

# Operating Instructions

for DULCOMETER® DSR Swimming Pool  
Controller, Measured Variables pH and redox



Please affix device label here!

**Please read the operating instructions through completely before commissioning this equipment! Do not discard! Any part which has been subject to misuse is excluded from the warranty!**

**Publishing Details:**

Operating Instructions DULCOMETER® DSR

Measured variables pH and redox

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### 1 Instructions for use of manual

Please read through the following instructions carefully. Knowledge of these instructions will help you use the operating instructions manual more effectively.

Points are highlighted as follows

- Indicate step by step instructions
- Indicate enumerated points

Input menus

#### **NOTE**

*Notes are intended to make your job easier.*

and safety guidelines:



#### **CAUTION**

*Could result in lesser injuries or damage to property if safety guidelines are not observed.*



#### **IMPORTANT**

*Could result in damage to property if safety guidelines are not observed.*

## **2 Safety**

*Correct use* The DSR controller is a microprocessor controlled measurement and control device for the measured variables pH value and redox potential.

The device is intended exclusively for:

- Measurement of pH and redox measured variables
- Measurement of pH and redox control variables
- Display of measured/control variables

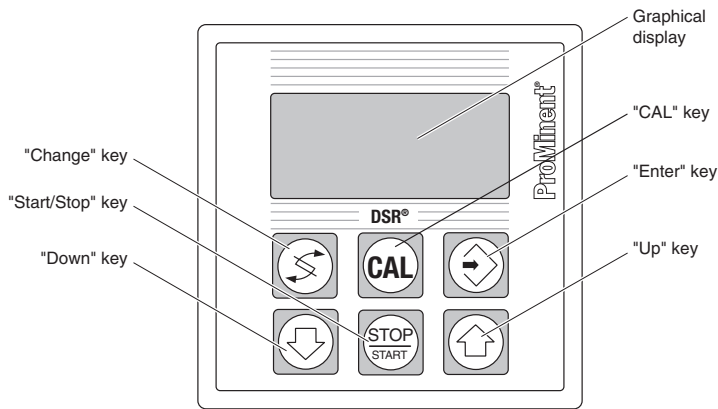
The device may not be used outdoors! It is forbidden to modify the device or to use it for any other means!



### **IMPORTANT**

- ***The device must be calibrated to the pH probe at regular intervals to prevent the possibility of calculating incorrect and dangerous doses!***
- ***The device has no on/off switch. It is ready to operate as soon as it is connected to the power supply.***
- ***Keep children away from the device! If device settings are altered it is possible to calculate incorrect and dangerous doses.***

3 Device overview/control elements



The DSR controller graphical display uses the following symbols:

Symbol	Meaning
O	Stop key pressed
ε	Failure
1	pH reference value exceeded 2 point controller 1 Acid metering
↓	pH reference below reference value 2 point controller 1 Alkali metering
1	Redox reference value exceeded 2 point controller 2 Oxidant above
↓	Redox reference below reference value 2 point controller 2 Oxidant below
▲	Pulse length 1* (acid, alkali) Controller off
△	Pulse length 1* (acid, alkali) Controller on
■	Pulse length 2* (Oxidant) Controller off
▢	Pulse length 2* (Oxidant) Controller on

\* controls metering pump or solenoid valve

## 4 Function description

The DULCOMETER® DSR swimming pool controller is a microprocessor controlled measuring and control device for the measured / control variables pH value and redox potential. It measures the pH value and the redox potential and displays the values. If used with corresponding regulating units (e.g. metering pumps) the DSR can perform control functions.

All pre-set values are stored in duplicate in an EEPROM and cannot be lost during a power failure. Values are saved on exit from a menu option using the Enter key.







In the event of a fault, the DSR screen display a fault message.

### Start/Stop key

The process controller is activated when you press the Start/Stop key.

#### NOTE

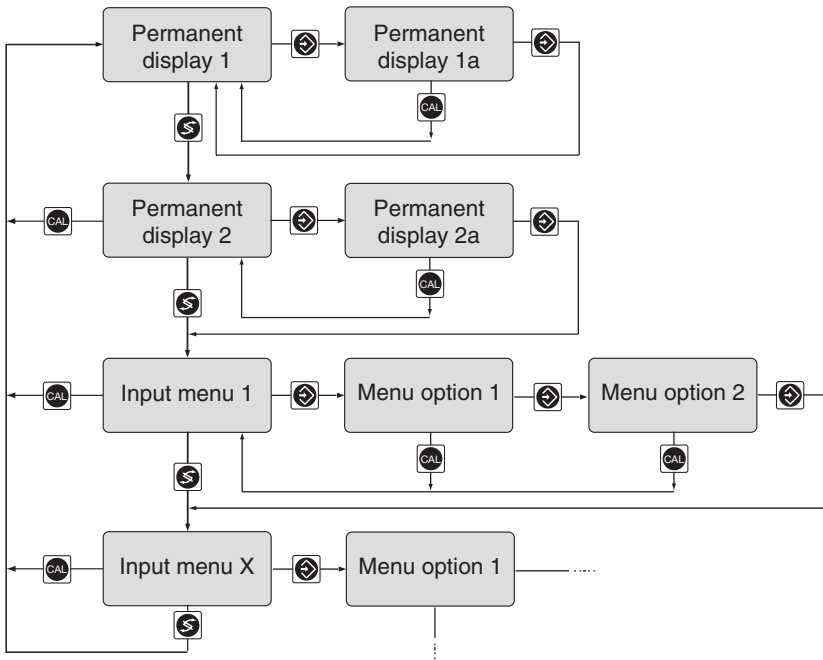
***The control process begins after 2 min. (factory setting). Until then it is switched off via the metering delay to prevent overdosing. The metering delay is activated every time the system is switched on at the mains. It is also activated after calibration.***

	In the input menus and permanent displays	In the menu options
“Change” key: 	Toggle between the permanent display and input menus. Access menu options (Access code?)	Select a value
“Enter” key: 	Used to access menu options (Access code?)	Exit a menu option and store values and access a input menu or another menu option
“Up” key: 	Enter access code Priming	Change a value
“Down” key: 	Enter access code	Change a value
“Start/Stop” key: 	Start/stop control and metering function	Start/stop control and metering function
“CAL” key: 	Open the calibration menu. Return to permanent display 1	Return to input menu without saving changes

4.1 Diagram of operating menu

The operating menu consists of

- permanent displays
- input menus
- input menu options



4.2 Negotiating the operating menu

NOTE

- *It is possible to exit any of the operating menu windows by pressing the CAL key. The display will then return to either the permanent display or the appropriate information display, depending on which section of the operating menu you are using.*
- *If you do not press any key within 10 minutes, the display will automatically return to permanent display 1 (does not apply to calibration menu).*

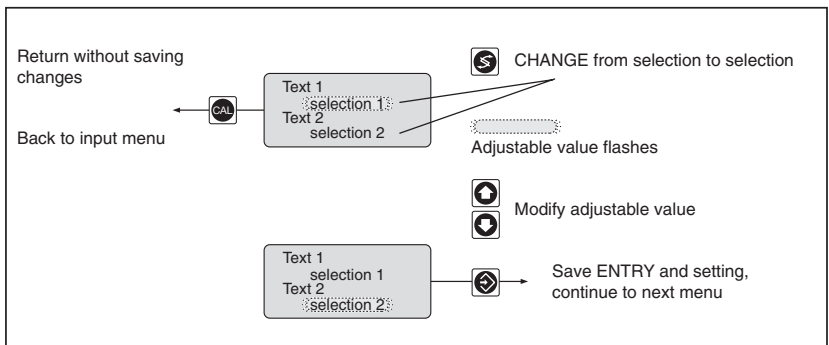


### 4.2.1 Permanent displays and input menus

The individual windows in the permanent display and the input menus are accessed in turn by pressing the change key. After having scrolled through all windows in turn, you will eventually return to permanent display 1.

### 4.2.2 Menu options

*Without access code* From input menus, menu options are accessed using the enter key. The enter key is also used to exit the menu options and simultaneously store the values selected in the menu option (see figure). If you do not want to store the value, then exit the menu option using the CAL key; you will then return to the input menu.



*With access code* Input menu options be accessed by entering the correct access code, if one has been set. Access to the menu options for subsequent input menus can then be gained without an access code. Once you have returned to permanent display 1, access to input menu options may only be gained by re-entering the access code.

### 4.2.3 Negotiating menu options

Once you have accessed the menu options, you will see words and figures (see figure). Adjustable values flash. You may activate another value using the change key (value options start flashing). You may also return to a previous adjustable value using the change key.

You can change an adjustable value. There are two types of

---

## Function description

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adjustable value, and they are altered in two different ways:

- Change word/phrase* ➤ Press the up or down keys to select word/expression.
- Change numerical value* ➤ Press the up or down keys. If you press a key briefly once, then the last figure is increased/decreased by 1. If you hold the key down, then the figure will continue to change in the direction selected. If you continue to hold the key down, the figure will change increasingly rapidly.

You can exit a menu option by pressing the enter key or CAL key as in the operating menu.

### **NOTE**

***Your settings become effective the moment you press the enter key.***

## **5 Operation and adaptation**

The operating menu comprises permanent displays and input menus with the following functions:

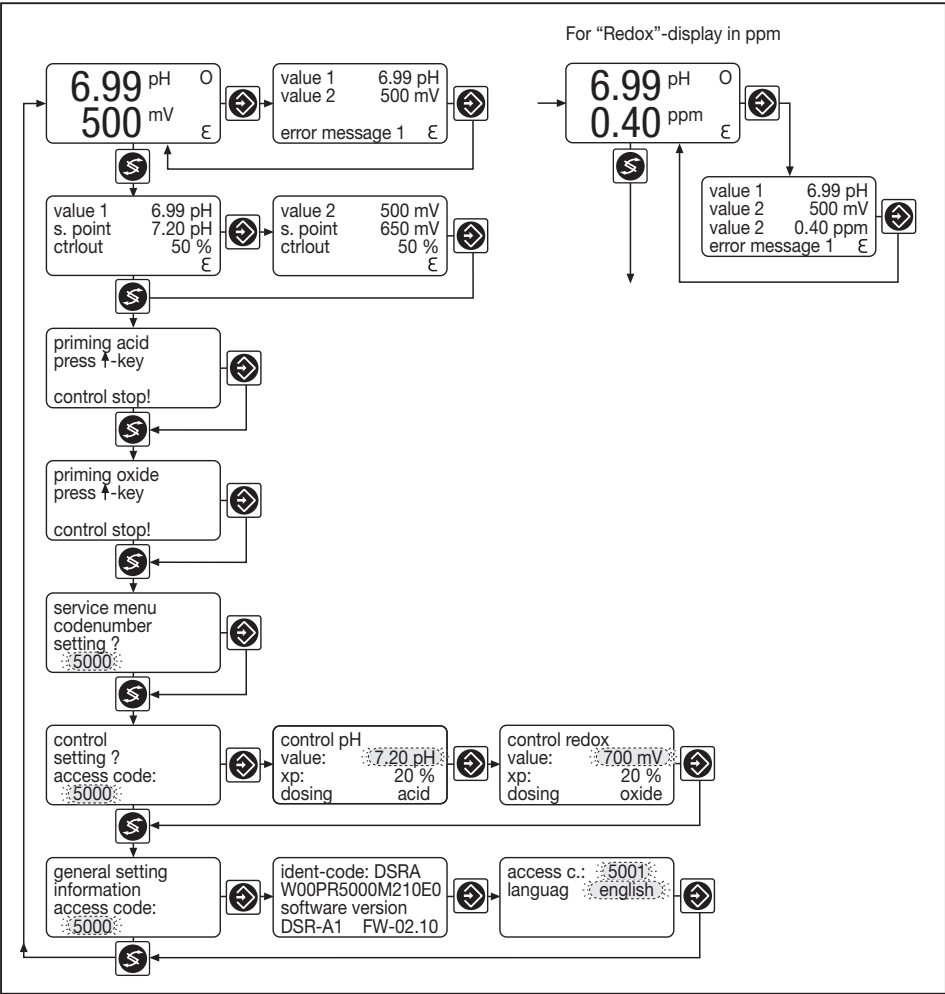
Permanent display 1	Monitoring
	Calibration (redox - chlorine allocation)
Permanent display 2	Monitoring
Priming (acid/alkali)	Priming of acid or alkali
Priming oxidant	Priming of oxidant
(Service menu)	(only for service technicians)
(Controller settings)	Set pH reference value (only if instructed!) Set redox reference value (only if instructed!)
General settings	Set access code Set language

**NOTE**

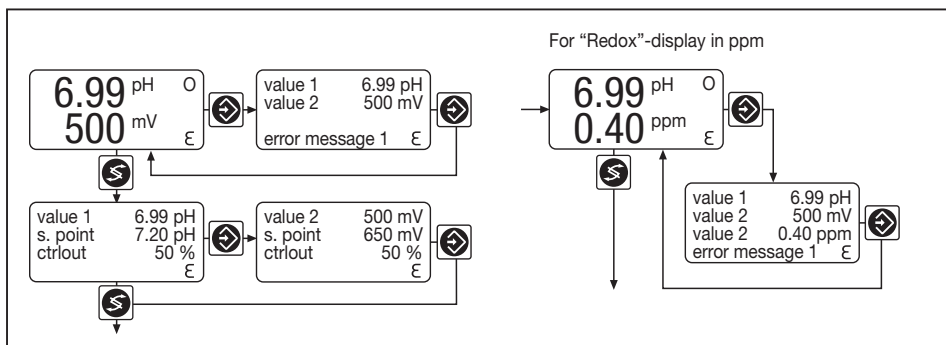
***Please read the function description section first in order to learn how to negotiate the operating menu and change values.***

### 5.1 Monitoring

Operating menu



The device function can be monitored via permanent displays 1,

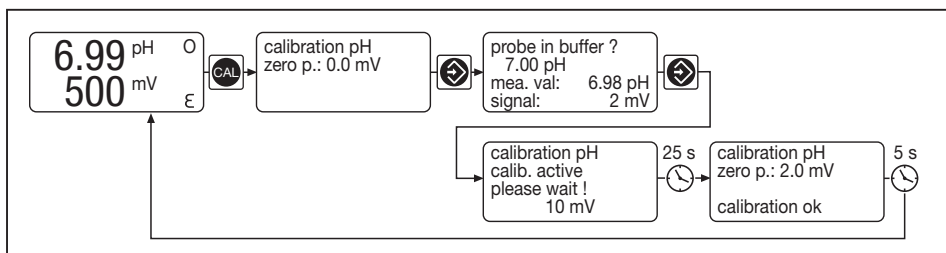


1a, 2 and 2a.

## 5.2 Calibration

The different types of calibration are explained in the "Glossary of terms". Use "General Settings" to change the type of calibration (in the complete operating menu).

### 5.2.1 One point pH calibration



### CAUTION

- You must calibrate the pH probe regularly during operation, i.e. 24 hours after the first calibration and then once each week. This protects bathers from irritation due to excess dosage or illness due to inadequate dosage quantities.**
- The pH probe must be calibrated using only quality pH 7 buffer solutions!**

- ***Incorrect calibration can lead to incorrect dosage calculations. This can cause irritation to bathers due to excess dosage or illness due to inadequate dosage quantities.***

### Preparation

Have pH 7 buffer solution ready. Prepare to dismantle pH probe (see operating instructions manual on the probe and the in-line flow housing).

Calibrating the device:



### **IMPORTANT**

***If the device automatically returns to permanent display 1 after calibration, press the start/stop key once ("O" appears). If you do not, the pumps may start running before your system is ready for use. They will run against a closed isolation valve and could be damaged.***

- Press the CAL key in the permanent display: the calibration menu will appear
- Press the enter key: the menu option ("Probe in buffer?") appears and the metering stops
- In this device mode, dismantle the pH probe (see operating instructions manual on the probe and the in-line flow housing)
- Rinse the pH probe with distilled water and dab it dry carefully
- Immerse the pH probe in a pH 7 buffer solution and press the enter key: the menu option ("Calibrating. Please wait.") appears
- After 25 sec the message "calibration OK" appears if calibration has been successful
- After 5 sec the display returns to permanent display 1
- Press the stop/start key once ("O" appears)
- Reassemble the pH probe (see operating instructions manual on the probe and the in-line flow housing)
- Press the stop/start key once ("O" disappears) and the pumps will start to run (isolation valve open?)

If it fails to function:



## CAUTION

**Do not use the pool until the fault has been remedied. Could result in irritation to bathers due to excess dosage or illness due to inadequate dosage quantities.**

One of the following failure messages appears:

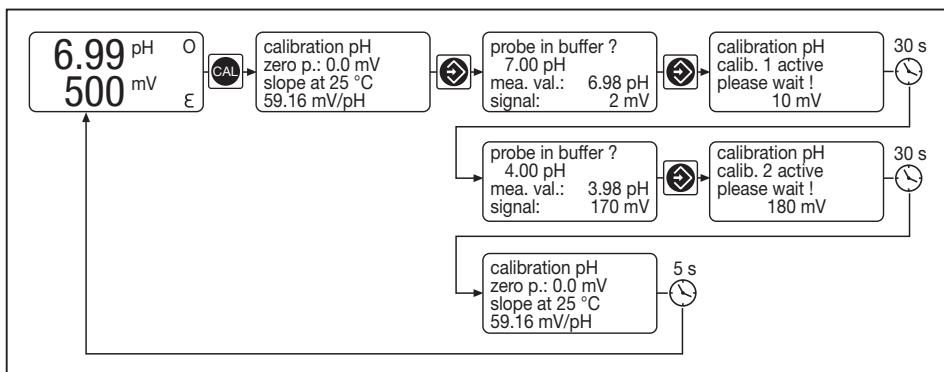
calibration pH  
not possible  
value erratic

calibration pH  
not possible !  
zero point high  
slope low

calibration pH  
not possible !  
zero point low  
change probe

Note the failure message and the values in permanent display 2 and permanent display 2a and call your servicing team.

## 5.2.2 Two point pH calibration



## CAUTION

- You must calibrate the pH probe regularly during operation, i.e. 24 hours after the initial calibration and then once each week. This protects bathers from irritation due to excess dosage or illness due to inadequate dosage quantities.**
- The pH probe must be calibrated using only quality pH 7 buffer solutions!**
- Incorrect calibration can lead to incorrect dosage calculations. This can cause irritation to bathers due to excess dosage or illness due to inadequate dosage quantities.**

### Preparation

Have pH 7 and pH 4 buffer solutions ready. Prepare to dismantle pH probe (see operating instructions manual on the probe and the in-line flow housing).

Calibrating the device:



#### **IMPORTANT**

***If the device automatically returns to permanent display 1 after calibration, press the start/stop key once ("O" appears). If you do not, the pumps may start running before your system is ready for use. They will run against a closed isolation valve and could be damaged.***

- Press the CAL key in the permanent display: the calibration menu will appear
- Press the enter key: the menu option ("Probe in buffer?") appears and the metering stops
- In this device mode, dismantle the pH probe (see operating instructions manual on the probe and the in-line flow housing)
- Immerse the pH probe into the pH 7 buffer solution and press the enter key: the menu option ("Calibrating. Please wait") appears
- Immerse the pH probe into the pH 4 buffer solution and press the enter key: the menu option ("Calibrating. Please wait") appears
- After 25 sec the message "calibration OK" appears if calibration has been successful
- After 5 sec the display returns to permanent display 1
- Press the start/stop key once ("O" appears)
- Reassemble the pH probe (see operating instructions manual on the probe and the in-line flow housing)
- Press the start/stop key once ("O" disappears) and the pumps will start to run (isolation valve open?)



If it fails to function:



## CAUTION

***Do not use the pool until the fault has been remedied. Could result in irritation to bathers due to excess dosage or illness due to inadequate dosage quantities.***

One of the following failure messages appears:

calibration pH  
not possible  
value erratic

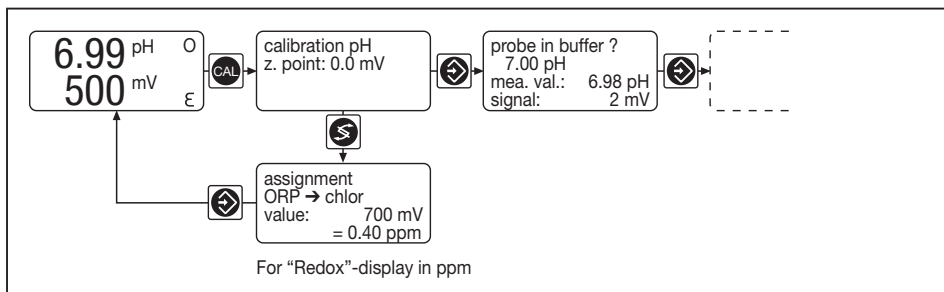
calibration pH  
not possible !  
zero point high  
slope low

calibration pH  
not possible !  
zero point low  
change probe

Note the failure message and the values in permanent display 2 and permanent display 2a and call your servicing team.

## 5.3 Redox-chlorine allocation (optional)

Only necessary if the device displays the chlorine content in ppm in the permanent display 1:



## IMPORTANT

- ***The chlorine content displayed is only an approximate value! It is not accurate.***
- ***Redox-chlorine allocation must be carried out weekly!***
- ***The following actions must be carried out rapidly in sequence! The chlorine content must remain constant until the redox potential has been allocated to the chlorine content!***

Determining the chlorine content of the water: (see instructions for DPD 1-test).

- Remove some of the water via the sampling tap of the in-line probe housing (use a clean container)
- Determine the chlorine content with the DPD 1-test

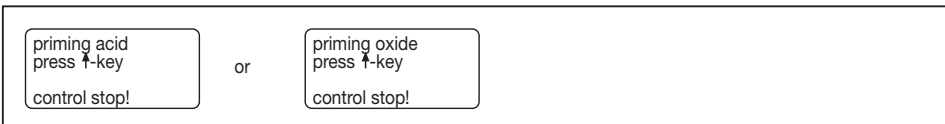
Allocating the chlorine content to the redox potential:

- Press the CAL key in the first permanent display
- Press the change key in the calibration menu
- In the allocation input menu, enter the determined chlorine content using the arrow keys
- Conclude allocation with enter key

### 5.4 Priming

Priming of the pH correcting agent or the oxidant (e.g. after changing a tank).

Priming:



In order to initiate priming of the pH correcting agent or the oxidant, use the change key to access the priming input menu (acid/alkali) or the oxidant priming input menu. Press the up key: the variable jumps to 100 % and the pump meters for approx. 30 seconds.

This also applies when the start/stop key is pressed or if metering is switched off due to a failure message.

To stop metering:

- Press the up key a second time.

The pump meters for approx. 30 seconds each time the up key is pressed.

To recommence metering:

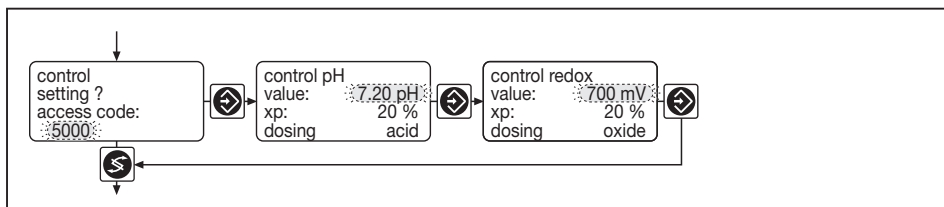
- Access permanent display 1 and press the start/stop key.

## 5.5 Service menu (only for adaptation)

The service menu is protected from unauthorized access by a code.

The service menu is only accessible to service technicians.

## 5.6 Setting controller (only for adaptation)



Service technicians only!

Only carry out settings yourself if instructed to do so by service staff!

pH value or redox potential reference values are set in this menu.



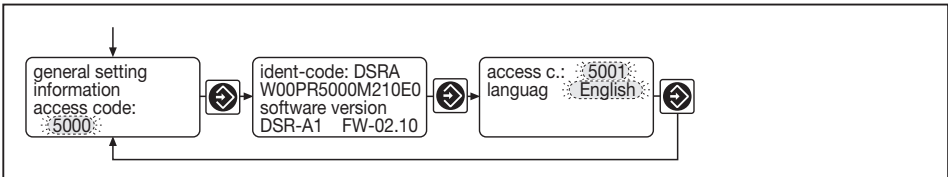
### CAUTION

- ***The reference value for the pH value must never be more than 7.5 and never less than 7.0!  
Can otherwise cause irritation to bathers!***
- ***The reference value should only be increased!  
Can otherwise cause irritation to bathers!***

Setting the controller:

- Press the change key 5 times in permanent display 1: "control setting?" appears in the input menu.
- Enter the access code, if activated, using the arrow keys.
- Use the enter key to access pH control menu option.
- If necessary, alter the pH reference value (flashing) using the arrow keys.
- Use the enter key to access redox control menu option.
- If necessary, alter the redox reference value (flashing) using the arrow keys.
- Exit the redox control menu using the enter key.

### 5.7 General settings (only for adaptation)



In the general input menu you can:

- Read off the identity code and the program version
- Activate and set the access code
- Select the operating language.

Reading off the identity code and the program version:

- Press the change key 6 times in permanent display 1: the general input menu appears.
- Enter the access code, if activated, using the arrow keys.
- Access the identity code menu option using the enter key: here you can read off the identity code and the program version.
- Press the enter key twice: permanent display 1 appears.

Activating and setting the access code or selecting the operating language:

- Press the change key 6 times in permanent display 1: the general input menu appears.
- Enter the access code, if activated, using the arrow keys.
- Press the enter key twice: the access code menu option appears.
- If necessary enter the access code using the arrow keys.
- If necessary access language using the change key and set the required operating language using the arrow keys.
- Press the enter key: permanent display 1 appears.

## **6 Maintenance/repair**

*Maintenance* The device is maintenance-free.



### **IMPORTANT**

***Never clean the housing with solvents. Will corrode the surface!***

Clean the housing with a cloth dipped in soapy water. Rub dry.

*Repair* Please return the DSR controller to ProMinent Dosiertechnik GmbH for repair.

## **7 Technical data**

### **Electrical data**

Supply voltage:	115 V or 230 V, corresponding to information on device label
Current consumption:	max. 40 mA at 230 V max. 80 mA at 115 V
Measured variables:	pH value: 2.00...12.00 mV (redox): 100 mV...1000 mV

### **Environmental conditions**

Operating temperature:	-5...+50 °C
Storage temperature:	-10...+70 °C
Air humidity:	< 95 % rel. humidity, non-condensing

### **Dimensions and weight**

Dimensions:	198 x 200 x 76 mm (W x H x D) wall mounted version Do* = 35 mm Control panel mounted version Di* = 38 mm Control panel mounted version
Weight:	approx. 1.2 kg approx. 2.0 kg with packaging

\*Do = outside depth, Di = inside depth

### Material information

Housing:	Luranyl PPE - GF10
Keypad:	Polyester film PET
Housing seal:	Foam rubber CR
Outer seal:	Foam rubber CR
Mounting devices:	Zinc plated steel
M5 screws:	A2

### Chemical resistance

The device is resistant to normal atmospheres in technical plant rooms.

## 8 Disposal



### **IMPORTANT**

***Observe all current locally applicable directives!  
(e.g. regarding electronic scrap)***

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Identity code

Identity code for swimming pool controller DSR

DSRa		W		Housing																	
				0		light grey, foil with ProMinent logo															
				1		light grey, foil without ProMinent logo															
				2		blue, foil with ProMinent logo															
						Supply Voltage															
				0		230 V, 50/60 Hz															
				1		115 V, 50/60 Hz															
						Measured variable															
				PR		pH and Redox															
						5		0													
										Control input											
								0		none											
								2		two pause inputs											
										0		N		0		1		0			



### A1 General instructions for users

**This appendix to the DSR operating instructions manual is only intended for service technicians!**

**You must have mastered the basic measurement and control basics!**

**This appendix completes the DSR operating instructions manual. Those working with this appendix must also read the operating instruction.**

The full operating menu is described in the appendix.

Please read through the following instructions carefully. Knowledge of these instructions will help you use the operating instructions manual more effectively.

Points are highlighted as follows

- Indicate step by step instructions
- Indicate enumerated points

Input menus

#### **NOTE**

***Notes are intended to make your job easier.***

and safety guidelines:



#### **WARNING**

***Describes a possibly hazardous situation. If the situation is not avoided you will be in grave danger and may lead to serious injury.***



#### **CAUTION**

***Could result in lesser injuries or damage to property if safety guidelines are not observed.***



#### **IMPORTANT**

***Could result in damage to property if safety guidelines are not observed.***

## A2 Safety

### Correct use

The DSR controller is a microprocessor controlled measurement and control device for the measured variables pH value and redox potential.

The device is intended exclusively for:

- Measurement of pH and redox measured variables
- Measurement of pH and redox control variables
- Display of measured values

The device may not be used outdoors!

It is forbidden to modify the device or to use it for any other means!



#### **WARNING**

*The device may carry mains voltage (may be live) at the connection terminal when connected to the power supply!*



#### **IMPORTANT**

- *The device has no on/off switch. It is ready to operate as soon as it is connected to the power supply.*
- *The device must be mounted, installed and adjusted by trained and authorised personnel.*
- *The device must not be used for outdoor applications without further protection (exterior housing, weather protection roof)! The type of enclosure does not permit any standing water on the housing seal and the housing may also be damaged by direct sunlight.*
- *The instrument must be calibrated for the pH combination electrode at regular time intervals. The redox electrode system too must be checked regularly with an accurate buffer solution. Otherwise dangerous dosing errors are possible.*
- *In order to prevent overdosing, the power supply to the DSR controller and the metering pumps must be combined with the power supply to the circulation pump, i.e. if circulation pump is not operating, then the DSR resp. metering pumps must be disconnected from the power supply.*

### A3 Storage/transport



#### **IMPORTANT**

- *Transport and store the device in its original packaging.*
- *Protect the unpacked device from moisture or the effects of chemicals.*

Environmental conditions for storage and transport:

Temperature: -10 ... +70 °C

Humidity: < 95 % relative humidity

### A4 Function description

The DULCOMETER® DSR swimming pool controller is a microprocessor-controlled measurement and control device for the measured/control variables pH value and redox potential. It measures the pH value and the redox potential and displays the values. If used with a corresponding regulating unit the DSR can perform control functions.

All set values are stored twice in an EEPROM for power failure protection. Values are saved when exiting a menu option using the enter key.

In the event of a failure the DSR displays a failure message on the display.

#### **Start/stop key**

Pressing the start/stop key activates the process control process.

#### **NOTE**

*The control process starts after 2 min. Prior to that it is deactivated via the metering delay. The metering delay occurs even when the device is connected to the power supply and after calibration.*

### A5 Assembly/installation

#### A5.1 Assembly (mechanical)

The device can be mounted onto a wall or into a control panel.

##### A5.1.1 Wall mounting

The device can be screwed directly to the wall using the bracket provided.

Assembly materials:

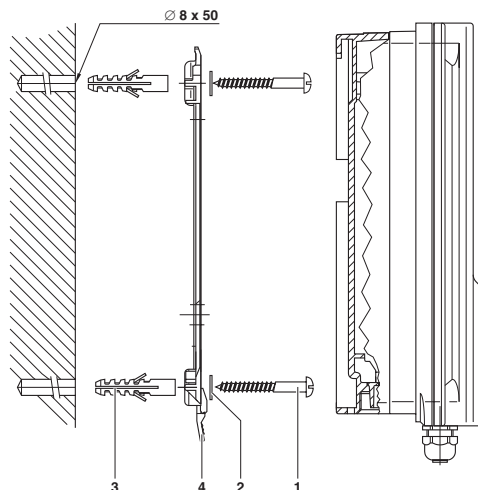
3 off Half-round head screws 5 x 45 mm (1)

3 off Washers 5.3 (2)

3 off Wall plugs Ø 8 mm, plastic (3)

Fasten the device to the wall using the bracket:

- Using the wall bracket (4) as a drilling template, mark the positions of the holes
- Drill holes (using 8 mm drill bit), depth approximately 50 mm
- Insert wall plugs (3)
- Screw on the wall bracket (4) with the screws (1), using washers (2)
- Hang the device in the top of the wall bracket (4), and push upwards until you hear an audible click.



### **A5.1.2 Control panel assembly**

The device can also be installed in a control panel using the wall-mounting housing.

You require the "control panel" assembly set, part number 792908.

Assembly materials:

- 1 off Profile seal, Ø 3 mm, foam rubber
- 6 off Zinc plated steel holding yokes
- 6 off PT tapping screws



#### **IMPORTANT**

- ***The control panel must be thick enough to withstand assembly without buckling! (Minimum 2 mm thickness steel; correspondingly thicker if plastic!) Otherwise the device will not conform to enclosure rating IP 54!***
- ***Check the measurements of the drilling/stamping template (please find in appendix)!***

#### **NOTE**

***Once assembled, the device projects approximately 35 mm from the control panel.***

The device is simply installed in its housing onto the control panel. Tensioning is carried out using the holding yokes.

Prepare a mounting aperture beforehand as follows:



#### **IMPORTANT**

***Allow approx. 120 mm above the device for installation purposes!***

- Using the drilling/stamping template, mark the exact location of the device (e.g. with sticky tape) on the control panel.
- Mark the holes for screws through the drilling/stamping template.
- If you do not want to punch out the mounting aperture, drill the 4 inner holes using a 12 - 13 mm drill bit.
- Pierce out sections using a piercing saw/keyhole saw as on the drilling/stamping template.



### **CAUTION**

***Sharp edges can cause injury!***

- Remove sharp edges.
- At the same time insert the profile seal (1) into the groove of the device.
- Place the device into the mounting aperture.
- Tension the device with the control panel from the rear with the holding yokes (2) and the screws (3) (a second person may be required to assist).



### **IMPORTANT**

- ***Check location of seal once more! Enclosure rating IP 54 is only achieved when assembly is carried out correctly!***

## **A5.2 Installation (electrical)**



### **WARNING**

- ***Installation may only be carried out by specially trained and appropriately certified personnel!***
- ***Installation may only be carried out once assembly is complete!***
- ***The device must be disconnected from the power during installation and reconnection must be reliably prevented!***
- ***The supply voltage must always be switched off when handling power supply leads!***



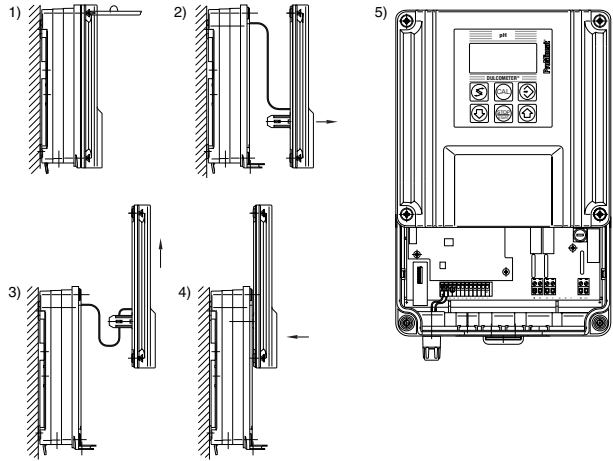
### **IMPORTANT**

***Connection changed! The pumps are supplied with power directly by the XR1 and XR2.***

### **NOTE**

***Pumps with built-in control should not be controlled via DSR!***

***The upper section of the device can be inserted using both guide rails into the approx. 100 mm high insert, i.e. the “parking” setting (take care that the ribbon cable is not loosened at this point). When in the parking position all fuses and terminals are easily accessible (see fig.).***



The following apertures can be used when wall-mounting:

- 5 off PG 11 threaded apertures
- 4 off 12.5 mm threaded apertures for PG 7 (for  $\varnothing$  3 - 6.5 mm) lead



### **IMPORTANT**

***When installing in a control panel, use only the back row of threaded apertures (PG 11) which are located within the control panel.***

Select the corresponding sealing ring in accordance with your lead cross section:

- 5 off sealing rings, internal  $\varnothing$  9 mm (for lead  $\varnothing$  8 - 10 mm)
- 3 off sealing rings, internal  $\varnothing$  7 mm (for lead  $\varnothing$  6 - 8 mm)
- 3 off sealing rings, internal  $\varnothing$  5 mm (for lead  $\varnothing$  4.5 - 6 mm)
- 5 off sealing rings, internal 2 x  $\varnothing$  5 mm (for lead  $\varnothing$  4.5 - 5.3 mm)
- 2 off sealing rings, internal 2 x  $\varnothing$  4 mm (for lead  $\varnothing$  3.5 - 4.3 mm)
- 2 off sealing rings, internal  $\varnothing$  4 mm (for lead  $\varnothing$  3.5 - 5 mm)

### **A5.2.1 Wall mounting**

- Undo the four housing screws
- Remove the front section and put into parking position
- Break open as many thread holes on the underside of the rear section as required (see diagram).



### IMPORTANT

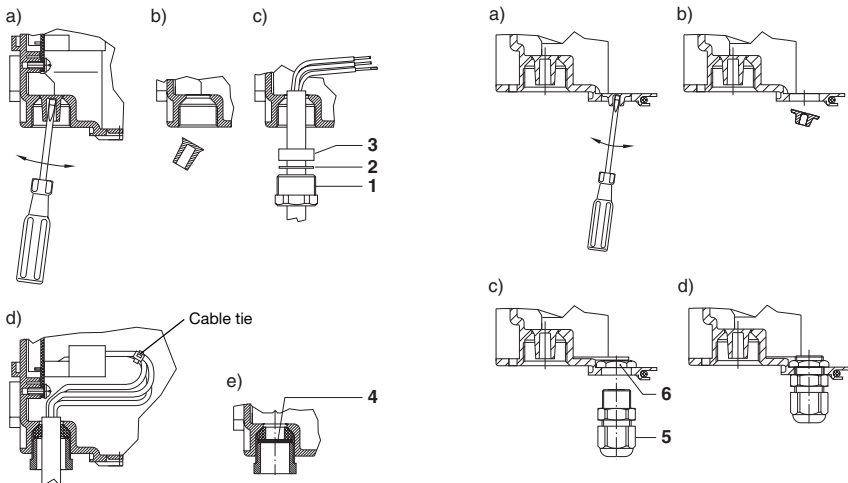
**Use cable clips to fasten the wires together at a distance of 30 mm from the terminals. If a failure causes power supply leads to loosen, they must not come into contact with low-voltage terminals.**

- Strip the lead to an appropriate length
- Push the corresponding threaded connector (1), the collar (2) and a corresponding sealing ring (3) onto the lead, screw into the threaded aperture and tighten. Sufficient cable must be left in the housing to ensure strain can never be exerted on the terminal connection!
- Strip the wires approx. 7 mm and fit corresponding connector sleeves
- Connect the wires according to the electrical wiring plan (see appendix). Push the ends of the stranded wires into the terminals up to their insulation!
- Tighten the locking screws
- Remove the front section from the parking position and tighten the four screws finger-tight.

### NOTE

**Always apply connector sleeves when working with bare wires.**

**Unused opened cable apertures can be closed using the stoppers (4) provided.**





### **A5.2.2 Control panel mounting**

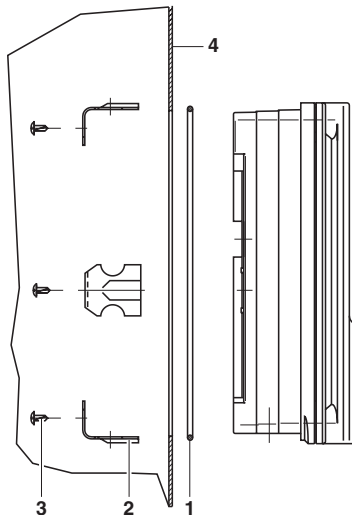
#### **NOTE**

***When installing in a control panel, use only the back row of threaded apertures (PG 11) which are located within the control panel.***

- Unscrew the four housing screws
- Remove the front section and place into the parking position
- Break open as many thread holes on the underside of the rear section as required (see fig.) using a 4.5 mm Ø screwdriver
- Strip the leads and fit corresponding connector sleeves
- Push the leads through the threaded apertures (behind the control panel; requires second person?)
- Connect the wires according to the electrical wiring plan (see circuit diagram in the appendix)
- Remove the front section from the parking position, locate onto the rear section and tighten the four screws finger-tight

#### **NOTE**

***In order to relieve stress on the cable it must be fed through a cable duct on the device side.***



### A6 Operation and adaptation

There are essentially two menus for the DSR:

- A restricted operating menu
- A complete operating menu

The device is delivered configured to the restricted menu. This menu contains all the necessary steps required to commission the device. The steps are as follows:

- Calibration
- Changing the access code
- Changing the operating language
- Changing the reference values (pH, redox)

The full operating menu is intended for use by trained personnel and is used to set or change settings (it can be accessed using the code number). It also offers the following options:

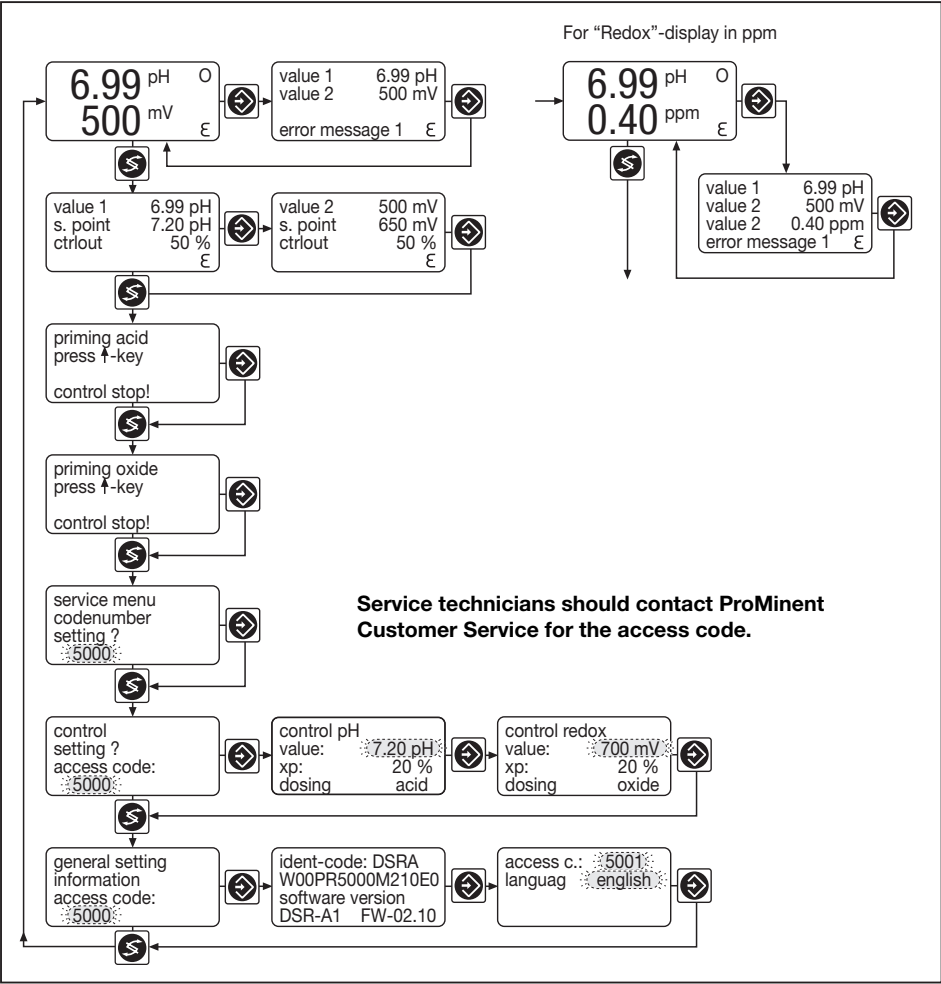
- Switching the relay function from pulse length to two-point control
- Setting the metering delay and metering control times

Trained personnel are thereby able to fully adapt the DSR to the process system.

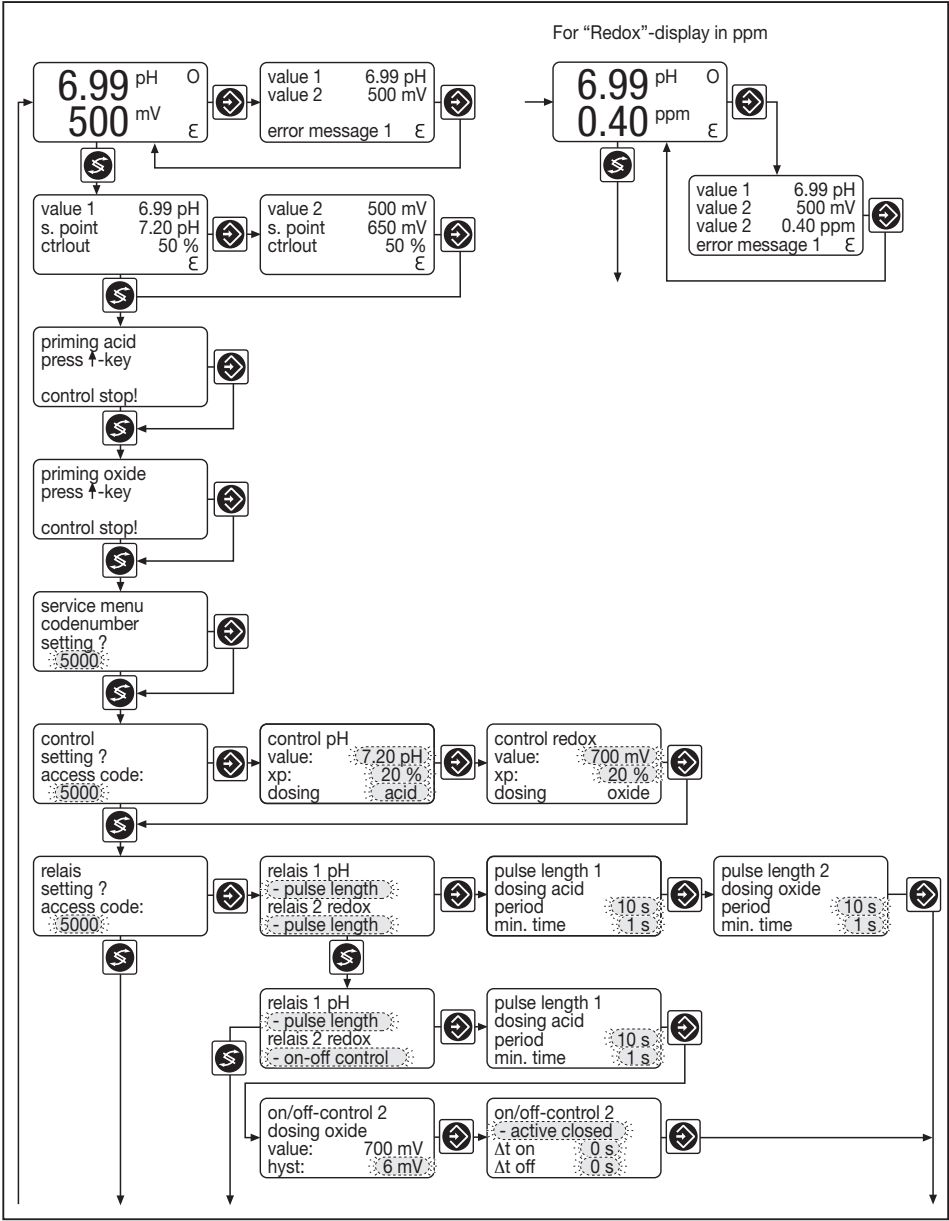
#### **NOTE**

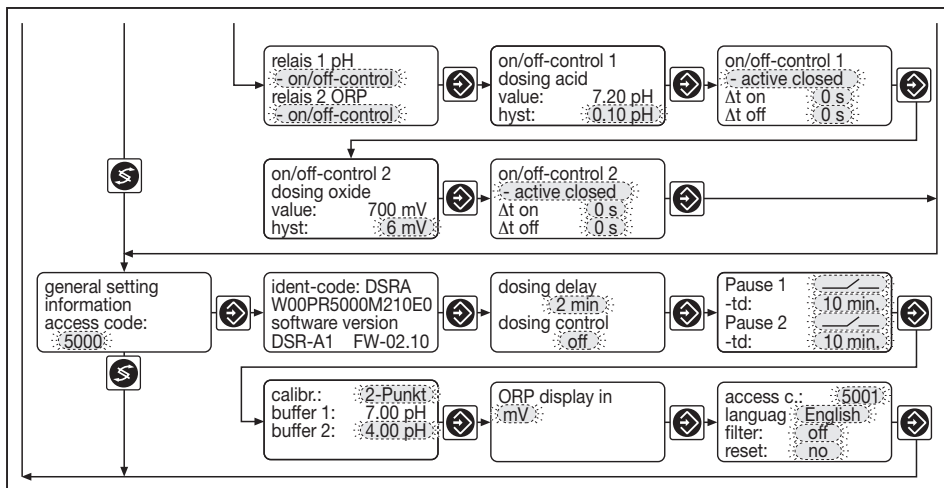
***Please read the chapter 4 Function description first. This gives instructions on how to negotiate the operating menu and alter values.***

Restricted operating menu



Complete operating menu





## The displays are as follows:

### Permanent display 1

The pH value is a four-digit display with two digits after the point. The unit appears to the right of the value.

The redox or the chlorine value is a four-digit display. The unit appears to the right of the value.

### Permanent display 1a

For the display of failure messages, displayed next to the measured variables.

### Permanent display 2

For the display of all pH-relevant values:

- Measured variable
- Reference value
- Variable

### Permanent display 2a

For the display of all redox-relevant values:

- Measured variable
- Reference value
- Variable

### **Input menus, prime acid / prime oxidant**

Press the "up arrow" key to initiate metering at 100 % for approx. 30 sec. Also applies when the stop key is pressed or if metering is switched off due to a failure message. If the relay is switched to "pulse length" function, metering initiates at 100 % frequency after an additional preset time delay.

### **Service menu**

The full operating menu can be accessed by entering the correct access code number. The code number must be set for service technicians.

### **Input menu, set controller**

Access to pH and redox control menus.

Can be accessed via access code. If it corresponds to the code set in menu option Access code of the general input menu, the displayed values in the subsequent menu options can be altered. Once set, the access code remains active until the user returns to permanent display 1.

### **Menu options 1 and 2: pH and redox control**

The controller is designed as a P controller with single sided control.

A reference value and a metering orientation (acid or alkali) is assigned to each measured variable.

Relay function "pulse length": the control parameter xp is also assigned to the measured variable.

### **NOTE**

*We recommend leaving the pH value at 7.2 since in this range chlorine has a good disinfecting capacity. This pH value is also compatible with skin.*

*The reference value for the redox potential depends upon the water quality and generally ranges from 650 - 720 mV.*

### **Relay input menu**

Access to the relay menu for pH and redox

Can be protected by an access code (see page 20).

### **Menu option relay 1 pH**

Each measured variable is assigned a relay.

A control unit can be operated by each relay.

### **Menu option pulse length 1 and pulse length 2**

Both of these menu options appear when the pulse length function is selected in menu option relay 1 pH. They are used to set the cycle time and the minimum on-time.

### **Menu option 2 point controller 1 and 2 point controller 2**

Both of these menu options and their submenus (see below) appear when the 2 point controller function is selected in menu option relay 1 pH. The switch hysteresis can be entered.

#### **Submenu options for 2 point controller 1 and 2 point controller 2**

Used to set the active status and the pick-up delay ( $\Delta t$  on) and drop-out delay ( $\Delta t$  off) for each relay.

The relay status is illustrated in permanent display 1 with the corresponding symbols (see chapter 3).

#### **General input menu**

Can be protected by an access code (see page 20)

Access to the menu options with the following information and settings options:

#### **Identity code menu option**

Displays the identity code and the program version.

#### **Metering delay menu option**

##### **Metering delay**

Used to set the metering delay (1 min [off] ... 30 min). After switching on power supply and the calibration the metering and failure processing is then initiated after a preset delay (= metering delay). Press the start/stop key to cancel the delay.

##### **Metering control**

Used to enter the metering control time (1 min [off] ... 120 min). If, after this preset time the measured variable has not yet reached the reference value, metering and control stops. Dosing can be restarted by pressing the start/stop key. If the setpoint is reached for more than 1 min., dosing and controlling is automatically started.

#### **Pause 1 and 2**

The pause periods are triggered by external digital isolated signals.

If one of the pause inputs is activated, control is stopped and no further faults are output.

The pause periods may be individually set either as actively closed (symbol NO contact) or as actively closed (symbol NC contact).

The time  $t_d$  determines the time after which control is activated again after deactivation of pause.

Ex-works mode is actively closed and  $t_d = 10$  minutes.

The following signals may e.g. be assigned to the pause inputs:

- isolated contacts in general
- level switch contacts from suction kits
- contact from filter control
- contact of measuring water flow sensors

### Filter

Filtering of the input values can be increased in order to steady the display.

### Reset

A reset can be carried out. During the reset, the data that were stored on delivery to the customer are loaded into the device (see factory settings in the appendix).

### Calibration menu option

The user can choose between one point and two point calibration.

If two point calibration has been selected, buffer 1 and buffer 2 appear in the next two cells. It is possible to set buffer 2. In this case the buffer 2 value must vary from the buffer 1 value by at least  $\pm 1.99$  pH (otherwise the system is locked)!

### Redox display menu

The device can convert the redox value in permanent display 1 into the chlorine concentration in ppm. It can also be displayed in mV.



### IMPORTANT

*The chlorine content displayed is only an approximate value! It is not accurate.*

### Access code menu option

By using an access code all settings values can be protected against unauthorised access. As a guide for the user that the access code is deactivated at 5000, 5000 is replaced by the word "off".

The languages that can be selected via the identity code can also be selected in this menu.

To make the display easier to read, input value filters can be increased.

Values can be reset. A reset converts them back to the factory settings. To do so, change reset from "No" to "Yes". Press the enter key to start loading the factory settings.

### Calibration menu

The pH probe must be calibrated

- When commissioning for the first time
- Regularly during operation (e.g. 24 hours after initial calibration and then once a week)
- Because the probe signal changes over time (if calibration is no longer possible even after cleaning the probe must be replaced.)



### **Two point pH calibration (see also 5.2.2)**

Access to the calibration menu is carried out using the calibration key.

The result of the last calibration is displayed.

If entry into the calibration menu is confirmed the device stops the following functions for pH and redox:

- Control and metering
- Failure processing

Failures relating to the pH measured variable are corrected if calibration is successful.

After calibration there is a metering delay before metering, control and failure processing recommence (default setting = 2 min).

### **Menu options Probe in buffer?**

The device awaits confirmation that the probe that is to be calibrated has been immersed in buffer 1 or 2.

Buffer values are illustrated in a briefer form.

- Display of set buffer value
- Display of measured buffer value
- Display of measured voltage

### **pH calibration submenu options**

The device periodically tests the measured mV value.

The selection of the next menu option and the transition occur automatically.

### **Zero point and slope calibration display**

The device carries out, depending upon the number of calculated values, a slope and/or zero point calibration.

One measurement involves performing only one zero point correction between pH 6 and pH 8.

A two point measurement involves recalculating both the zero point and the slope.

The values determined in the calibration process or, if not yet determined, the currently applicable values, are displayed. Values are adopted automatically, but can be anticipated by pressing the enter key.

### **Unstable measured value**

If the voltage remains unstable throughout the calibration process a failure message is signalled. After approx. 4 sec. pH calibration is abandoned. The old zero point and slope values are retained.

### Failure message

If, after calculating the zero point and slope the values are outside permitted tolerances, the whole calibration process is abandoned and the device continues to operate with the previous calibration values.

A general failure signal is then generated in the permanent display 1a. Metering for pH value adjustment is stopped.

### One point pH calibration (see 5.2.1)

Access the calibration menu is gained using the calibration key.

The result of the last calibration is displayed.

One point calibration is always carried out on buffer 1 pH 7.

If entry into the calibration menu is confirmed the device stops the following functions for pH and redox:

- Control and metering
- Failure processing

Failures relating to the pH measured variable are corrected if calibration is successful.

After calibration there is a 1 minute delay before metering, control and failure processing recommences.

### Displays

The device awaits confirmation that the probe that is to be calibrated has been immersed in buffer 1.

Buffer values are illustrated in a briefer form.

- Display of set buffer value
- Display of measured buffer value
- Display of measured voltage

### Calibration

The device periodically tests the measured mV value.

The selection of the next menu option and the transition takes place automatically.

### Zero point display

The device carries out a zero point calibration.

The values determined in the calibration process or, if not yet determined, the currently applicable values, are displayed. Values are adopted automatically, but can be anticipated by pressing the enter key.

### Unstable measured variable

If the voltage remains unstable throughout the calibration process a failure message is signalled. After approx. 4 sec. pH calibration is abandoned. The old zero point and slope values are retained.

### Failure message

If, after calculating the zero point and slope the values are outside permitted tolerances, the whole calibration process is abandoned and the device continues to operate with the previous calibration values.

A general failure signal is then generated in the permanent display 1a. Metering for pH value adjustment is stopped.

### Allocation Redox --> Chlorine

Entry of a chlorine concentration determined by DPD measurement.

### Glossary of terms and function explanations

"Stop" control means:

Variable = 0 %

Effects:

- P-proportion is cancelled
- Relays are inactive

## A7 Repair

You can only change the fuse.



### WARNING

- ***Before opening the housing the system (not just the device) must be disconnected from the power supply!***

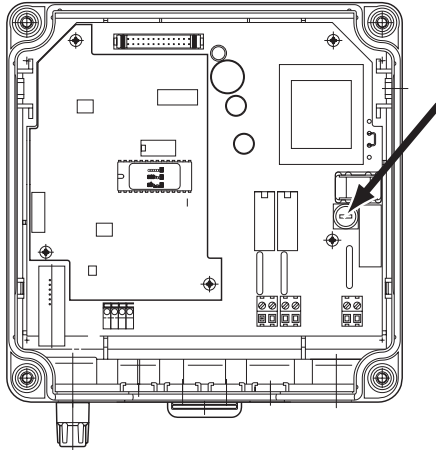
***If only the device has been disconnected from the power supply terminals XR1 and XR2 may be live!***

- ***The fuse must be replaced with an original part!***

Fuse: fine fuse 5 x 20 mm 160 mA, 250 V slow to blow.  
Part number 712048.

Changing the fuse (see fig. next page):

- Open the device and place top section in „parking position“
- Open the bayonet fitting of the fuse holder (arrow)
- Replace the fuse
- Close the bayonet fitting (arrow)
- Close the device and screw together



### A8 Troubleshooting



#### IMPORTANT

- *All failures are indicated in the display with the symbol “⚡” to the bottom, right. Troubleshooting must begin as soon as the “⚡” appears.*
- *If you are requested as a result to dismantle or change the probe, use the operating instructions for the probe and in-line probe housing!*

Failure texts are found in permanent display 1a.

#### Failure text "check pH input ↓ ?"

Failure: the pH signal is below the minimum probe value  
(i.e. pH value < approx. pH 2.00)

Reason: the pH probe needs cleaning

Remedy: clean the pH probe and recalibrate

Reason: the pH probe is defective

Remedy: change the pH probe and recalibrate

Reason: the electrode lead is defective

Remedy: check the electrode lead and the plug connection to the pH probe and the connection to the measuring device

**Failure text "check pH input ↑ ?"**

Failure: the pH signal is above the maximum probe value  
(i.e. pH value > approx. pH 14.00)

Reason: the pH probe needs cleaning

Remedy: clean the pH probe and recalibrate

Reason: the pH probe is defective

Remedy: change the pH probe and recalibrate

**Failure text "dosing stop pH"**

Failure: The pH reference value was not reached within the  
metering control time (see "Metering Control" on page 52).

Reason: the pH probe needs cleaning

Remedy: clean the pH probe and recalibrate

Reason: the pH probe is defective

Remedy: change the pH probe and recalibrate

Reason: the acid/alkali metering pump is defective

Remedy: check the metering pump and completely re-commission  
(excluding probe calibration)

Reason: the chemical storage tank is empty

Remedy: refill the storage tank and completely re-commission  
(excluding probe calibration)

**Failure text "pH calib. defective"**

Failure: the probe could not be calibrated

Reason: the pH probe is defective

Remedy: change the pH probe and recalibrate

Reason: the probe lead is defective

Remedy: connect a new probe lead and recalibrate

Reason: the buffer solution does not comply with the given  
pH value

Remedy: recalibrate with a new buffer solution

### **Failure text "check mV input ↓ ?"**

Failure: The redox probe signal was below the reference value

Reason: the redox probe needs cleaning

Remedy: clean the redox probe and recalibrate

Reason: the redox probe is defective

Remedy: change the redox probe and recalibrate

Reason: the electrode lead is defective

Remedy: check the electrode lead and the plug connection to the pH probe and the connection to the measuring device

### **Failure text "check mV input ↑ ?"**

Failure: The redox probe signal exceeded the reference value

Reason: the redox probe needs cleaning

Remedy: clean the redox probe and recalibrate

Reason: the redox probe is defective

Remedy: change the redox probe and recalibrate

### **Failure text "dosing stop mV"**

Failure: the mV reference value was not reached in the preset time

Reason: the redox probe needs cleaning

Remedy: clean the redox probe and recalibrate

Reason: the redox probe is defective

Remedy: change the redox probe and recalibrate

Reason: the oxidant/reducing agent metering pump is defective

Remedy: check the metering pump and completely re-commission

Reason: the chemical storage tank is empty

Remedy: refill the storage tank and completely re-commission

## **A9      Technical data**

### **Electrical data**

Device:	enclosure rating II
Supply voltage:	115 V or 230 V, corresponding to details on device label
Current consumption:	max. 40 mA at 230 V; max . 80 mA at 115 V
Electrical isolation:	3750 V between the mains voltage and connecting wires 500 V between measuring circuits
Measured variables:	pH value: 2,00 ... 12,00 mV (redox): 100 mV ... 1000 mV
Input resistance:	glass electrode: $> 5 \times 10^{11} \Omega$
pH/redox input:	reference electrode: $> 10^7 \Omega$
Reproducibility:	max. $\pm 1\%$ from measurement range
Resolution:	input/output sides: 0.01 pH / 1 mV / 0.01 ppm
Display:	LCD display 100 x 32 points, measured variable character height: approx. 14 mm other characters: approx. 5 mm
Pause inputs:	Common reference potential and with RS interface but galvanically isolated from the remaining inputs and outputs. Insulation voltage: 500 V
Internal fuse protection:	fine fuse 5 x 20 mm 160 mA, 250 V slow to blow
Power relay output for switch type:	N/O contact, varistor-triggered
Variable output:	load capacity: 250 VAC, 3 A, 700 VA switch operating life: $10^6$ switch cycle
Enclosure ratings	If assembly has been carried out correctly the following enclosure ratings apply: <ul style="list-style-type: none"><li>• wall mounting: IP 65</li><li>• control panel mounting: IP 54</li></ul>

### **Compatibility**

The device is compatible with all commercial glass probes with pH 7 sensor zero point.

Environmental conditions

Operating temperature: -5...+50 °C  
Storage temperature: -10...+70 °C  
Humidity: < 95 % relative humidity, non condensing

Dimensions and weight

Dimensions (WxHxD) : 198 x 200 x 76 mm wall mounted version  
Do\* = 35 mm  
control panel mounted version  
Di\* = 38 mm  
control panel mounted version  
Weight: approx. 1.2 kg  
approx. 2.0 kg with packaging  
\*Do = outside depth, Di = inside depth

Materials information

Housing: Luranyl PPE - GF10  
Keypad: Polyester film PET  
Housing seal: Foam rubber CR  
Outer seal: Foam rubber CR  
Mounting devices: Zinc plated steel  
M5 screws: A2

Chemical resistance

The device is resistant to normal atmospheres in technical plant rooms.



A10 Spare parts and accessories

Accessories

	Part No.
• Assembly set for control panel mounting	792908
• Power lead	818446
• Sensor lead	1005672



Table of factory settings

Description	Factory setting	Incremental value	Min. value	Max. value	Comment
Access code	5000 (off)	1	0	9999	
Measured variable	0.40 ppm	0.01 ppm	0 ppm	20.00 ppm	
Code number	5000	1	0	9999	
Reference value/value	pH 7.20	pH 0.01	pH 6	pH 10.00	
Control parameter xp	20 %	1 %	1 %	500 %	100% relates to a pH of 14
Metering orientation	acid	acid alkali			
Reference value/value	700 mV	1 mV	100 mV	1000 mV	
Control parameter xp	20 %	1 %	1 %	500 %	100% relates to a redox value of 1000 mV
Relay x pH/redox	pulse length	2 point controller pulse length			
Cycle	10 s	1 s	10 s	9999 s	
Minimum time	1 s	1 s	1 s	Cycle/2	
Hysteresis	pH 0.10	pH 0.01	pH 0.03	pH 1.00	
Hysteresis	6 mV	1 mV	3 mV	100 mV	
Switch allocation	N/O	N/O N/C			
Δt on	0 s	1 s	0 s	60 s	
Δt off	0 s	1 s	0 s	60 s	
Metering delay	2 min	1 min	1 min (off)	30 min	on/off function
Metering control	off	1 min	1 min (off)	120 min	on/off function
Calibration	1 point	1 point 2 point			
Buffer 2	pH 4.00	pH 0.01	pH 2.00	pH 12.00	
Redox display	mV	mV ppm			
Access code	off (5000)	1	0	9999	
Language	Identity code	German English French Dutch Italian Spanish			
Filter	off	1 s	1 s (off)	60 s	on/off function
Reset	no	no yes			
Pause					none-operative
td	10 min	1 min	1 min (off)	30 min	on/off function

### Glossary of terms

#### pH value

The pH value refers to a measurement for the concentration (activity) of hydrogen ions or, in other words, a measurement for the acid or alkaline character of water.

The pH value is of great significance in swimming pool water treatment. It affects:

- Disinfection: the disinfecting capacity of chlorine diminishes as pH rises.
- Flocculation: each flocculent has only one specific pH range within which it is effective.
- Corrosiveness: as the pH value drops, the water becomes more corrosive towards metallic materials.
- Skin reaction: the acid protection layer on our skin is pH 5.5. Excessive pH values in pool water attack the acid protection layer and lead to skin irritations.

A pH value which is too low encourages the production of tri-chloramines. These cause irritation to the eyes (redness and burning eyes) and mucous membrane irritation (e.g. coughing).

For the reasons mentioned, the pH value in swimming pools should be maintained at between 6.5 and 7.6 (optimum: pH optimum of the flocculent used). In a private pool where flocculents are normally used, the pH value should be between 7 and 7.2.

The pH measurement is, however, influenced by the following factors:

- Chlorination: all chlorinating products alter the pH value
- The water feed: carbon dioxide (CO<sub>2</sub>) which is emitted from the pool water alters the pH value. This effect can be increased by an unsuitable water feed or by air jets, water agitators or similar.

For all these reasons it is necessary to monitor and control the pH value on a continuous basis.

#### Redox potential

The redox potential is dependent upon the sum of the reducing and oxidising substances present in the water, it is a measure of the disinfection strength in the water. The higher the concentration of oxidising substances, the higher the redox potential (oxidation = disinfection).

Hypochlorous acid is the decisive oxidant in swimming pools. The contaminants present in water reduce this level.

During chlorination, pH value and temperature have the following effects on the redox value:

Rising pH value --> falling redox potential

Rising temperature --> rising redox potential

It is particularly important to maintain a stable pH value.

There is no clear relationship between disinfectant concentrations and redox potential. It has been determined that at a redox potential of 750 mV, microorganisms are eradicated or deactivated in seconds. At less than 600 mV the disinfecting time can take minutes or hours.

### Calibration (of probes)

All pH electrodes deviate from theoretical values. For this reason, it is necessary to carry out zero point and slope calibration of the probe on the measuring transducer.

In a one point calibration, this is carried out using pH 7 buffer solution, i.e. zero point calibration.

In two point calibration, a second value must be selected for calibration of the slope value, e.g. either pH 4 or 10. The second value is dependent upon the actual measurement range (alkaline or acid).

In swimming pools a zero point calibration will suffice (at pH 7). The sensor function can be controlled with a pH 4 or pH 10 buffer solution. As the measurement is carried out around the zero point, moderate errors in the slope values are insignificant.

Age and dirt will alter the sensor slope value.

### Zero point

This refers to the voltage given off by a pH sensor at pH value 7. The zero point of the probe is altered by aging and dirt.

The zero point of pH probes is theoretically 0 mV. In practice good probe function is achieved with a zero point between -30 mV and +30 mV. New electrodes have a maximum zero point variation of  $\pm 30$  mV.

### **Slope/sensitivity**

This value is given in mV/pH at 25 °C.

### **Control variables (Measured variable, actual value)**

The control variable is the value to be measured resp. determined (e.g. pH value, redox value).

### **Reference value**

The reference value describes the value which is to be kept constant during the process.

### **xp value**

This value influences the proportional control relationship. Thus, an xp of 10 % at a deviation of 1.4 pH (= 10 % of pH 14) and/or 100 mV (= 10 % of 1000 mV) gives a variable of 100 %. If the xp value is increased by 20 % the deviation must be double that value in order to achieve a 100 % variable. If the controller overshoots, the set xp value must be doubled.

### **Variable**

The variable describes the value (e.g. frequency, mA signal) given by the controller to the regulating unit, e.g. a metering pump, in order to adjust the system to the reference value (the pump runs at full capacity if this variable is 100 %).

### **Metering delay**

The metering delay can be entered here. After switching on the power supply, metering and failure processing are activated following a preset delay (= metering delay). Press the start/stop key to cancel the delay.

### **Metering control**

The metering control time can be entered under metering control. If, after this metering control time has elapsed, the measured variable has not reached the reference value, metering and control stops. Dosing can be restarted by pressing the start/stop key. If the setpoint is reached for more than 1 min., dosing and controlling is automatically started.

## **Filter**

The filtering time constant of the input values can be increased in order to obtain steady readings.

## **Standard values**

The standard values are loaded when a reset is executed. They correspond to the initial adjustment of the instrument. They do not correspond to the factory settings of the instrument as delivered.

## **Pause 1 and 2**

The pause periods are triggered by external digital isolated signals. If one of the pause inputs is activated, control is stopped and no further faults are output.

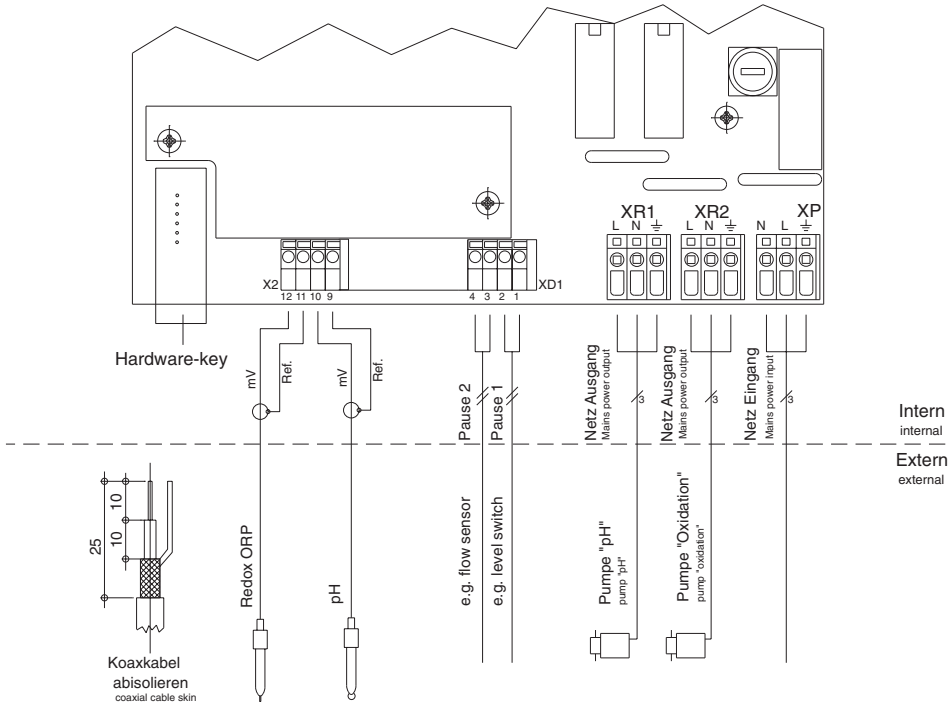
The pause periods may be individually set either as actively closed (symbol NO contact) or as actively closed (symbol NC contact).

The time  $t_d$  determines the time after which control is activated again after deactivation of pause.

Ex-works mode is actively closed and  $t_d = 10$  minutes.

The following signals may e.g. be assigned to the pause inputs:

- isolated contacts in general
- level switch contacts from suction kits
- contact from filter control
- contact of measuring water flow sensors



## IMPORTANT

### Connection changed!

**The pumps are supplied with power directly by the XR1 and XR2.**

## NOTE

- Pumps with built-in control should not be controlled via DSR!
- The components of the device does not in all cases correspond to the above connection diagram or to the plan at the device. The device-specific identification code applies!

## **EC Declaration of Conformity**

We,

**ProMinent Dosiertechnik GmbH  
Im Schuhmachergewann 5 - 11  
D - 69123 Heidelberg**

hereby declare that, on the basis of its functional concept and design and in the version brought into circulation by us, the product specified in the following complies with the relevant, fundamental safety and health stipulations laid down by EC directives.

Any modification to the product not approved by us will invalidate this declaration.

Product description : ***Measurement and control system, DULCOMETER***

Product type : ***DSRa ...***

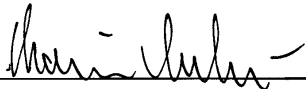
Serial number : ***see type identification plate on device***

Relevant EC regulations : ***EC - low voltage directive (73/23/EEC)  
EC - EMC - directive 89/336/EEC subsequently 92/31/EEC***

Harmonised standards used,  
in particular : ***DIN EN 60335-1, DIN EN 61010-1  
DIN EN 50081-1/2, DIN EN 50082-1/2, DIN EN 55011  
DIN EN 61000-3-2, DIN EN 61000-3-3, DIN EN 61000-4-2  
DIN EN 61000-4-4***

National standards and other  
technical specifications used,  
in particular : ***DIN 19226  
DIN IEC 38  
IEC 61000-3-2, IEC 61000-3-3, IEC 61000-4-2, IEC 61000-4-4  
VDE 0838-3-2/3-3, VDE 0847-4-2***

Date/manufacturer's signature : ***12th January 2001***



The undersigned : ***Dr. Rainer V. Dulger, Executive Vice President R&D and Production***

**Addresses and delivery  
through manufacturer:**

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