

## Technical Specifications - Dissolved Oxygen (DO)

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|--|---|
| <b>Pill core material</b>                                | PA-6  |
| Pill volume  | 1.3 cm <sup>3</sup>                         |
| Pill density   | 1.25 g/cm <sup>3</sup>                      |
| <b>Sterilization</b>                                     | Beta irradiated at 25 kGy                   |
| <b>Response time <math>t_{90}^{1-3}</math> (typical)</b> | 25 s  |
| <b>Shaking noise<sup>4,6</sup> (typical)</b>             |   |
| Peak-to-peak,  | 1 – 8 %                                     |
| Standard deviation                                       | 0.5 – 1.5 %                                 |
| <b>Accuracy (typical)</b>                                |   |
| 5 % air saturation <sup>5</sup>                          | 4 %   |
| 95 % air saturation <sup>5</sup>                         | 2 %   |
| <b>Resolution (typical)</b>                              |   |
| 5 % air saturation <sup>5</sup>                          | 0.2 mbar or 0.1 % air saturation            |
| 95 % air saturation <sup>5</sup>                         | 0.2 mbar or 0.1 % air saturation            |
| 240 % air saturation <sup>5</sup>                        | 0.2 mbar                                    |
| <b>Measuring range</b>                                   | 0 – 470 % air saturation <sup>5</sup>       |
| <b>Detection limit</b>                                   | 0 – 0.5 % air saturation <sup>5,6</sup>     |
| <b>Drift</b>   | < 0.2 %/day <sup>7</sup>                    |
| <b>Lifetime (typical)</b>                                | > 1 million data points                     |
| <b>Shelf life</b>  | 6 months in original packaging <sup>8</sup> |
| <b>Storage conditions</b>                                | Dry, dark, and at room temperature          |

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### Cross sensitivities

Organic solvents at high concentrations, bleach

### Chemical compatibility<sup>6 9</sup> (typical)

| Compound          | Maximum concentration <sup>10</sup> |
|-------------------|-------------------------------------|
| Ethanol           | 10 %                                |
| Methanol          | 5 %                                 |
| Ammonia           | 1 %                                 |
| Ammonium Chloride | 1 %                                 |
| Acetic acid       | 5 %                                 |
| HCl               | 1 %                                 |
| NaOH              | 1 %                                 |
| Tris-HCl          | 50 mM                               |

1 All measurement specifications represent typical values under commonly observed cultivation conditions. Each measurement specification may be influenced by cultivation, ambient and shaking conditions, compounds in the media, handling of Pills and devices, calibration codes provided to the DOTS Software as well as other factors or parameters unknown to the author.

2 Time to reach 90 % of the equilibrium sensor signal during a step response from 100 % DO in ambient air to 0 % DO via sulfite addition. Recorded at 30 °C in PBS, 250 mL shake flask with 10 % filling volume, at 300 rpm with 25 mm shaking diameter. The DO was changed instantly from air saturation to zero DO by catalyzed sulfite reaction (copper(II) oxide and sodium sulfite).

3 Response time may furthermore depend on agitation, temperature, pressure, medium polarity and other media and ambient conditions.

4 Shaking noise describes the maximum signal deviation from signal average during shaking.

5 Air saturation at 30 °C, 1013 mbar air pressure, 0 % humidity.

6 Strongly depends on the shaking conditions as well as flask size, liquid levels and dynamics.

7 Drift given in percent deviation from initial DO Partial Pressure signal. Recorded under constant shaking, air saturation at 30 °C, 100 % humidity, measured in PBS. Value refers to first week of continuous operation. The drift rate decreases after several days of operation.

8 A recalibration of the DO Sensor Pills may be required after prolonged storage (> 2 months).

9 The DO Sensor Pills are generally resistant to typical chemicals and typical concentrations found in microbial and cell cultures. The list only shows prominent examples. However, depending on the exact media composition, the chemical compatibility of the DO Pills may be different or cross-influenced by other compounds.

10 Compounds tested as additives in PBS. %-Concentrations are given in weight-percent.

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## Recommended Operating Conditions - Dissolved Oxygen Sensor Pills

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**Temperature** 4 - 45 °C

### Shake flask filling volume

|                           |           |
|---------------------------|-----------|
| 100 ml shake flask        | 10 - 20 % |
| 250 ml shake flask        | 5 - 20 %  |
| 500 - 2000 ml shake flask | 5 - 10 %  |

### Shaking speed

|                                |               |
|--------------------------------|---------------|
| Optimal range                  | 200 - 300 rpm |
| shaking diameter $\leq$ 2.5 cm | 200 - 350 rpm |
| shaking diameter $\leq$ 5.0 cm | 180 - 300 rpm |

<sup>1</sup> For 100 ml shake flasks, and 250 ml shake flask with less than 10 % filling volume, a minimum of 250 rpm applies.

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