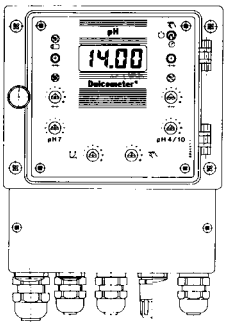
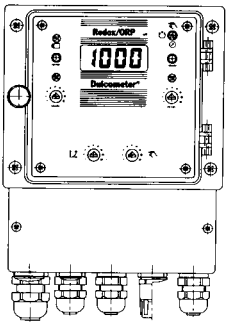
DULCOMETER® PHWS F1 K1
RHWS F1 K1, CLWS F1 K1

Instruction Manual

ProMinent®

Part.No. 986443.0





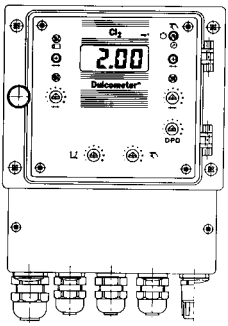


Table of Contents

Dear user,

You have made a good choice in purchasing this reliable, sturdy and versatile measurement and control system.

In order that you may make full use of the benefits the system offers you please follow our advice and

read this instruction manual

throughout **before** you install the system and start operation. If treated in accordance with the instructions given, the DULCOMETER® system will reward you with many years of faultless performance.

First of all, please check by means of the packing list whether the shipment is complete.

1. General remarks on DULCOMETER® F1 K1 transmitters / controllers

DULCOMETER® F1 K1 series transmitters / controllers are used to measure and control pH, redox potential (ORP) and chlorine residual in public and private swimming pools and in the treatment of potable water and wastewater.

If installed in accordance with the Instruction Manual, DULCOMETER® transmitters / controllers will ensure strict maintenance of the desired setpoints and alarm values. An optional standard signal output is available for centralised display and recording purposes.

2. Installation

Remove the bezel around the perspex cover by loosening the four cross head screws. This will access to the two wall mounting holes at the left and right at 126 mm centers.

For panel mounting provide a cut-out of 139 x 115 mm (wide x high). The electrical connections can be made after the unit is mounted since the terminals are accessible both from the front (wall mounting) and the rear (panel mounting).

Safety information

Danger: Measuring and control systems and their peripheral equipment may only be connected by trained personnel and qualified electricians. Contact your customer service responsible!

Disposal of Old Parts

Please note: Plastic and electronic waste are classified as special waste and must be recycled!

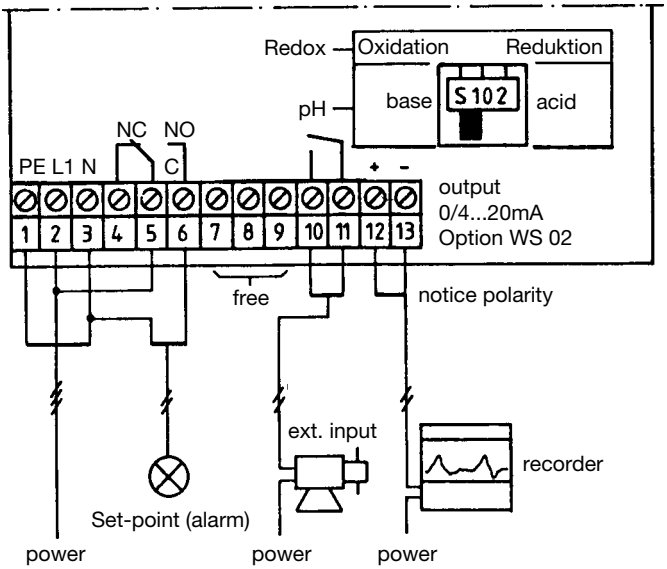
Disposal Law
Waste (old parts) is to be disposed of in an orderly manner for the common good especially the protection of the environment. Therefore old parts have to be disposed of in accordance with the order on the (German) Waste Avoidance and Waste Management Act or recycled in accordance with the (German) Waste and Residual Materials Monitoring Act.

Taking back old parts
The municipal collection points for small quantities of the towns and municipalities accept plastic and electronic waste.

If you should not find any appropriate collection point **the ProMinent® subsidiary or representative responsible for you will take back your old parts for a small fee.**

3. Electrical connections

Remove the front or rear cover of the terminal box and make the following connections:



Power supply:
Terminal 1: Protective earth PE
Terminal 2: Line L1
Terminal 3: Neutral N

Alarm relay:
Terminal 4: Normally closed
Terminal 5: Common
Terminal 6: Normally open

Contact load: max. 250 V a.c. , 3 A, 700 VA

Caution: Provide a RC combination when switching inductive loads

Terminal 7: no function
Terminal 8: no function
Terminal 9: no function

Terminal 10: Pulse train output
Terminal 11: Pulse train output

These terminals are used to pace an E, B or C series ProMinent® solenoid-driven metering pump.

Terminal 12: signal output 0/4...20 mA
Terminal 13: Option WS 02

Caution: Take note of the polarity: Terminal 12 + Terminal 13 -

If option WS 02 is included, terminals 12 and 13 are used to connect a recording instrument or a panel meter or such like.

4. Connecting the probes

4.1 pH and redox (ORP) probes

pH and redox combination probes will be connected by means of a special signal cable. The moisture-protected SN 6 connector will be plugged into socket 12 (PHWS F1K1) or 11 (RHWS F1 K1). Connectors and cables must be protected against moisture. The special low-noise signal cables should be routed separate from other cables and the distance between the point of measurement and the transmitter should be as short as possible.

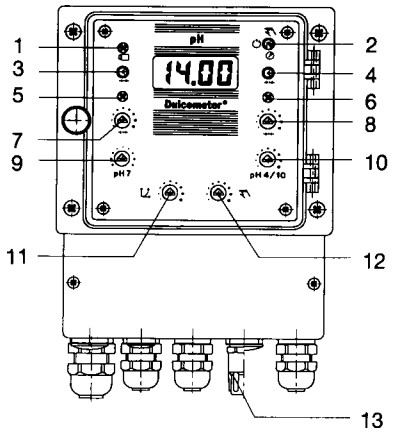
It is recommended to locate the point of measurement within reach of the transmitter so that calibration can be performed by one and the same person.

4.2 Chlorine probes, type CLE II / CLE II T / CLE 2.2 / CGE 1-4 P

Chlorine probes require a special signal cable, type CLE, which will be plugged into socket 12 (see page 14, item 12). Refer to the Instruction Manual for the chlorine probe.

5. Functional description and commissioning of PHWS F1K1 transmitters / controllers

5.1 Controls:



1 - Stroke indication (LED, yellow); will be extinguished while the connected ProMinent® solenoid-driven metering pump performs a stroke
2 - Mode selector switch: Manual Automatic Measurement
3 - Pushbutton key to display set value
4 - Pushbutton key to display alarm value
5 - LED, green; lighting up when set value is reached
6 - LED, red; indicating the pulled-in state of the alarm relay
7 - Adjustment of set value (pulse-train output)
8 - Adjustment of alarm value (relay output)
9 - Calibration for pH 7
10 - Slope calibration
11 - Adjustment of proportional bandwidth
12 - Adjustment of simulated measured value
13 - SN 6 connector for pH probe

5.2 Setting set value

Press pushbutton 3 to display the set value on the LCD readout. Set desired value by means of potentiometer 7. For swimming pool applications the recommended set value is between pH 7 and pH 7.5.

5.3 Setting alarm value

Press pushbutton 4 to display the alarm value on the LCD readout. Set desired value by means of potentiometer 8. The alarm relay will pull in when the measured value exceeds the alarm value.

5.4 Calibrating the pH probe

Important: Prior to calibration the pH probe must be sufficiently soaked. Probes having been stored in a dry state need at least one hour to be ready for measurement.
To soak the probe use KCl solution, if not available, water
Do not forget to remove the protective cap first!
Please follow the "Cleaning and servicing instructions" supplied with each probe.

To calibrate switch on power supply and place the mode selector switch into position "Measurement" (bottom) or "Automatic" (center).

5 4.1 Calibrating for pH 7

Connect the probe to the transmitter and dip it into a pH 7 standardizing solution.
Turn the adjustment potentiometer to make the display read 7.00. If the last digit is instable this may be disregarded.

5.4.2 Slope calibration

Having calibrated the probe to pH 7, rinse the probe with distilled water and check its function. Place probe into pH 4 and pH 10 standardizing solution, one after the other. Bring the value of the respective standardizing solution onto the display by means of slope potentiometer 10. If this value is reached rather sluggishly or not at all, the probe may need cleaning (see “Cleaning instructions”). If after cleaning the probe performance is still unsatisfactory, replace probe by a new one.

Caution: At probe failure, a wrong measured value may be transmitted. This may lead to an uncontrolled dosage. Hence, the customer is kindly requested care that no consequential damages can occur.

Possible security measures are described here below:

Measuring of pH-values

Deposits, ageing, poisoning of the reference probe, humidity in the plug-in connections, cable parting or mechanical damages (e. g. glass breakage) of the pH measuring chain may lead to any signals from pH 0 through pH 14.

The limit may be used for providing security. Highest possible security, however, can only be achieved by measuring the difference in pH-value (second measuring cell).

Generally, a regular probe maintenance (visual check and control of function, calibration, cleaning) is necessary.

5.5 Function of the controller

The PHWS F1 K1 transmitter / controller has a pulse-train output designed to pace a ProMinent® solenoid-driven metering pump, and a relay output for giving an alarm or switching the power supply of a metering pump or a solenoid valve.
The controller is factory-set for **acid feeding** (lowering pH).

If the measured pH exceeds the set value an error-proportional pulse train will be generated which causes the metering pump to feed acid relative to demand. The pulse rate will be indicated by the yellow LED 1. The green LED 5 will light up when the measured value equals the set value. If the measured value exceeds the predetermined alarm value, the alarm relay will pull in and the red LED 4 light up.

5.5.1 Changing control direction

In soft water areas, or when chlorine gas is used for disinfection, need may arise to raise the pH of the pool water. The control direction of the PHWS F1 K1 can be easily changed by means of switch S 102 in the terminal box. When it is placed to the left the control direction is for caustic feeding, to the right for acid feeding.

5.5.2 Setting proportional bandwidth

The maximum pulse rate of 6000 pulses per hour will not be generated until the measured value has departed from the set value by a certain amount called proportional bandwidth. Adjustment of the proportional bandwidth allows to tune the control action to the pool flow conditions and the buffer capacity of the water. It is recommended to start initial operation with the maximum proportional bandwidth, that is with potentiometer 10 turned fully clockwise, and, if overshooting occurs, to reduce the proportional bandwidth until no more overshooting takes place.

5.5.3 Checking oontrol functions

By placing the mode selector switch 2 into its top position  ("Manual") it is possible to simulate pH values between 0 and 14 by means of potentiometer 11. Thus it is possible to check the LEDs, the pulse-train output and the alarm relay. In case of a defective probe, simulation of a measured value will cause the controller to generate a pulse train with a fixed pulse rate.

5.5.4 Standard signal output 0/4-20 mA

If the measured data is to be transferred to a recording instrument or a remote indicator this can be realized by adopting Option WS 02. “Electrically isolated standard signal output (order no. 91.49.32.9)”. The analog 0/4 - 20 mA signal will be available at terminals 12 and 13.

Caution: Take note of the polarity: Terminal 12 +
Terminal 13 -

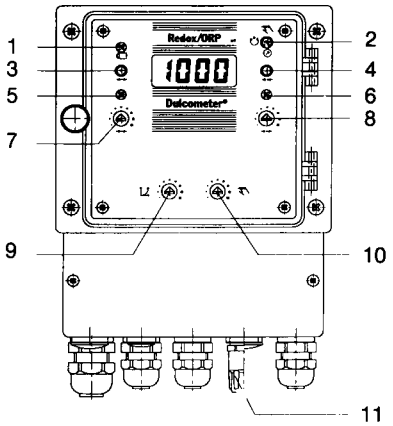
The signal output 0...20 mA or 4...20 mA can be selected on the additional signal output circuit board.

5.6 Operation

When all the foregoing instructions have been followed the transmitter / controller can be brougth into operation. Place mode selector switch into the center position  (“ Automatic”). If measurement only is desired and no chemical feeding, place mode selector switch 2 in its bottom position  (“Measurement”).

6. Functional description and commissioning of RHWS F1 K1 transmitters / controllers

6.1 Controls:



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1 - Stroke indication (LED, yellow); will be extinguished while the connected ProMinent® solenoid-driven metering pump performs a stroke
2 - Mode selector switch: Manual Automatic Measurement
3 - Pushbutton key to display set value
4 - Pushbutton key to display alarm value
5 - LED, green; lighting up when set value is reached.
6 - LED, red; indicating the pulled-in state of the alarm relay
7 - Adjustment of set value (pulse-train output)
8 - Adjustment of alarm value (relay output)
9 - Adjustment of proportional bandwidth
10 - Adjustment of simulated measured value
11 - SN 6 connector for redox probe

6.2 Setting set value

Press pushbutton 3 to display the set value on the LCD readout. Set desired value by means of potentiometer 7. For swimming pool applications the recommended set value is between 700 and 750 mV.

6.3 Setting alarm value

Press pushbutton 4 to display the alarm value on the LCD readout. Set desired value by means of potentiometer 8. The alarm relay will pull in when the measured value drops below the alarm value.

6.4 Checking the redox probe

Important: Prior to being checked the redox probe must be sufficiently soaked. Probes having been stored in a dry state need at least one hour to be ready for measurement.
To soak the probe use KCl solution, if not available water.
Do not forget to remove the protective cap first!
Please follow the “Cleaning and servicing instructions” supplied with each probe.
To check the probe switch on power supply and place the mode selector switch into position “Measurement” (bottom) or “Automatic” (center).
Place probe into a standardizing solution of, say, 475 mV. The probe is in working order if this value is reached or exceeded within 10 seconds. If it takes more than 10 seconds to obtain this value or if the reading falls short by more than 20 mV, the probe may need cleaning (see “Cleaning instructions”). If after cleaning probe performance is still unsatisfactory, replace probe by a new one.

Important: The probe need not be calibrated.

Caution: At probe failure, a wrong measured value may be transmitted. This may lead to an uncontrolled dosage. Hence, the customer is kindly requested to take care that no consequential damages can occur.
Possible security measures are described here below:

Measuring of Redox values

Deposits, ageing, poisoning of the reference probe, humidity in the plug-in connections, cable parting or mechanical damages (e. g. glass breakage) of the Redox measuring chain may lead to any signals from -1.000 through + 1.000 mV.
The limit may be used for providing security.
Generally, a regular probe maintenance (visual check and control of function, calibration, cleaning) is necessary.

6.5 Function of the controller

The RHWS F1 K1 transmitter / controller has a pulse-train output designed to pace a ProMinent® solenoid-driven metering pump, and a relay output for giving an alarm or switching the power supply of a metering pump or a solenoid valve.

The controller is factory-set for oxidant feeding. e g. chlorine feeding (raising the redox potential).

If the measured redox voltage drops below the set value an error-proportional pulse train will be generated which causes the metering pump to feed oxidant relative to demand. The pulse rate will be indicated by the yellow LED 1. The green LED 5 will light up when the measured value equals the set value.

If the measured value drops below the predetermined alarm value, the alarm relay will pull in and the red LED 4 light up.

6.5.1 Changing control direction

The control direction of the RHWS F1 K1 can be easily changed by means of switch S 102 in the terminal box. When it is placed to the left the control direction is for oxidant feeding, to the right for reducing agent feeding.

Note: In swimming pool applications a reversal of the control direction does not make any sense!

6.5.2 Setting proportional bandwidth

The maximum pulse rate of 6000 pulses per hour will not be generated until the measured value has departed from the set value by a certain amount called proportional bandwidth. Adjustment of the proportional bandwidth allows to tune the control action to the pool flow conditions and the buffer capacity of the water. It is recommended to start initial operation with the maximum proportional bandwidth, that is with potentiometer 9 turned fully clockwise, and, if overshooting occurs, to reduce the proportional bandwidth until no more overshooting takes place.

6.5.3 Checking control functions

By placing the mode selector switch 2 into its top position  ("Manual") it is possible to simulate redox voltages between 0 and 1000 mV by means of potentiometer 10. Thus it is possible to check the LEDs, the pulse-train output and the alarm relay. In case of a defective probe, simulation of a measured value will cause the controller to generate a pulse train with a fixed pulse rate.

6.5.4 Standard signal output 0/4 - 20 mA

If the measured data is to be transferred to a recording instrument or a remote indicator this can be realized by adopting Option WS 02, “Electrically isolated standard signal output (order no. 91.49.32.9)”. An analog 0/4- 20 mA signal, corresponding to 0 - 1.000 mV, will be available at terminals 12 and 13.

Caution: Take note of the polarity: Terminal 12 = +
Terminal 13 = -

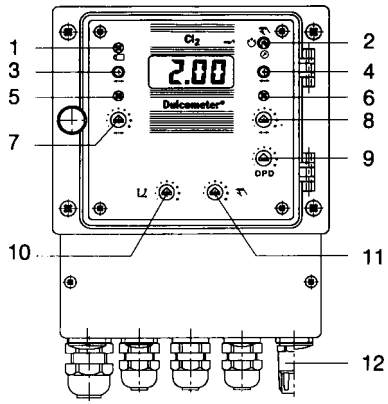
The signal output 0... 20 mA or 4...20 mA can be selected on the additional signal output circuit board.

6.6 Operation

When all the foregoing instructions have been followed the transmitter / controller can be brougth into operation. Place mode selector switch into the center position (“Automatic”). If measurement only is desired and no chemical feeding, place mode selector switch 2 in its bottom position (“Measurement”).

7. Functional description and commissioning of CLWS F1 K1 transmitters / controllers

7.1 Controls:



1 - Stroke indication (LED, yellow); will be extinguished while the connected ProMinent® solenoid-driven metering pump performs a stroke
2 - Mode selector switch: Manual / Automatic / Measurement
3 - Pushbutton key to display set value
4 - Pushbutton key to display alarm value
5 - LED, green; lighting up when set value is reached
6 - LED, red; indicating the pulled-in state of the alarm relay
7 - Adjustment of set value (pulse-train output)
8 - Adjustment of alarm value (relay output)
9 - Calibration (DPD method)
10 - Adjustment of proportional bandwidth
11 - Adjustment of simulated measured value
12 - Connector for chlorine probe

7.2 Setting set value

Press pushbutton 3 to display the set value on the LCD readout. Set desired value by means of potentiometer 7. For swimming pool applications the recommended set value is between 0.3 and 0.6 mg/l of chlorine.

7.3 Setting alarm value

Press pushbutton 4 to display the alarm value on the LCD readout. Set desired value by means of potentiometer 8. The alarm relay will pull in when the measured value drops below the alarm value, e.g. in case of probe failure.

Note: Set values and alarm values are displayed on the LCD readout with a negative sign.

7.4 Commissioning and calibrating the chlorine probe CLE II / CLE II T / CLE 2.2 / CGE 1-4P

Read the Instruction Manual supplied with the chlorine probe thoroughly before putting the probe into operation.

7.4.1 Calibration by means of the DPD method

Install the probe according to instructions and put it into operation. Calibrate the probe after about one hour's operation as follows:
Take a sample of the effluent from the in-line probe housing (type DLG). Determine the concentration of free chlorine by means of the DPD test kit. Make the transmitter display the value thus found by adjusting potentiometer 9 (DPD).
Re-check the calibration the follwing day, then in weekly intervals.

7.4.2 Checking the chlorine probe

If it should turn out impossible to display the value found by the DPD method, the membrane cap of the chlorine probe might need cleaning and refilling or being replaced. (Refer to the Instruction Manual for chlorine probe)

Caution: At probe failure, a wrong measured value may be transmitted. This may lead to an uncontrolled dosage. Hence, the customer is kindly requested to take care that no cosequential damages can occur.

Possible security measures are described here below:

Measuring of chlorine

Deposits on the diaphragm, high pH-value (for chlorine), too small (< 30 l/h) sample water flow of the probe or lack of test water may lead to measured signals being too small and hence to an overdosage.

If the measured values are too high, the hygienic security can no longer be guaranteed.

The limit may be used as a security measure. In addition, also a supervision (locking) by the Redox potential as well as a locking by the circulating pump / sample water pump is recommended.

Generally, a regular probe maintenance (visual check and control of function, calibration, change of diaphragms and electrolytes) is necessary.

7.5 Function of the controller

The CLWS F1 K1 transmitter / controller has a pulse-train output designed to pace a ProMinent® solenoid-driven metering pump, and a relay output for giving an alarm or switching the power supply of a metering pump or a solenoid valve.

The controller is factory-set for **chlorine feeding**.

If the measured chlorine concentration drops below the set value an error-proportional pulse train will be generated which causes the metering pump to feed chlorine relative to demand. The pulse rate will be indicated by the yellow LED 1. The green LED 5 will light up when the measured value equals the set value.

If the measured value drops below the predetermined alarm value, the alarm relay will pull in and the red LED 4 light up.

7.5.1 Setting proportional bandwidth

The maximum pulse rate of 6000 pulses per hour will not be generated until the measured value has departed from the set value by a certain amount called proportional bandwidth. Adjustment of the proportional bandwidth allows to tune the control action to the pool flow conditions and the buffer capacity of the water. It is recommended to start initial operation with the maximum proportional bandwidth, that is with potentiometer 10 turned fully clockwise, and, if overshooting occurs, to reduce the proportional bandwidth until no more overshooting takes place.

7.5.2 Checking control functions

By placing the mode selector switch 2 into its top position (“Manual”) it is possible to simulate chlorine concentrations between 0 and 2 mg/l by means of potentiometer 11. Thus it is possible to check the LEDs, the pulse-train output and the alarm relay. In case of a defective probe, simulation of a measured value will cause the controller to generate a pulse train at a fixed pulse rate.

7.5.3 Standard signal output 0/4 - 20 mA

If the measured data is to be transferred to a recording instrument or a remote indicator this can be realized by adopting Option WS 02, “Electrically isolated standard signal output (order no. 91.49.32.9)”. An analog 0/4-20 mA signal corresponding to 0-1mg/l of chlorine will be available at terminals 12 and 13. With Option WS 02-2 (order no. 92.49.25.1) the analog signal range will correspond to 0-2 mg/l of chlorine.

Caution: Take note of the polarity: Terminal 12 = +
Terminal 13 = -

The signal output 0...20 mA or 4...20 mA can be selected on the additional signal output circuit board.

7.6 Operation

When all the foregoing instructions have been followed the transmitter / controller can be brougth into operation. Place mode selector switch into the center position
(“ Automatic”). If measurement only is desired and no chemical feeding, place mode selector switch 2 in its bottom position (“Measurement”).