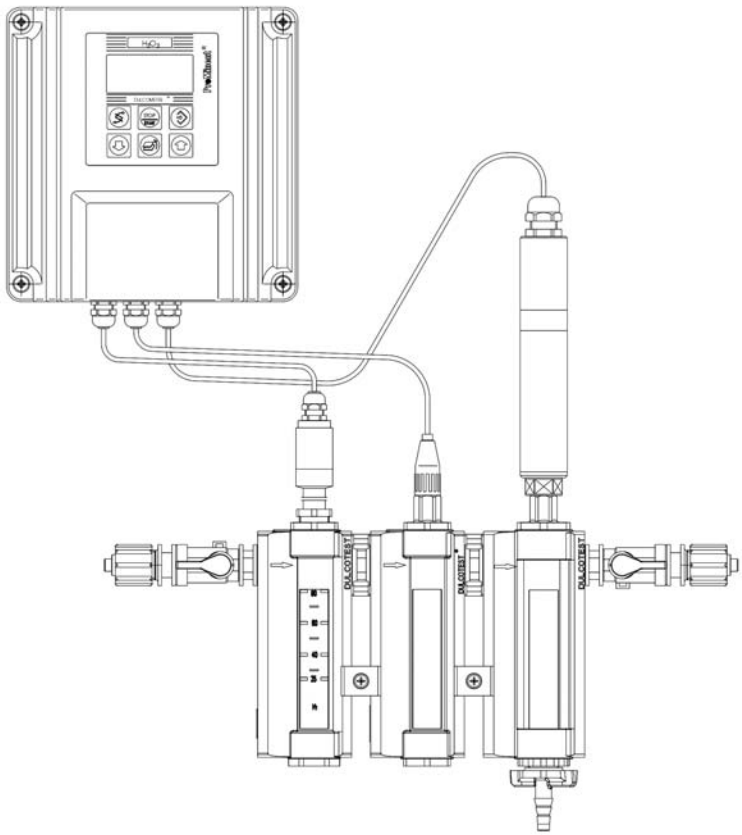
Operating Instructions

DULCOMETER® D1C

Part 3: Adjustment and Operation,
Measured Variable H_2O_2 for PEROX Sensor



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Please first read the operating instructions completely! · Do not discard!
The operator shall be liable for any damage caused
by installation or operating errors!

Part No. 987936 **ProMinent Dosiertechnik GmbH · D-69123 Heidelberg · Germany** BA DM 171 12/08 GB

1 General User Information

General Instructions for the User

These operating instructions describe the technical data and functions of the DULCOTEST® PEROX V1 sensor signal transmitter PEROX V1 and the accessory devices. These descriptions contain detailed safety instructions and are sectioned clearly according to the sequence of action steps.

IMPORTANT

- ***The instrument must always be in an electrically dead state (disconnected from the mains voltage) while connecting measuring sensors and/or accessory devices!***
- ***Please note which parts of this manual are relevant for your particular version of the instrument. You can determine this from the equipment designation and identification code.***
- ***Correct measuring and metering is possible only when the measuring sensors are functioning correctly. The sensor must therefore be checked and recalibrated regularly.***

2 Measuring Principle

Measuring Principle

The PEROX measuring system is based on amperometric measurements with some special features not found in conventional systems. The small surface area measuring electrode is made of platinum (for hydrogen peroxide measurements) and is covered with a microporous diaphragm cap to make the readings largely independent of the liquid flow conditions. The entire stainless steel shaft of the PEROX sensor acts as counter-electrode. The sensor part of the H_2O_2 measurement is thus complete.
All amperometric measurements depend strongly on the temperature, therefore we recommend temperature compensation using a PT100 resistance thermometer sensor, if temperature fluctuations occur in your application.

2.1 Applications

The environmentally compatible substance hydrogen peroxide (H_2O_2) is increasingly being used in process engineering as oxidising and reducing agent. Some examples of specific applications for continuous PEROX-H_2O_2 measurements and loop control functions are:

- Gas scrubbers, e.g. in municipal and industrial sewage treatment plant
- Ground water purification
- Drinking water oxidation
- Process water / cooling water disinfection
- Chlorine removal, e.g. in chemical processes
- Seepage water treatment in refuse dumps
- Bio-engineering
- Vat dyeing / textiles
- Swimming pool water disinfection

3 Operating Conditions

Operating Conditions

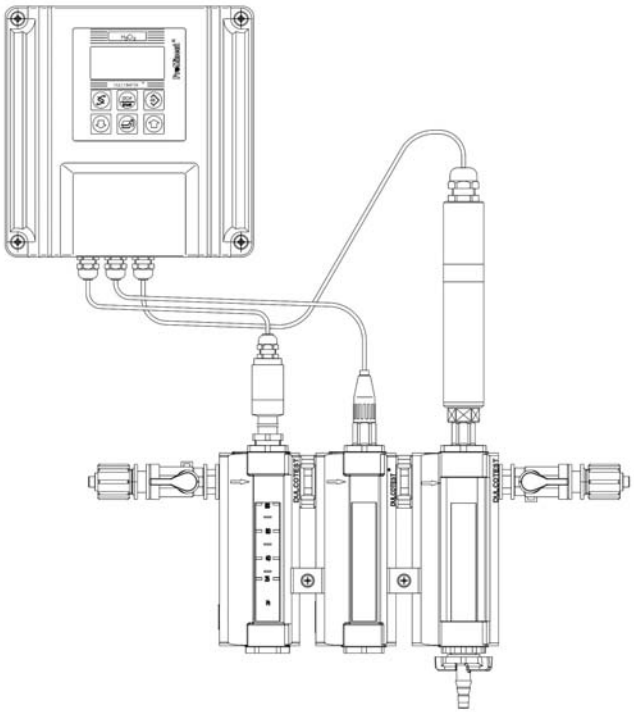
	H_2O_2
Measuring ranges:	1 ... 20 mg/l 10 ... 200 mg/l 100 ... 2000 mg/l 2-electrode technology
pH operating range:	pH 2.5 ... 10
Temperature range:	0 ... 40 °C
Temperature compensation:	manually or automatically, depending on Identcode specification
Permissible temperature change rate:	< 0.5 K/min
Minimum conductivity of the sample solution up to:	20 mg/l: 50 µS/cm 200 mg/l: 200 µS/cm 1,000 mg/l: 500 µS/cm 2,000 mg/l: 1 mS/cm
Max. operating pressure of the sensor:	6 bar, without pressure peaks
Response rate of sensor, T_{90} :	approx. 20 seconds
Sample water flow rate:	30 ... 100 l/h
Reproducibility:	Better than 2 % of the measuring range end value
Cross-sensitivity:	negligible cross-sensitivity to free chlorine
Interfering factors:	Tensides can impair the measurements. Solid material may clog the diaphragm; pre-filter if necessary.

4 Set-Up of the Complete Measuring System

4.1 Set-Up Examples

H_2O_2 measuring system in wall-mounted set-up, with automatic temperature correction and flow rate monitoring:

(1) DULCOMETER® D1C controller
Measured variable PES/PAA
(2) Continuous flow measuring sensor with monitoring facility
(3) PT100; for long-distance signal transmission,
temperature signal transmitter screwed onto the PT100
(4) H_2O_2 sensor type PEROX
(4a) Transmitter type PEROX V1
(5) DGMA 320T000



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5 Installation

5.1 Mechanical Installation

IMPORTANT

- ***When installing the equipment, make quite sure that it is disconnected from the mains voltage!***
- ***Interpose a filter in the input feed line if the liquid to be measured is turbid or dirty!***
- ***Install a continuous flow sample cooler if the sample temperature is high or subject to large or rapid fluctuations!***

The PEROX sensor is delivered with a protecting cap to protect the diaphragm and the electrode surface. Storage and transport take place in the dry state. The electrode must be polished before utilisation for the first time, in order to bring the electrode surface into a condition suitable for making measurements (see chap. 7.3 'Polishing the electrode surface'). Before installation, the diaphragm cap is to be filled with water and screwed onto the sensor hand-tight (no air bubbles).

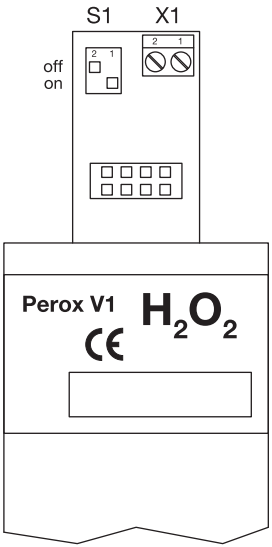
5.2 Installation in the Bypass Fitting

Like the other sensors, the PEROX sensor is installed hand-tight and leak-tight in the fitting using a socket wrench SW17. Then manually screw the transmitter(s) onto the sensor(s). The power supply voltage must be in the switched-off state at the D1C while installing the signal transmitters.

After the installation of the sensors, the fitting must always be filled with liquid (if possible sample liquid) because all sensors with the exception of PT100 are to be protected against drying out.

5.3 Electrical Installation

See also electrical installation and connecting terminal diagram in the operating instructions DULCOMETER® D1C, Part 1, Assembly and Installation for Wall-Mounted and Panel-Mounted Systems:
- Terminal block X2, terminal 9 of the D1CA controller is connected with terminal 1 of the transducer PEROX V1
- Terminal block X2, terminal 10 of the D1CA controller is connected with terminal block X1, terminal 2 of the transducer PEROX V1 (see fig.)



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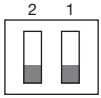
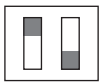
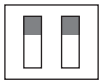
5.4 Setting of the Measuring Range

The measuring ranges 20/200/2,000 ppm are set via the DIP switch S1 at the transducer PEROX V1.
The measuring range is factory-set to 0-200 ppm.
The other measuring ranges can be set via the DIP switch positions listed in the table.

Hydrogen peroxide (H_2O_2)	
Switch position ***S1***	Measuring range [ppm]
 off / on	2000
 off / on	200 (as delivered)
 off / on	20
 off / on	not defined

6 Commissioning

SAFETY INSTRUCTIONS

Disconnect the power supply voltage every time before mounting/removing sensors, signal transmitters and other components.

The PEROX signal transmitter must not be disconnected from the PEROX sensor during operation.

For the sequence of operating steps on the D1C-controller (settings, calibration, etc.), please consult the "Operating Instructions DULCOMETER® D1C, Part 2, Measured Variable H_2O_2 and Peracetic Acid (PAA).

6.1 Functional Test

Before calibrating the measuring system, make a visual inspection of all electrical connections, and check that the hydraulic connections are not leaking.
If required, the function of the transducer PEROX V1 can be tested separately.
The test is made at the SN6 socket of the transducer. The following DC voltage U_{des} must be measured with the multimeter between the outer and inner contact area:

U_{des}: 750 ±20 mV

A short-term change in the indicated value is normal.

6.2 Run-In Phase

Elapse of a run-in phase of at least one hour must be awaited to avoid drift of the sensor signal. Calibrate the measuring system again after 24 hours.

6.3 Calibration with Photometer Type DT3

Preferably, calibration with the help of the photometer kit DT3 (1023143) is recommended.

6.4 Calibration with Buffer Solution in the Bypass Fitting Type DLG

After the run-in phase, the sensor must be calibrated according to the calibration menu of the D1C (PEROX) (see also Operating Instructions DULCOMETER® D1C, Part 2, Measured Variable H_2O_2 and Peracetic Acid (PAA)). Always make a two-point calibration when commencing operation for the first time. A single-point calibration with buffer 2 suffices for the recalibrations at routine intervals.
Choose the two calibration points such that the solution 1 (buffer 1) contains no H_2O_2 (zero point solution) and the solution 2 (buffer 2) corresponds to the concentration expected when making measurements subsequently. As far as possible, use solutions on the basis of the original process water for calibrating the sensor. If the process water contains components which consume H_2O_2, replace the process water with tap water.
For calibration, the process water input feed line must be shut off and the measuring system must first be emptied, to avoid any mixing of calibration solution and process water.

- Switch to the calibration menu according to "Operating Instructions DULCOMETER® D1C, Part 2, Measured Variable H_2O_2 and Peracetic Acid (PAA)".
- Close the shut-off valves
- Empty the process water out of the measuring system
- Empty the cup of the DLG and then fill it with calibrating solution
- Screw the cup back into the DLG
- Switch-on the magnetic stirrer to feed liquid to the sensor.
- Proceed according to the calibration menu "Operating Instructions DULCOMETER® D1C, Part 2, Measured Variable H_2O_2 and Peracetic Acid (PAA)".
- When changing the calibrating solutions, rinse the cup and the probe thoroughly with "buffer 2", empty the cup and then fill it with buffer 2.
- Continue according to the calibration menu "Operating Instructions DULCOMETER® D1C, Part 2, Measured Variable H_2O_2 and Peracetic Acid (PAA)".

6.5 Calibration Intervals

The proper calibration intervals depend strongly on the process conditions and the substances actually present in the process water, therefore no generally valid specifications can be given. Under laboratory conditions (pure aqueous solutions of H_2O_2), the calibrations intervals are about 3 months. To determine the optimum calibration intervals under process conditions, determine the H_2O_2 concentrations by independent methods (e.g. DT3) at regular intervals (e.g. initially daily).
For definite results, the sample-taking point must lie in the immediate vicinity of the sensor. If this condition is not fulfilled, there may be considerable discrepancies between the sensor reading and the externally determined H_2O_2 content of the sample.

Operation

IMPORTANT

The PEROX system should always be left switched-on, even when the process which is monitored/controlled is temporarily shut-down (e.g. over a weekend). Otherwise the sensor would lose its proper surface condition which is important for making measurements. When switching-on again after switch-off, the sensor is ready again for making measurements only after elapse of a run-in time. The measuring cup of the DLG or DGM must always be kept filled with process water or tap water.

7.1 Maintenance

It is advisable to make a regular visual check of the sensor condition, in particular the diaphragm. If the diaphragm is contaminated with dirt, replace the complete diaphragm cap.
If the electrode surface is dull, polish the electrode and replace the diaphragm cap.

7.2 Diaphragm Replacement

- Disconnect the PEROX system from the mains voltage.
- Close the shut-off valves.
- Unscrew the transmitter from the sensor.
- Screw-out the PEROX sensor from the DLG/DGM.
- Unscrew and detach the diaphragm cap.
  Hereby check the condition of the electrode surface. If the platinum electrode appears dull or modified, polish it (see chap. 7.3 “Polishing the Electrode Surface”).
- Fill new diaphragm caps completely with tap water.
- Screw the sensor hand-tight into the diaphragm cap. This displaces excess water. Make sure that there are no air bubbles trapped between the diaphragm and the electrode.
- The diaphragm should be slightly convex with respect to the exterior.
- Screw the sensor leakproof into the DLG/DGM filled with water or process water (SW17 wrench). Screw-on the signal transmitter (SW22 wrench). Establish the signal connection to the D1C.
- Open the shut-off valves.
- Switch-on the mains voltage.
- Recalibrate

When replacing the diaphragm without polishing the electrode, the sensor requires **no** run-in period; this facilitates the calibration after stabilisation of the measuring signal. After polishing and diaphragm replacement, we recommend a 2-point calibration (buffer 1 and 2), whereas a regular slope correction (buffer 2 only) suffices in routine operation.

7.3 Polishing the Electrode Surface

- Put a pea-size amount of polishing paste onto a soft (paper) rag.
- Press the electrode into the polishing paste and turn it under gentle pressure.
- Completely remove the polishing paste from the electrode and sensor shaft by rinsing under lukewarm running water.
- The surface of the platinum electrode must have a metallic gloss again. If not, repeat the polishing process.
- Do not touch the electrode surface again. Contamination with skin grease or sweat would impair the sensor function.

For further procedure steps, see chap. 7.2 “Diaphragm Replacement”.

After polishing the electrode, the surface must be brought again into the condition required for making measurements. This requires a run-in time of at least 1 hour. Calibration can be carried out thereafter. Repeat the calibration after 24 hours.

8 Spare Parts and Consumables

H_2O_2 sensor shaft, type H2.10 P, complete with diaphragm cap	792976
Transmitter, type PEROX V1	1034100
H_2O_2 replacement diaphragm cap, type M 2.0P	792978
Temperature sensor, type PT 100 SE	305063
Temperature transmitter, type PT 100 V1	809128
Bypass fitting (3-fold) (hose connection 8x5)	DGMA 320T000
Bypass fitting (3-fold) (screw fitting d16 / DN10)	DGMA 320T010
Polishing paste for PEROX sensor, 90 g tube	559810
Two-wire measuring line (2 x 0.25 mm^2)	725122
Measuring line for PT 100 (2 x 0.5 mm^2, 5 m)	1003208

Operating Instructions DULCOMETER® D1C, Part 3, Measured Variable H_2O_2 for PEROX Sensor
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