity (Electromagnetic Compatibility)**: According to standard requirements of NAMUR NE21 (08/98)
- **Electrical safety**: According to EN 61010-1 overvoltage category III
- **Fuses**:
  - 100...120 V: 1.0T/250
  - 200...240 V: 0.63T/250

#### Gas inlet conditions
- **Perm. sample gas pressure**
  - for analyzers with pipes: 500 to 3000 hPa absolute
  - without pressure switch: 500 to 1500 hPa absolute
  - with pressure switch: 500 to 1300 hPa absolute
- **Sample gas flow**: 18 to 60 l/h (0.3 to 1 l/min)
- **Sample gas temperature**: 0 to 50 °C
- **Sample gas humidity**: < 90 % RH ²)

#### Time response
- **Warm-up period**: With ambient temperature < 30 min ³)
- **Response time (T₉₀ time)**: min. 1.5 to 3.5 s, depending on version
- **Damping (electric time constant)**: 0 to 100 s, programmable
- **Dead time (purging time of gas path in analyzer at 1 l/min)**: Approx. 0.5 to 2.5 s depending on version
- **Time for internal signal processing**: < 1 s

### Pressure correction range
- **Pressure sensor**
  - internal
  - external
- **Pressure correction range**
  - 500 to 2000 hPa absolute
  - 500 to 3000 hPa absolute

### Measuring response ¹)
- **Output signal fluctuation**: < 0.75 % of smallest possible measuring range specified on rating plate with an electronic time constant of 1 s (corresponds to ± 0.25 % with 2 σ)
- **Zero drift**: < 0.5 %/month of smallest possible measuring span specified on rating plate
- **Measured-value drift**: < 0.5 %/month of respective measuring span
- **Linearity error**: < 1 %/month of respective measuring span

#### Influencing variables ¹)
- **Ambient temperature**: < 0.5 %/10 K referred to the smallest possible measuring span according to rating plate
- **Sample gas pressure**: Without pressure compensation: < 2 % of measuring span/1 % change in pressure
  - With pressure compensation: < 0.2 % of measuring span/1 % change in pressure
- **Residual gases**: Deviation in zero point corresponding to paramagnetic or diamagnetic deviation of residual gas (see Table 2, page 5)
- **Sample gas flow**: < 1 % of smallest possible measuring span according to rating plate with a change in flow of 0.1 l/min within the permissible flow range
- **Power supply**: < 0.1 % of output signal span with rated voltage ± 10 %

### Electric inputs and outputs
- **Analog output**: 0/2/4 to 20 mA, floating; max. load 750 Ω
- **Relay outputs**: 6, with changeover contacts, freely selectable, e.g. for range identification; loading capacity: 24 V AC/DC/ 1 A, floating
- **Analog inputs**: 2, designed for 0/24 to 20 mA, for external pressure sensor and correction of influence of residual gas (correction of cross interference)
- **Binary inputs**: 6, designed for 24 V, floating, freely-selectable, e.g. for range switching
- **Serial interface**: RS 485
- **Options**: Autocal function with 8 binary inputs and 8 relay outputs, also with PROFIBUS-PA or PROFIBUS-DP

### Ambient conditions
- **Perm. ambient temperature**: -30 to +70 °C during storage and transport;
  - +5 to +45 °C during operation
- **Permissible humidity**: < 90 % RH ²) as annual average, during storage and transport ⁴)

---

¹) Referred to 1000 hPa absolute sample gas pressure, 0.5 l/min sample gas flow and 25 °C ambient temperature.
²) RH: relative humidity.
³) Maximum accuracy achieved after 2 hours.
⁴) Dew point must not be fallen below.
⁵) With air (100 hPa) as reference gas, a correction of the atmospheric pressure fluctuations is only possible when the sample gas is vented to ambient air.
OXYMAT 6
19" unit

Dimensions

Fig. 10  OXYMAT 6, 19" unit, dimensions in mm
### Ordering data

**OXYMAT 6 gas analyzer**

19" unit for installation in cabinets

**Gas connections for sample gas and reference gas**
- Piping with outer diameter 6 mm
- Piping with outer diameter ¼"

**Smallest possible span O₂**
- 0.5 % Reference gas pressure 3000 hPa
- 0.5 % Reference gas pressure 100 hPa (external pump)
- 2 % Reference gas pressure 3000 hPa
- 2 % Reference gas pressure 100 hPa (external pump)
- 5 % Reference gas pressure 3000 hPa
- 5 % Reference gas pressure 100 hPa (external pump)

### Sample cell
- Without flow-type compensation branch
  - Made of stainless steel, type No. 1.4571
  - Made of tantalum
- With flow-type compensation branch
  - Made of stainless steel, type No. 1.4571
  - Made of tantalum

### Internal gas paths
- Viton hose
- Titanium piping
- Pipe made of stainless steel

### Power supply
- 100 V to 120 V AC, 48 to 63 Hz
- 200 V to 240 V AC, 48 to 63 Hz

### Monitoring (reference gas, sample gas)
- Without
- Only reference gas
- Reference gas and sample gas (with flowmeter and pressure switch for sample gas)
- Sample gas only

### Additional electronics
- Without
- With additional 8 binary inputs and outputs
- With serial interface for the automotive industry (AK)
- Additional electronics with 8 binary inputs/outputs and PROFIBUS-PA interface
- Additional electronics with 8 binary inputs/outputs and PROFIBUS-DP interface

### Language
- German
- English
- French
- Spanish
- Italian
1) Customer acceptance: ½ day at factory in presence of customer. The following work is carried out: comparison of analyzer with ordering data; linearization check (zero, mid-point value and full-scale value); reproducibility check with calibration gas (recording in each case on XT recorder, logging of results).

2) Drift recording: an XT recording is supplied when the analyzer is delivered: zero drift with 16 hours continuous operation and sensitivity drift (largest measuring range) with 6 hours continuous operation.

3) Standard setting: Measuring range 1: 0 to smallest possible span
   Measuring range 2: 0 to 10 %
   Measuring range 3: 0 to 25 %
   Measuring range 4: 0 to 100 %.

<table>
<thead>
<tr>
<th>Further versions</th>
<th>Order code</th>
</tr>
</thead>
<tbody>
<tr>
<td>RS 485/RS 232 converter</td>
<td>A11</td>
</tr>
<tr>
<td>Slide rails (2 rails)</td>
<td>A31</td>
</tr>
<tr>
<td>Set of Torx tools, socket spanner</td>
<td>A32</td>
</tr>
<tr>
<td>Kalrez gaskets in sample gas path</td>
<td>B01</td>
</tr>
<tr>
<td>TAG labels (customer-defined inscriptions)</td>
<td>B03</td>
</tr>
<tr>
<td>Customer acceptance (in factory before delivery) 1)</td>
<td>Y01</td>
</tr>
<tr>
<td>Clean for O₂ service (specially cleaned gas path)</td>
<td>Y02</td>
</tr>
<tr>
<td>Drift recording 2)</td>
<td>Y03</td>
</tr>
<tr>
<td>Measuring range in plain text, if different from standard setting 3)</td>
<td>Y11</td>
</tr>
<tr>
<td>TÜV version according to 17.BlmSch</td>
<td>Y17</td>
</tr>
<tr>
<td>Pressure attenuator (to reduce pump pressure pulses)</td>
<td>Y20</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Retrofitting sets</th>
<th>Order code</th>
</tr>
</thead>
<tbody>
<tr>
<td>RS 485/Ethernet converter</td>
<td>C79451-A3364-D61</td>
</tr>
<tr>
<td>RS 485/RS 232 converter</td>
<td>C79451-Z1589-U1</td>
</tr>
<tr>
<td>Additional electronics with 8 binary inputs/outputs</td>
<td>C79451-A3480-D511</td>
</tr>
<tr>
<td>Additional electronics with 8 binary inputs/outputs and PROFINET-PA</td>
<td>A5E00057307</td>
</tr>
<tr>
<td>Additional electronics with 8 binary inputs/outputs and PROFINET-DP</td>
<td>A5E00057312</td>
</tr>
</tbody>
</table>
Gas and electrical connections (unit underside)

Gas connections
1. not used
2. Sample gas inlet
3. Reference gas inlet
4. Sample gas outlet
5-8. Purging gas inlets/outlets

Electric connections
a - c. Signal line (analog + digital): Pg 16
d. Interface connection: Pg 13.5
e. Power connection: Pg 13.5

Clamping ring connection for pipe Ø 6 mm or ¼"

Gas preparation (not included in delivery)
1. Gas sampling device (heated if required)
2. Sample gas line (heated if required)
3. Gas cooler
4. Coarse filter
5. Fine filter
6. Sample gas pump
7. Control valve, flow regulator
8. Flowmeter
9. Reference gas supply (synthetic air or N₂ from gas cylinder)
10. Condensation drain

Fig. 11 OXYMAT 6, field unit, gas and electrical connections shown at top, external installation preparation (example) shown at bottom
**OXYMAT 6**

Field unit

**Gas paths**

**Internal gas paths, gas flow diagrams, basic layout**

---

**Fig. 12** Gas path OXYMAT 6F with reference gas connection 100 hPa (e.g. external pump)

---

**Fig. 13** Gas path OXYMAT 6F with reference gas connection 3000 to 4000 hPa

---
Pin assignment

Connector SUB-D 9F (RS 485)

- GND
- R_Level-N-NC
- RD/TD-N
- RD/TD-P
- R_Level-P-NC
- NC
- GND

Possibility for connection of bus terminating resistors to pins 7 and 9

Contact loading max. 24 V/1 A, AC/DC; relay contacts shown: de-energized relay coil

Floating via opto isolator
"0" = 0 V (0 to 4.5 V)
"1" = 24 V (13 to 33 V)

Interfering gas corr.
Pressure correction
Pressure correction

Non-floating analog inputs, 0 to 20 mA or 0 to 10 V (low resistance ≤ 500 Ω)

Analog outputs floating

Note: Cable and plug must be shielded and connected to chassis potential.

Fig. 14  OXYMAT 6, field unit, connector and terminal assignment
**Pin assignment** (continued)

**Terminal block B (option)**

- GND
- Relay 7
- Relay 8
- Relay 9
- Relay 10
- Relay 11
- Relay 12
- Relay 13
- Relay 14
- NC
- Binary input 7 to 14-N
- Binary input 7-P
- Binary input 8-P
- Binary input 9-P
- Binary input 10-P
- Binary input 11-P
- Binary input 12-P
- Binary input 13-P
- Binary input 14-P
- NC

**Contact loading**
- max. 24 V/1 A, AC/DC;
- relay contacts shown:
  - de-energized relay coil

**Floating via opto isolator**
- "0" = 0 V (0 to 4.5 V)
- "1" = 24 V (13 to 33 V)

**Note:**
- Cable and plug must be shielded and connected to chassis potential.

---

**Fig. 15** OXYMAT 6, field unit, connector and terminal assignment of the Autocal board and PROFIBUS connectors
### Technical data

#### General
- **Measuring ranges**: 4, switchable internally and externally; autoranging is also possible
- **Smallest possible measuring span**: 0.5 % v/v, 2 % v/v or 5 % v/v O₂
- **Largest possible measuring span**: 100 % v/v O₂ (25 % v/v O₂ for a pressure beyond 2000 hPa)
- **Measuring ranges with suppressed zero**: Any zero point is possible between 0 to 100 % v/v as long as a suitable calibration gas is used (see also Table 1)
- **Position of use**: Front panel vertical
- **Conformity**: CE identification EN 50081-1, EN 50082-2

#### Design, enclosure
- **Dimensions**: see Fig. 16
- **Weight**: Approx. 28 kg
- **Degree of protection**: IP 65 according to EN 60529
- **Power consumption**: Approx. 35 VA; with heated unit approx. 330 VA
- **EMC interference immunity (ElectroMagnetic Compatibility)**: According to standard requirements of NAMUR NE21 (08/98)
- **Electrical safety**: According to EN 61010-1
- **Degree of protection**: F3: 0.63 T/250, F4: 2.5 T/250
- **Fuses (unit with heater)**:
  - 100...120 V: F3: 1 T/250, F4: 4 T/250
  - 200...240 V: F3: 0.63 T/250, F4: 1 T/250
- **Fuses (unit with heater)**:
  - 100...120 V: F3: 1 T/250, F4: 4 T/250
  - 200...240 V: F3: 0.63 T/250, F4: 1 T/250

#### Electrical characteristics
- **Power supply**: 100 to 120 V AC (rated range 90 V to 132 V), 48 to 63 Hz or 200 to 240 V AC (rated range 180 V to 264 V), 48 to 63 Hz
- **Power consumption**: Approx. 35 VA; with heated unit approx. 330 VA
- **Linearity error**:
  - Permissible deviation: < 0.2 % of smallest measuring span/1 % change in pressure
  - Permissible humidity: < 0.5 %/month of respective span
- **Repeatability**:
  - Permissible deviation: < 1 %/month of respective span
- **Measured-value drift**:
  - Permissible deviation: < 1 % of smallest possible measuring span
  - Permissible relative humidity: < 0.5 %/month of respective span

#### Gas inlet conditions
- **Perm. sample gas pressure**:
  - with hoses, Ex version: 500 to 1500 hPa absolute
  - with pipes, Ex version: 500 to 1160 hPa absolute
  - Continguous purging: 500 to 3000 hPa absolute
- **Purging gas flow**:
  - < 165 hPa above ambient max. 250 hPa above ambient
  - for short periods: 18 to 60 l/h (0.3 to 1 l/min)
- **Sample gas flow**: 0 to 15 °C over temperature of analyzer section (with heater)
- **Sample gas temperature**: < 90 % relative humidity

#### Time response
- **Warm-up period**: With ambient temperature < 30 min
  - 500 to 1500 hPa absolute: 200 to 240 V
  - 500 to 1160 hPa absolute: 200 to 240 V
  - 500 to 3000 hPa absolute: 200 to 240 V
- **Reading delay time**: Tₚ₉₀ < 1.5 s
- **Damping (electric time constant)**: 0 to 100 s, programmable
- **Dead time (purging time of gas path in analyzer at 1 l/min)**: Approx. 0.5 s
- **Time for internal signal processing**: < 1 s

#### Pressure correction range
- **Pressure sensor**:
  - internal: 500 to 2000 hPa absolute
  - external: 500 to 3000 hPa absolute

#### Measuring response
- **Output signal fluctuation**: < 0.75 % of smallest possible measuring range specified on rating plate with an electric time constant of 1 s (corresponds to ± 0.25 % with 2 o)
- **Zero drift**: < 0.5 %/month of smallest possible measuring span specified on rating plate
- **Measured-value drift**: < 0.5 %/month of respective span
- **Repeatability**: < 1 %/month of respective span
- **Linearity error**: < 1 %/month of respective span

#### Influencing variables
- **Ambient temperature**: < 0.5 %/10 K referred to the smallest possible measuring span according to rating plate
- **Sample gas pressure**: With no pressure compensation: < 2 % of measuring span/1 % change in pressure
- **Residual gases**: Deviation in zero point corresponding to paramagnetic or diamagnetic deviation of residual gas
- **Sample gas flow**: < 1 % of smallest possible measuring span according to rating plate with a change in flow of 0.1 l/min within the permissible flow range; up to double error for analyzer with heater (< 2 %) ²
- **Power supply**: < 0.1 % of output signal span with rated voltage ± 10 %

#### Electric inputs and outputs
- **Analog output**: 0/24 to 20 mA, floating; max. load 750 Ω
- **Relay outputs**: 6, with changeover contacts, freely selectable e.g. for range identification; loading capacity: 24 V AC/DC / 1 A, floating
- **Analog inputs**: 2, designed for 0/24 to 20 mA, for external pressure sensor and correction of residual gas (correction of cross interferences)
- **Binary inputs**: 6, designed for 24 V, floating, freely selectable e.g. for range switching
- **Serial interface**: RS 485
- **Options**: Autocal function with 8 binary inputs and 8 relay outputs, also with PROFIBUS-PA or PROFIBUS-DP

#### Ambient conditions
- **Perm. ambient temperature**: -30 to +70 °C during storage and transport; +5 to +45 °C during operation
- **Permissible humidity**: < 90 % rel. humidity as annual average, during storage and transport

---

1) Referred to 1000 hPa absolute sample gas pressure, 0.5 l/min sample gas flow and 25 °C ambient temperature.

2) Maximum accuracy achieved after 2 hours.

3) Dew point must not be fallen below.

4) With air (100 hPa) as reference gas, a correction of the atmospheric pressure fluctuations is only possible when the sample gas is vented to ambient air.

5) Smallest possible span with a heated analyzer: 0.5 % (< 65 °C); 0.5 to 1 % (65 to 90 °C); 1 to 2 % (90 to 130 °C).

---

Siemens Catalog Extract PA 10 · November 2002
OXYMAT 6
Field unit

Dimensions

Fig. 16 OXYMAT 6, field unit, dimensions in mm
### Ordering data

#### OXYMAT 6 gas analyzer for field mounting

<table>
<thead>
<tr>
<th>Gas connections for sample gas and reference gas</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Clamping ring connection of stainless steel (type No. 1.4571)</td>
</tr>
<tr>
<td>- Piping with outer diameter 6 mm</td>
</tr>
<tr>
<td>- Piping with outer diameter ¼&quot;</td>
</tr>
<tr>
<td>• Clamping ring connection of titanium</td>
</tr>
<tr>
<td>- Piping with outer diameter 6 mm</td>
</tr>
<tr>
<td>- Piping with outer diameter ¼&quot;</td>
</tr>
<tr>
<td>• Piping and gas connections with Hastelloy C22:</td>
</tr>
<tr>
<td>7MB2011-0... + Order code D01 or D02</td>
</tr>
</tbody>
</table>

#### Smallest possible span O₂

0.5 % Reference gas pressure 3000 hPa
0.5 % Reference gas pressure 100 hPa (external pump)
2 % Reference gas pressure 3000 hPa
2 % Reference gas pressure 100 hPa (external pump)
5 % Reference gas pressure 3000 hPa
5 % Reference gas pressure 100 hPa (external pump)

<table>
<thead>
<tr>
<th>Sample cell</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Without flow-type compensation branch</td>
</tr>
<tr>
<td>- Made of stainless steel, type No. 1.4571</td>
</tr>
<tr>
<td>- Made of tantalum</td>
</tr>
<tr>
<td>• With flow-type compensation branch</td>
</tr>
<tr>
<td>- Made of stainless steel, type No. 1.4571</td>
</tr>
<tr>
<td>- Made of tantalum</td>
</tr>
</tbody>
</table>

#### Heating of internal gas paths and analyzer section

<table>
<thead>
<tr>
<th>Without</th>
<th>With (65 to 130 °C)</th>
</tr>
</thead>
</table>

#### Power supply

100 V to 120 V AC, 48 to 63 Hz
200 V to 240 V AC, 48 to 63 Hz
100 V to 120 V AC, 48 to 63 Hz, to ATEX 100, hazardous zone 1) (protection mode: leakage compensation)
200 V to 240 V AC, 48 to 63 Hz, to ATEX 100, hazardous zone 1) (protection mode: leakage compensation)
100 V to 120 V AC, 48 to 63 Hz, to ATEX 100, hazardous zone 1) (operating mode: continuous purging)
200 V to 240 V AC, 48 to 63 Hz, to ATEX 100, hazardous zone 1) (operating mode: continuous purging)

#### Reference gas monitoring

<table>
<thead>
<tr>
<th>Without</th>
<th>With</th>
</tr>
</thead>
</table>

#### Additional electronics

<table>
<thead>
<tr>
<th>Without</th>
<th>With additional 8 binary inputs and 8 relay outputs</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Additional electronics with 8 binary inputs/outputs and PROFIBUS-PA interface</td>
</tr>
<tr>
<td></td>
<td>Additional electronics with 8 binary inputs/outputs and PROFIBUS-DP interface</td>
</tr>
<tr>
<td></td>
<td>With additional electronics for connection to PROFIBUS-PA Ex i</td>
</tr>
</tbody>
</table>

#### Language (supplied documentation, software)

<table>
<thead>
<tr>
<th>German</th>
<th>English</th>
<th>French</th>
<th>Spanish</th>
<th>Italian</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
</tbody>
</table>

1) Only in relation with an approved purging unit.
OXYMAT 6

Field unit

Ordering data

Further versions

Please add "Z" to Order No. and specify Order code

<table>
<thead>
<tr>
<th>Further version</th>
<th>Order code</th>
</tr>
</thead>
<tbody>
<tr>
<td>RS 485/RS 232 converter</td>
<td>A11</td>
</tr>
<tr>
<td>Set of Torx tools, socket spanner</td>
<td>A32</td>
</tr>
<tr>
<td>Kalrez gaskets in sample gas path</td>
<td>B01</td>
</tr>
<tr>
<td>TAG labels (customer-defined inscriptions)</td>
<td>B03</td>
</tr>
<tr>
<td>Gas connections and piping made of Hastelloy C22, external diameter 6 mm</td>
<td>D01</td>
</tr>
<tr>
<td>Gas connections and piping made of Hastelloy C22, external diameter ¼&quot;</td>
<td>D02</td>
</tr>
<tr>
<td>Certificate: ATEX 100; II 3G EE nR; restricted breathing (Ex zone 2) (only for gas compound &lt; LEL)</td>
<td>E11</td>
</tr>
<tr>
<td>Certificate: ATEX 100; II 2/3G EE EE nRP; (Ex zone 2)</td>
<td>E12</td>
</tr>
<tr>
<td>Customer acceptance (in factory before delivery)</td>
<td>Y01</td>
</tr>
<tr>
<td>Clean for O2 service (specially cleaned gas path)</td>
<td>Y02</td>
</tr>
<tr>
<td>Drift recording</td>
<td>Y03</td>
</tr>
<tr>
<td>Customer acceptance explosion-protected units incl. BARTEC purging enclosure</td>
<td>Y04</td>
</tr>
<tr>
<td>Measuring range in plain text, if different from standard setting</td>
<td>Y11</td>
</tr>
</tbody>
</table>

Additional units for explosion-proof versions, ATEX category 2G (zone 1)

Bartec EE p control unit, 230 V, „Leakage compensation”
7MB8000-2BA

Bartec EE p control unit, 115 V, „Leakage compensation”
7MB8000-2BB

Bartec EE p control unit, 230 V, „Continuous purging”
7MB8000-2CA

Bartec EE p control unit, 115 V, „Continuous purging”
7MB8000-2CB

Explosion-protected isolation amplifier
7MB8000-3AA

Explosion-protected isolating relay
7MB8000-4AA

Differential pressure switch for corrosive gases
7MB8000-5AA

Differential pressure switch for non-corrosive gases
7MB8000-5AB

Flame inhibitor made of stainless steel
7MB8000-6AA

Flame inhibitor made of Hastelloy
7MB8000-6AB

Supplementary units for Ex versions, ATEX category 3G (zone 2)

Ex purging unit MiniPurge FM
7MB8000-1AA

Bartec EE p control unit (for units with Order code E12)
7MB8000-1BA

Retrofitting sets

RS 485/Ethernet converter
C79451-A3364-D61

RS 485/RS 232 converter
C79451-Z1589-U1

Autocal function with 8 binary inputs/outputs
A5E00064223

Autocal function with 8 binary inputs/outputs and PROFIBUS-PA
A5E00057315

Autocal function with 8 binary inputs/outputs and PROFIBUS-DP
A5E00057318

Autocal function with 8 binary inputs/outputs and PROFIBUS-PA Ex i (requires Firmware 4.1.10)
A5E00057317

---

1) Customer acceptance: ½ day at factory in presence of customer.

2) Drift recording: an XT recording is supplied when the analyzer is delivered:
   zero drift with 16 hours continuous operation and sensitivity drift (largest measuring range) with 6 hours continuous operation.

3) Standard setting:
   - Measuring range 1: 0 to smallest possible span
   - Measuring range 2: 0 to 10 %
   - Measuring range 3: 0 to 25 %
   - Measuring range 4: 0 to 100 %.

4) Only in relation with an approved purging unit.
Use of the OXYMAT 6 in hazardous areas

Suitability-tested field analyzers of series 6 must be used to measure gases in hazardous areas. The preferred explosion protection for these analyzers is the pressurized enclosure EEx p for zone 1 or the simplified pressurized enclosure EEx n P for zone 2. In addition, these analyzers must be connected to monitoring equipment which must also be suitability-tested for zone 1.

Exception: a pressurized enclosure is not required in zone 2 for the measurement of gases whose composition always remains below the lower explosion limit (LEL); in this case it is sufficient for the field housing to be gas damp-proof (type of protection EEx n R).

Following pre-purging of 5 minutes, the monitoring equipment ensures that no gas damp can enter the housing, and accumulation of the sample gas in the housing is prevented. The volume flow during the pre-purging phase is > 50 l/min. The protective gas is usually fed into the analyzer housing from a supply network via the monitoring equipment.

Ex zone 1

Two versions of pressurized enclosure EEx p complying with directive 94/9/EC are available for use in zone 1:

• Pressurized enclosure with compensation of losses resulting from leaks
  Only that volume of protective gas required to hold an over-pressure of at least 50 Pa compared to the sample gas pressure and atmospheric pressure is fed into the housing. The maximum purging gas pressure is 165 hPa; this causes a max. permissible sample gas pressure of 160 hPa.
  Test certificate: PTB 00 ATEX 2022 X
  Analyzer identification: II 2 G EEx p [ia] ia IIC T4

• Pressurized enclosure with continuous purging
  Protective gas continuously flows through the housing with a volume flow of at least 1 l/min; furthermore, the flow results in an overpressure in the housing of at least 50 Pa compared to atmospheric pressure. The max. permissible purging gas pressure is 25 hPa. The max. permissible sample gas pressure is equivalent to the analyzer sample gas pressure.
  Test certificate: TÜV 01 ATEX 1708 X
  Analyzer identification: II 2 G EEx p [ia] ia IIC T4


The EExp monitoring equipment is a stand-alone unit which is connected electrically and pneumatically to the analyzer. Ex protection is only provided when these two units are connected together.

Ex zone 2

Two versions complying with directive 94/9/EC are available for use in zone 2:

• Ex protection resulting from gas damp-proof housing
  The housing is sealed sufficiently such that gas damp cannot penetrate. With this type of protection, only sample gases may be connected which are below the LEL.
  Test certificate: TÜV 01 ATEX 1686 X
  Analyzer identification: II 3 G EEx n R II T6

• Simplified pressurized enclosure with continuous purging
  This type of protection must always be selected if flammable gases or gas mixtures are to be connected. Protective gas continuously flows through the housing with a volume flow of at least 1 l/min; furthermore, the flow results in an overpressure in the housing of at least 50 Pa compared to atmospheric pressure. Manually controlled pre-purging with the analyzer power supply switched off is sufficient for the simplified pressurized enclosure. It is not necessary for the analyzer to be switched off automatically should the protective gas fail.
  Test certificate: TÜV 01 ATEX 1697 X
  Analyzer identification: II 2/3 G EEx n P II T4

The EExn monitoring equipment is a stand-alone unit which is connected electrically and pneumatically to the analyzer. Ex protection is only provided when these two units are connected together.

FM Class 1 Div 2

The same applies here as to the simplified pressurized enclosure with continuous purging; the required Ex protection is only provided when appropriate equipment is connected.

Type of protection and flame inhibitor

It generally applies that selection of the protective gas and use of flame inhibitors depend on the type of sample gas:

• Connection of combustible gases above the LEL always require an inert gas (e.g. N2) as the protective gas. Furthermore, the process must be protected by flame inhibitors if it cannot be excluded that explosive gas mixtures could occasionally be present in the sample gas path.

• Gas mixtures which could be frequently or permanently explosive must not be connected!

• With gases below the LEL, air can also be used as the protective gas, and flame inhibitors can be omitted.
### Table 3  Explosion-proof configuration – Principle selection criteria

<table>
<thead>
<tr>
<th>Type of gas</th>
<th>Sample gas non-flammable or permanently below the lower explosive limit (LEL)</th>
<th>Sample gas seldom above LEL, and only briefly in such cases</th>
<th>Sample gas occasionally above LEL</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Zone</strong></td>
<td><strong>Not possible</strong></td>
<td><strong>Not possible</strong></td>
<td><strong>Not possible</strong></td>
</tr>
<tr>
<td>0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Analyzer in ATEX 100a - EEx p version</td>
<td>Analyzer in ATEX 100a - EEx p version</td>
<td>Analyzer in ATEX 100a - EEx p version</td>
</tr>
<tr>
<td></td>
<td>Metal pipe for gas path</td>
<td>Metal pipe for gas path</td>
<td>Metal pipe for gas path</td>
</tr>
<tr>
<td></td>
<td>EEx p control unit in mode &quot;Leakage compensation&quot;</td>
<td>EEx p control unit in mode &quot;Leakage compensation&quot;</td>
<td>EEx p control unit in mode &quot;Leakage compensation&quot;</td>
</tr>
<tr>
<td></td>
<td>Sample gas pressure &lt; 165 hPa, fail-safe</td>
<td>Sample gas pressure &lt; 165 hPa, fail-safe</td>
<td>Sample gas pressure &lt; 165 hPa, fail-safe</td>
</tr>
<tr>
<td></td>
<td>EEx p control unit in mode &quot;Leakage compensation&quot;</td>
<td>Sample gas pressure occasionally &gt; 165 hPa</td>
<td>EEx p control unit in mode &quot;Continuous purging&quot;</td>
</tr>
<tr>
<td></td>
<td>Differential pressure switch (if the sample gas pressure is not controlled fail-safe)</td>
<td></td>
<td>Sample gas pressure occasionally &gt; 165 hPa, fail-safe</td>
</tr>
<tr>
<td>2</td>
<td>Analyzer in field housing with degree of protection EEx nR (restricted breathing enclosure)</td>
<td>Analyzer in field enclosure with degree of protection EEx nP</td>
<td>Analyzer in field enclosure with degree of protection EEx nP</td>
</tr>
<tr>
<td></td>
<td>Metal pipe for gas path</td>
<td>Metal pipe for gas path</td>
<td>Metal pipe for gas path</td>
</tr>
<tr>
<td></td>
<td>Simplified pressurized enclosure with continuous purging with inert gas or EEx nRP (restricted breathing enclosure for electronics unit, and simplified pressurized enclosure for physical unit with continuous purging with inert gas)</td>
<td>Simplified pressurized enclosure with continuous purging with inert gas</td>
<td>Simplified pressurized enclosure with continuous purging with inert gas</td>
</tr>
</tbody>
</table>

Table 4  Additional units

<table>
<thead>
<tr>
<th>Additional units (Ex zone 1)</th>
<th>Ex 1 → Ex 1</th>
<th>Ex 1 → Ex 2</th>
<th>Ex 1 → Ex free</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ex-i isolation amplifier</td>
<td>required</td>
<td>conditional use (when energy recovery cannot be excluded)</td>
<td>conditional use (when energy recovery cannot be excluded)</td>
</tr>
<tr>
<td>Isolating relay</td>
<td>required</td>
<td>not required</td>
<td>not required</td>
</tr>
<tr>
<td>Pressure switch</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• non-flammable gases</td>
<td>not required</td>
<td>required (when customer pressure is not controlled fail-safe)</td>
<td></td>
</tr>
<tr>
<td>• flammable gases</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Flame inhibitors</td>
<td></td>
<td></td>
<td>see above</td>
</tr>
</tbody>
</table>
**Description „Leakage compensation”**

The APEX 2003.SI/A2 control unit controls and monitors the prepurging phase and the operating phase of gas analyzers with „Containment Systems“. The control unit redundantly monitors the set overpressure of the purging gas. When the overpressure decreases, it is corrected to the adjustable setpoint (max. purging gas pressure 165 hPa).

4 programmable relay outputs and 8 relay contacts are available to interrupt the data lines.

**Additional function**

Due to the connection of additional pressure sensors, the internal pressure of the enclosure is maintained at a pressure higher than the sample gas with a proportional valve. During the prepurging phase the purging gas flow is max. 4100 Nl/h with an internal enclosure pressure of 50 hPa.

4 programmable relay inputs and 8 relay contacts are available to separate the data lines.

---

**Technical data**

**Guidelines**

EC EMC guideline 89/336/EEC
EC low voltage
RL 73/23/EWG
Ex guideline 94/9/EC

**Design**

Explosion-protected enclosure (EEx e) with viewing window in the cover

**Enclosure material**

glas-fiber reinforced polyester

**Degree of protection**

IP 65

**Terminals**

2.5 mm, stranded conductor

**Pressure sensors**

MIN A = 0 to 300 hPa
MIN B = 0 to 300 hPa
MAX = 0 to 300 hPa
MAX 1 = 0 to 300 hPa
DIFF A = 0 to 25 hPa
DIFF B = 0 to 25 hPa

**Prepurging time**

0 to 99 min; 5 s delayed

**Weight**

11 kg

**Electrical data**

**Supply voltage**

230 V AC (115 V AC)

**Power consumption**

21 W / 230 V

**NO contact**

K2/3; max. 250 V, 5 A with \( \cos \phi = 1 \),
K4/K5; supply voltage or floating, max. 250 V, 5 A with \( \cos \phi = 1 \)

**Communication**

RS 485 interface

**Temperature switching value (option)**

0 to + 40 °C

**Explosion-protected type**

Marking

EEx e d ib [ia p] IIC T4/T6

Certification

DMT 99 ATEX E 082

**Ambient temperature**

-20 to +40 °C

---

**Fig. 17** BARTEC control unit, gas connection diagram

**Fig. 18** BARTEC control unit, electric connection diagram

**Fig. 19** BARTEC control unit, dimensions in mm
**OXYMAT 6**

**Explosion-proof design, Ex zone 1**

**BARTEC EEx p control unit**

### Description „Continuous purging“

The APEX 2003.SI/A4 control unit controls and monitors the prepurging phase and the operating phase of gas analyzers with „Containment Systems“.

The control unit redundantly monitors a continuous current of protection gas through the connected analyzer and thereby dilutes the eventually appearing sample gas below the lower explosive limit (max. purging gas pressure 25 hPa).

4 programmable relay outputs and 8 relay contacts are available to interrupt the data lines.

### Technical data

- **Guidelines**
  - EC EMC guideline 89/336/EEC
  - EC low voltage
  - RL 73/23/EWG
  - Ex guideline 94/9/EC

- **Design**
  - Explosion-protected enclosure (EEx e) with viewing window in the cover
  - Enclosure material: Glas-fiber reinforced polyester
  - Degree of protection: IP 65
  - Terminals: 2.5 mm, stranded conductor
  - Pressure sensors: MIN A = 0 to 25 hPa, MIN B = 0 to 25 hPa, MAX = 0 to 25 hPa, MAX 1 = 0 to 25 hPa, DIFF A = 0 to 25 hPa, DIFF B = 0 to 25 hPa

- **Prepurging time**
  - 0 to 99 min; 5 s delayed

- **Weight**
  - 10 kg

- **Electrical data**
  - **Supply voltage**: 230 V AC (115 V AC)
  - **Power consumption**: 14 W / 230 V
  - **NO contact**: K2/3; max. 250 V, 4 A with \( \cos \phi = 1 \), K4/K5; supply voltage or floating, max. 250 V, 5 A with \( \cos \phi = 1 \)
  - **Communication**: RS 485 interface
  - **Temperature switching value (option)**: 0 to + 40 °C

- **Explosion-protected type**
  - **Marking**: EEx e d ib [ia p] IIC T4/T6
  - **Certification**: DMT 99 ATEX E 082
  - **Ambient temperature**: -20 to +40 °C
**Description, for flammable gases**

Compact EEEx p control unit for the explosion protection of pressurized analyzers in zone 2, inclusive redundant surveillance of the purging gas pressure and flow during purging and operating phase.

![Fig. 23 BARTEC control unit, gas connection diagram](image)

**Technical data**

<table>
<thead>
<tr>
<th>Guidelines</th>
<th>EC EMC guideline 89/336/EEC RL 73/23/EWG Ex guideline 94/9EC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Design</td>
<td>Explosion-protected enclosure (EEEx e) with viewing window in the cover</td>
</tr>
<tr>
<td>Enclosure material</td>
<td>stainless steel</td>
</tr>
<tr>
<td>Terminals</td>
<td>2.5 mm, stranded conductor</td>
</tr>
<tr>
<td>Purging gas pressure</td>
<td>0.2 MPa to 1.0 MPa (0.2 MPa)</td>
</tr>
<tr>
<td>Purging gas flow</td>
<td>0 to 3.5 m³/h (2.0 m³/h)</td>
</tr>
<tr>
<td>Operating pressure</td>
<td>0 to 60 hPa (8 hPa)</td>
</tr>
<tr>
<td>Operating flow</td>
<td>0 to 1.5 l/min (1 l/min)</td>
</tr>
<tr>
<td>Weight</td>
<td>4.3 kg</td>
</tr>
<tr>
<td>Line voltage</td>
<td>0...230 V AC, 0...30 V DC</td>
</tr>
<tr>
<td>Switching capacity</td>
<td>max. 6 A with cos $\varphi = 1$ / max. AC 253 V</td>
</tr>
<tr>
<td></td>
<td>max. 1.5 A with cos $\varphi = 0.6$ / max. AC 253 V</td>
</tr>
<tr>
<td></td>
<td>max. 2 A with $L/R \sim 0$ ms / max. DC 30 V</td>
</tr>
<tr>
<td>Marking</td>
<td>EEEx n A C R (P) II C T6</td>
</tr>
<tr>
<td>Certification</td>
<td>TÜV 01 ATEX 1748 X</td>
</tr>
<tr>
<td>Ambient temperature</td>
<td>-20 to +60 °C</td>
</tr>
</tbody>
</table>
**Description**

The Ex purging unit MiniPurge FM is used to monitor the pressure during continuous purging of an analyzer with purging gas or inert gas. If the pressure falls below the set value, an optical display is triggered and the relay is activated. This monitoring unit is driven by the purging gas pressure and therefore does not require an additional power supply.

---

**Technical data**

<table>
<thead>
<tr>
<th>Classification</th>
<th>Class 1 Division 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enclosure dimensions (in mm)</td>
<td>444 x 438 x 275</td>
</tr>
<tr>
<td>Enclosure volume (l) for purging</td>
<td>Approx. 50 l</td>
</tr>
<tr>
<td>Enclosure pressure (normal)</td>
<td>1 hPa</td>
</tr>
<tr>
<td>FM certificate</td>
<td>Certificate of compliance</td>
</tr>
<tr>
<td></td>
<td>1X8A4.AE / 0B3A3.AE</td>
</tr>
<tr>
<td>Reaction upon failure of pressure</td>
<td>Opening of switching contact, and alarm via signal indicator (red display)</td>
</tr>
<tr>
<td>System type</td>
<td>MiniPurge complete system</td>
</tr>
<tr>
<td>Operating mode</td>
<td>Continuous purging</td>
</tr>
<tr>
<td>Type of enclosure</td>
<td>Strengthened polycarbonate</td>
</tr>
<tr>
<td>Enclosure surface</td>
<td>RAL 7035 gray with transparent cover</td>
</tr>
<tr>
<td>Pressure supply</td>
<td>Dry, oil-free air or inert gas with regulated pressure of approx. 30 psi/2000 hPa at inlet of MiniPurge</td>
</tr>
<tr>
<td>Supply connections</td>
<td>Pressure via ¼ BSPP connection, pressure hose at least ½” or 12 mm</td>
</tr>
<tr>
<td>Display (signal indicator)</td>
<td>Pneumatically driven color signal: green/red</td>
</tr>
<tr>
<td>Switching contact</td>
<td>Via SPCO switch approved for Class 1 Division 2</td>
</tr>
<tr>
<td>Settings</td>
<td>Lower operating limit 0.5 hPa set relative to purging gas flow of 1 to 2 l/min</td>
</tr>
<tr>
<td>Prepurging time</td>
<td>Is defined by operator, and controlled manually</td>
</tr>
<tr>
<td>Housing pressure limitation</td>
<td>By means of stainless steel RLV 25 output valve with integral flame arrestor; opens at 10 hPa ± 10 %</td>
</tr>
</tbody>
</table>

---

**Fig. 25** MiniPurge, gas connections

**Fig. 26** MiniPurge, dimensions in mm
## Ordering data

<table>
<thead>
<tr>
<th>Description</th>
<th>Qty</th>
<th>Order No.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Analyzer section</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Measuring cell</td>
<td>1</td>
<td>C79451-A3277-B35</td>
</tr>
<tr>
<td>• SS, type No. 1.4571, without flow-type compensation branch</td>
<td>1</td>
<td>C79451-A3277-B36</td>
</tr>
<tr>
<td>• Tantalum, without flow-type compensation branch</td>
<td>1</td>
<td>C79451-A3277-B37</td>
</tr>
<tr>
<td>• SS, type No. 1.4571, with flow-type compensation branch</td>
<td>1</td>
<td>C79451-A3277-B38</td>
</tr>
<tr>
<td>• Tantalum, with flow-type compensation branch</td>
<td>1</td>
<td>C79451-A3277-B39</td>
</tr>
<tr>
<td>• O-ring</td>
<td>4</td>
<td>C79121-Z100-A32</td>
</tr>
<tr>
<td>Measuring head for measuring cell</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• without flow-type compensation branch</td>
<td>1</td>
<td>C79451-A3460-B25</td>
</tr>
<tr>
<td>• with flow-type compensation branch</td>
<td>1</td>
<td>C79451-A3460-B26</td>
</tr>
<tr>
<td>Measuring gas path</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Restrictor made of stainless steel, type No. 1.4571, gas path hose</td>
<td>2</td>
<td>C79451-A3480-C10</td>
</tr>
<tr>
<td>• Restrictor made of titanium, gas path pipe</td>
<td>2</td>
<td>C79451-A3480-C37</td>
</tr>
<tr>
<td>Reference gas path</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Capillary tube, 3000 hPa, tube and screw connection parts</td>
<td>1</td>
<td>C79451-A3480-D518</td>
</tr>
<tr>
<td>• Capillary tube, 100 hPa, tube and screw connection parts</td>
<td>1</td>
<td>C79451-A3480-D519</td>
</tr>
<tr>
<td><strong>Electronics</strong></td>
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</tr>
<tr>
<td>Fuse</td>
<td>2</td>
<td>W79054-L1010-T630</td>
</tr>
<tr>
<td>• 0.63 A / 250 V (220-V version)</td>
<td>2</td>
<td>W79054-L1011-T100</td>
</tr>
<tr>
<td>• 1.0 A / 250 V (110-V version)</td>
<td>2</td>
<td>W75025-B5001-B1</td>
</tr>
<tr>
<td>LC-display</td>
<td>1</td>
<td>C79451-A3474-B605</td>
</tr>
<tr>
<td>Adapter board LCD/keyboard</td>
<td>1</td>
<td>C79165-A3042-B5</td>
</tr>
<tr>
<td>Catalog extract</td>
<td>Manual</td>
<td>Order No.</td>
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<tr>
<td>-----------------</td>
<td>--------</td>
<td>-----------</td>
</tr>
<tr>
<td><strong>OXYMAT 6</strong></td>
<td><strong>ULTRAMAT 6 / OXYMAT 6</strong></td>
<td>E86060-K3510-B101-A3</td>
</tr>
<tr>
<td>Gasanalysengeräte für die Bestimmung von Sauerstoff (German)</td>
<td>Gasanalysgerät für IR-absorbierende Gase und Sauerstoff (German)</td>
<td>C79000-G5200-C143</td>
</tr>
<tr>
<td><strong>OXYMAT 6</strong></td>
<td><strong>ULTRAMAT 6 / OXYMAT 6</strong></td>
<td>E86060-K3510-B101-A3-7600</td>
</tr>
<tr>
<td>Gas Analyzers for the Determination of Oxygen (English)</td>
<td>Gas Analyzers for IR-absorbing Gases and Oxygen (English)</td>
<td>C79000-G5276-C143</td>
</tr>
<tr>
<td><strong>OXYMAT 6</strong></td>
<td><strong>ULTRAMAT 6 / OXYMAT 6</strong></td>
<td>E86060-K3510-B101-A3-7700</td>
</tr>
<tr>
<td>Analyseurs de gaz pour la détermination d’oxygène (French)</td>
<td>Analyseurs de gaz pour la mesure de composants infrarouges et d’oxygène (French)</td>
<td>C79000-G5277-C143</td>
</tr>
<tr>
<td><strong>OXYMAT 6</strong></td>
<td><strong>ULTRAMAT 6 / OXYMAT 6</strong></td>
<td>C79000-G5272-C143</td>
</tr>
<tr>
<td><strong>ULTRAMAT 6 / OXYMAT 6</strong></td>
<td>Analizzatori per i gas assorbenti raggi infrarossi ed ossigeno (Italian)</td>
<td>C79000-G5278-C143</td>
</tr>
<tr>
<td><strong>ULTRAMAT 6 / OXYMAT 6</strong></td>
<td>Analizadores para gases absorbentes de infrarrojo y oxígeno (Spanish)</td>
<td></td>
</tr>
</tbody>
</table>
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---

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<table>
<thead>
<tr>
<th>AL</th>
<th>Number of the German Export List.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Products marked other than &quot;N&quot; require an export license.</td>
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<tr>
<td></td>
<td>In the case of software products, the export designations of the relevant data medium must also be generally adhered to.</td>
</tr>
<tr>
<td></td>
<td>Goods labeled with an &quot;AL not equal to N&quot; are subject to a European or German export authorization when being exported out of the EU.</td>
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<table>
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<th>ECCN</th>
<th>Export Control Classification Number.</th>
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<tr>
<td></td>
<td>Products marked other than &quot;N&quot; are subject to a reexport license to specific countries.</td>
</tr>
<tr>
<td></td>
<td>In the case of software products, the export designations of the relevant data medium must also be generally adhered to.</td>
</tr>
<tr>
<td></td>
<td>Goods labeled with an &quot;ECCN not equal to N&quot; are subject to a US re-export authorization.</td>
</tr>
</tbody>
</table>

Even without a label or with an "AL: N" or "ECCN: N", authorization may be required due to the final destination and purpose for which the goods are to be used.

The deciding factors are the AL or ECCN export authorizations indicated on order confirmations, delivery notes and invoices. Subject to change without prior notice.

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### If you have any questions, please contact your local sales representative or any of the contact addresses below.

<table>
<thead>
<tr>
<th>Siemens AG</th>
<th>Siemens Applied Automation</th>
<th>Siemens Pte. Limited</th>
</tr>
</thead>
<tbody>
<tr>
<td>A&amp;D PI 2M Process Analytics</td>
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<td>A&amp;D PI2 Regional Head Quarter</td>
</tr>
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<td>Oestliche Rheinbrueckenstr. 50</td>
<td>Bartlesville, OK 74003</td>
<td>19A Tech Park Crescent</td>
</tr>
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</tr>
<tr>
<td>E-Mail: <a href="mailto:processanalytics@siemens.com">processanalytics@siemens.com</a></td>
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Siemens AG
Automation and Drives
Process Instrumentation and Analytics
D-76181 Karlsruhe
Germany

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