



NIEUWKOOP

USER MANUAL



PH3005

pH CONTROLLER

DIN-RAIL



TO MEASURE  TO KNOW



Scale : 0.0/14.0 pH

Scale : 0/1000 mV

Power Supply : 110/220 Vac

Cod. 28001361

Rev. C 11/18

Valid from S/N 42401

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1 GENERAL WARNINGS AND INFORMATION FOR ALL USERS

1.1 WARRANTY

This product is guaranteed for all manufacturing defects.

Please take a look at the terms and conditions described on the Warranty certificate at the end of the manual.

1.2 AFTER SALES SERVICE

Nieuwkoop B.V./B&C offers to all of its Customers the following services:

- a free of charge technical assistance over the phone for problems regarding installation, calibration and regular maintenance
- a repairing service in our Aalsmeer headquarter for all types of damages, calibration or for a scheduled maintenance.

Please take a look at the technical support data sheet at the end of the manual for more details.

1.3 CE MARKING

This instrument is manufactured according to the following European Community directives:

- 2011/65/EU "Restriction of the use of certain hazardous substances in electrical and electronic equipment"
- 2014/35/EU "Low Voltage" LV
- 2014/30/EU "Electromagnetic compatibility" EMC

- EN 61010-1/2011 "Low Voltage" LV
- EN 61326-1/2013 "Electromagnetic compatibility" EMC
 - Controlled electromagnetic environment

- EN 55011/2009 "Radio-frequency disturbance characteristics"
 - Class A (devices for usage in all establishment other than domestic)
 - Group 1 (Industrial equipment that do not exceed 9kHz)

The marking  is placed on the packaging and on the S/N label of the instrument.

1.4 SAFETY WARNINGS

It is important to underline the fact that electronic instruments are subject to accidents. For this, it is important to take all necessary precautions to avoid damages caused by malfunctions.

All types of operations must be performed by authorized and trained staff.

The use of this controller must respect the parameters described in chapter "Technical specification", so to avoid potential damages and a reduction of its operating life.



2 FUNCTIONAL DESCRIPTION

This system provides a digital readout of the pH or the ORP of aqueous solutions.

Automatic Temperature Compensation is employed to provide highly accurate pH measurements over the entire ranges of pH and Temperature.

A basic pH/mV monitoring system consists of two elements:
a pH/mV control device and a probe or electrode.

The control system can be expanded by adding accessories for field applications: recorders, secondary relays, proportional regulators and Temperature probes.

The controller contains electronic circuits to control the operation of the entire system. It provides a digital readout of pH or ORP on a LCD display.

There is included an internal relay circuit for actuating an alarm, valve, pump etc.

The Set-point is programmable by a front-panel control 3 and the value can be displayed by pushing button 4.

The red Led 2 on the panel lit when the internal relay is activated. The relay action is adjusted min/max by means of the dip switch marked " m M ".

The relay actuation may be delayed 0/5 sec. by adjusting the trimmer marked " SET DEL ".

The controller provides an output of 4/20 mA proportional to the pH or ORP value, which can be used for recorders, remote readouts or regulators with an isolated input.

The front panel contains trimmer pots for "ZERO" and "SLOPE" adjustment. Zero is adjusted with trimmer 5 and Slope is adjusted with trimmer 6.

The unit may be powered by 110 VAC or 220 VAC.

3 PHYSICAL DESCRIPTION

The controller enclosure is designed for DIN Rail mounting.

It consists of a plastic case with front panel coated by a polycarbonate membrane, to ensure the maximum anticorrosion characteristics.

However mounting in a splash proof board is suggested for field applications.

The Fig. 4 shows the physical details and dimensions.

Connections to power supply, loads, recorder, RTD, electrodes or probe are carried out by means of extractable terminal blocks.



4 PH 3645 SPECIFICATIONS

Display	LCD
Input	from pH electrode and NTC 10 K
Output	4/20 mA dc, non-isolated, 300 Ω max.
Scale	0.0/14.0 pH
Temp. comp.	automatic 0/100 °C
Zero	adjustment ± 15%
Slope	adjustment ± 20%
Input current	< 2 pA
R input	> 10 ¹² Ω
Temperature	0/50 °C
Humidity	95% without condensate
Regulators	± 0.25% hysteresis (others as requested)
Switching time	< 0.5 s
Relay delay	0/40 s
Relay contacts	5A 220V resistive load
Voltage	110/220 Vac ± 10% 50/60 Hz
Power	3 VA max
Weight	265 g
Terminal blocks	extractable
Dimensions	105 x 95 x 58 mm (DIN Rail housing)
Option 091.402	24 Vac power supply



5 MV 3645 SPECIFICATIONS

Display	LCD
Input	from ORP electrode
Output	4/20 mA dc, non-isolated, 300 Ω max.
Scales	0/1999 mV reading 0/1000 mV regulator
Zero	adjustment \pm 15%
Slope	adjustment \pm 20%
Input current	< 2 pA
R input	> 10 ¹² Ω
Regulators	\pm 0.25% hysteresis (others as requested)
Switching time	< 0.5 s
Relay delay	0/40 s
Relay contacts	5A 220V resistive load
Temperature	0/50 °C
Humidity	95% without condensate
Voltage	110/220 Vac \pm 10% 50/60 Hz
Power	3 VA max
Weight	265 g
Dimensions	105 x 95 x 58 mm (DIN Rail housing)
Terminal blocks	Extractable
Option 091.402	24 Vac power supply



6 PHYSICAL INSTALLATION

The controller may be installed close to the points being monitored, or it may be located some distance away in a control area.

For a distance between sensor (electrode/probe) and controller greater than electrodes cable an extension cable is suggested by means of a waterproof box.

The enclosure is designed for DIN Rail mounting.

It should be mounted in a box protected from the possibility of damage or excessive moisture or corrosive fumes.

The electrode's coax cable must be protected by a sheath and not installed near power cables.

Interrupting cables must be avoided or carried out using high insulation terminals.

When installing "in line" electrodes it is suggested to follow the specific instructions given by the sensor's manufacturer.



7 ELECTRICAL INSTALLATION

The electrical installation consists of:

- connecting the power supply to the meter
- connecting the electrode or the probe to the meter
- connecting alarm, pump, valve if necessary
- connecting the monitor output to the recorder or similar devices if required
- connecting other optional accessories (RTD P.I.D. regulators)

All connections within the controller are made on terminal block.

7.1 CONNECTING THE POWER

- connect ground to terminal 4
- connect ac power to 1 and 2 terminals if power voltage is 110V
- connect ac power to 1 and 3 terminals if power voltage is 220V
- connect ac power to 1 and 3 terminals if power voltage is 24 V

WARNING

- power the device by means of an isolation transformer
- avoid mains voltage from an auto-transformer
- avoid mains voltage from a branch point with heavy inductive loads
- separate power supply wires from signal ones
- control the mains voltage value

7.2 CONNECTING THE ELECTRODE (PROBE)

Electrode cabling is a critical part of the whole system.

- use a low noise coax cable on overall length between sensor and input terminals of the meter
- low noise cable has, in general, a black conductive sheath interposed between the central and the shield. Be sure this sheath has been removed
- avoid interruption on the cable if a coax connector and a high insulation terminal block are not available
- as a rule the shield of the coax cable is connected to the Reference electrode and fastened to the terminal 17 marked "R".
The central shielded wire is connected to the Glass (pH) or Metal electrode (ORP) and fastened to the terminal 18 marked "V". (see connections diagram).
In Glass/Metal electrode applications the Glass electrode must be connected to the high impedance terminal 18.
- keep the cable away from power wires on the overall length.



7.3 CONNECTING ALARMS, PUMPS, VALVES

The output connections are made at terminal block and they consist of SPDT relay contacts.

terminal 6 marked NO : normal open contact
terminal 7 marked C : common contact
terminal 8 marked NC : normal closed contact

To provide an ac-line voltage at the relay commons, connect the ac power phase to the terminal 7 marked C.

Connect one side of an external line-operated device to the terminal NO/NC according to the requirements of the device, and connect the other side of the device to the ac power neutral wire.

ATTENTION

Install a fuse in order to protect the relay contacts.

The device must be powered by an external independent line following the above procedure.

In order to avoid interferences, when necessary, insert the RC antispark by connecting the terminal 5 marked "X" to the terminal 6 or 8 connected with the load.

7.4 CONNECTING A RECORDER

A 4/20 mA output for recorder is available on terminals 11-12.

Connect the recorder "+" to terminal "11" and connect the recorder "-" to terminal "12".

A series connection is required for driving more loads having a total input resistance lower than 300 Ω . The output will only drive ground-isolated loads .

7.5 CONNECTING THE NTC

The model PH 3645 has the Automatic Temperature Compensation carried out by means of a NTC 10 K. The Temperature sensor has to be installed in the same solution being measured, close to the electrode either in the pipe-line or in the tank.

ATTENTION

In order to activate the ATC function, prior to connecting the NTC between terminals 13-14, it's necessary to remove the Resistor from these terminals.

This Resistor must be reinstalled when operating in a non ATC fixed Temperature Compensation mode.

Failure to reinstall this Resistor will result in an open Temperature circuit and incorrect controller operation.



8 SYSTEM CHECKING

Before connecting the system to the power supply:

- check that terminal 4 is connected to ground
- check that all connections are installed correctly
- check that all cables are properly fastened to prevent strain on the connections
- check that all terminal-strip connections are mechanically and electrically solid.



9 OPERATING THE SYSTEM

9.1 PRE-OPERATION CHECK

The system's controls and indicators are all located on the front panel (see Fig. 1).

The controlled LCD 1 will be displayed when the unit is on.

Push the key pad 4 and rotate the control 3.

The LCD will display the set point value.

Set-point relay actuation is indicated when red LED 2 is lit.

When the monitored value is higher than the set-point value, the LED is lit and the corresponding relay is activated.

If necessary the function may be recalibrated as Min. by moving switch "Mm" to the position marked "m".

Check the correct switching of the relays by rotating the set point control higher or lower than the value simulated, watching the LED 2.

If necessary adjust the time delay action by means of the trimmer "SET DEL" If necessary Insert the RC antispark connecting the terminal 5 marked "x" to the terminal 6 "NO" or 8 "NC" depending to the relay connection.

The circuit boards of the controllers are preadjusted at the factory.

If sensors and probes have been installed correctly as previously described, the system should operate correctly requiring only the electrode calibration.

WARNING:

Faults due to bad connections while connecting are not covered by the guarantee.

9.2 ELECTRIC CALIBRATION

The following procedures can be used to verify that the pH and O.R.P. controllers are operating satisfactorily, and it can be repeated periodically to check that the controller is maintaining electric calibration:

- connect a pH/mV simulator to terminals 17-18 of the controller
- simulate pH/mV values over the entire scale
- adjust "zero" and "slope" with trimmers 5 and 6 located on the front panel
- check the input insulation following the right instructions of the simulator.
Input current must be lower than 2 pAmps.



9.3 CALIBRATING THE PH CONTROLLER

The pH instrumentation manufactured by Nieuwkoop B.V./B&C are laboratory calibrated and verified using a standard pH electrode with a "zero point" at 7.00 pH. Slope is verified at 20°C.

Before using the electrode and/or the pH calibration, check that the Glass membrane has been stored wet.

If the protective cap is empty and the electrode is dry, immerse the electrode in a buffer solution or tap water (do not use distilled water) for three hours before operating.

Buffer solutions with a pH value of 4-7-9 are available to calibrate the meter.

Immerse the electrode in the buffer solution pH = 7 and adjust the trimmer 5 marked "ZERO".

Immerse the electrode in the buffer solution pH = 4 or pH = 9 and adjust trimmer 6 marked "SENS".

If Automatic Temperature Compensation is to be used, the Temperature sensor must also be immersed into the buffer solutions. Allow the sensor to reach thermal equilibrium before adjusting the "ZERO" and "SENS" trimmers.

Check the calibration periodically.

10 NORMAL OPERATION

As the solution passes the installed electrode, the controller will indicate the appropriate pH or ORP value.

The display will indicate instantly the pH or ORP value of the solution currently being measured.

Adjust the set-point control 3 to the setting required for each particular application.



11 PREVENTIVE MAINTENANCE

11.1 CONTROLLER

Quality components are used to give the controller a high reliability.

The frequency of such maintenance depends on the nature of each particular application.

As in any electronic equipment, the mechanical components, such as switches, relays, potentiometers and connectors, are the most subject to damage.

- check for damage of the electrolytic capacitors if the meter is exposed to temperatures above 60°C.
- check for damage in all the electronic components if the meter is subjected to excessive voltage
- check for damage of the electronic and mechanical components if the meter is dropped
- repeat the pre-operation check periodically
- check that all the connections are free from moisture and contamination

WARNING:

Disconnect the power supply to the monitor before performing the following procedures:

- Use moisture free air and blow out the interior of the case and terminal board connections as necessary.
- Inspect the printed circuit boards for dirt and corrosion; clean as necessary and blow dry.
- Tighten all the terminal-board connections and mounting hardware.
- Replace the front panel circuit board or the base circuit board.

11.2 SENSOR

The state of the electrode's surface is critical for the normal operation of the system and should be inspected more frequently when using alkaline liquids, oil and grease containing water, and bio-applications.

Suggested methods for cleaning the electrode include chemical cleaning (except hydrofluoric acid) and detergent washing (see the chemical auto cleaning system Nieuwkoop B.V./B&C).

Either brush or ultrasonic methods may be used.

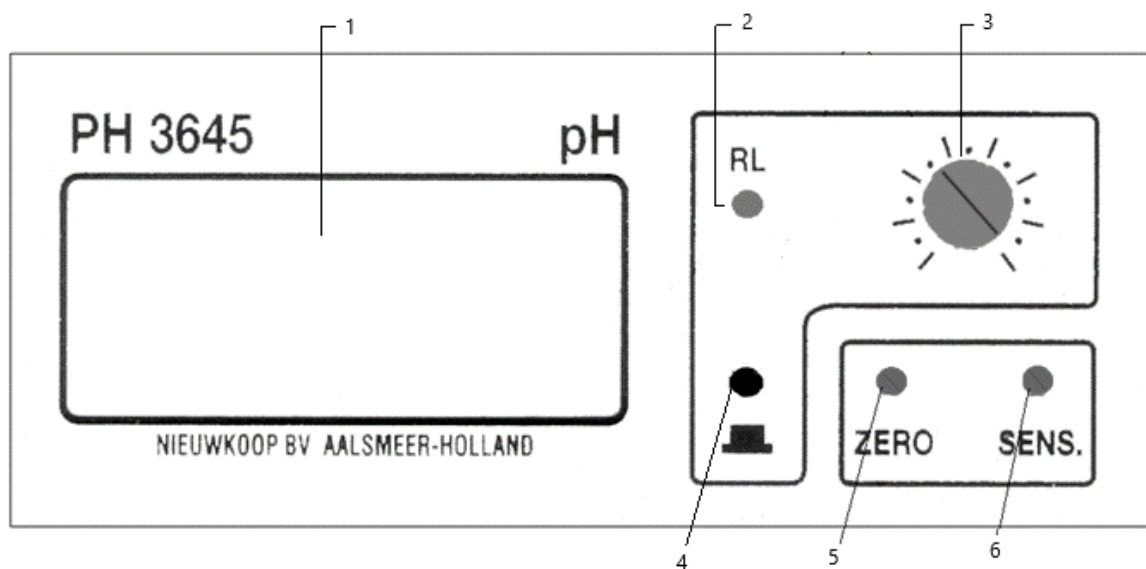


12 TROUBLESHOOTING GUIDE

Symptoms	Probable cause	Remedy
Neither LCD lit nor meter reading	line not connected incorrect power wiring	check power check wiring
No meter reading, but LCD light	I.C. failure inside connector	replace I.C. driver replace circ. board
Meter reading too high/low	electrode failure; meter uncalibrated	clean sensor calibrate with buffers.
Meter reading does not change	electrode damage; short circuit	electrode replacement check cable
Relay chattering Alarm circuit does not operate, meter reading OK	Interferences relay contacts; circuit failure	Connect RC antispark check wiring/loads replace base c.board return to factory
Slope not sufficient	Electrode damage; temp. compensation	electrode replacement check ATC sensor
Recorder does not operate	recorder not connected output circuits damaged	check wiring replace base c.board



FRONT PANEL

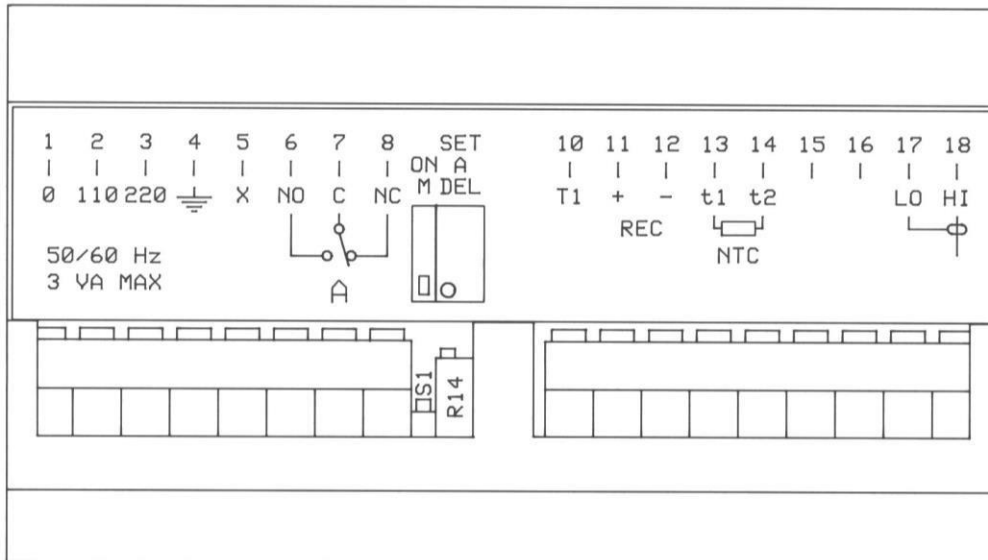


1. Display
2. Switched relay light
3. Set point control
4. Set point visualization
5. Zero calibration
6. Slope calibration

Fig.1



PH 3645
REAR PANEL CONNECTIONS

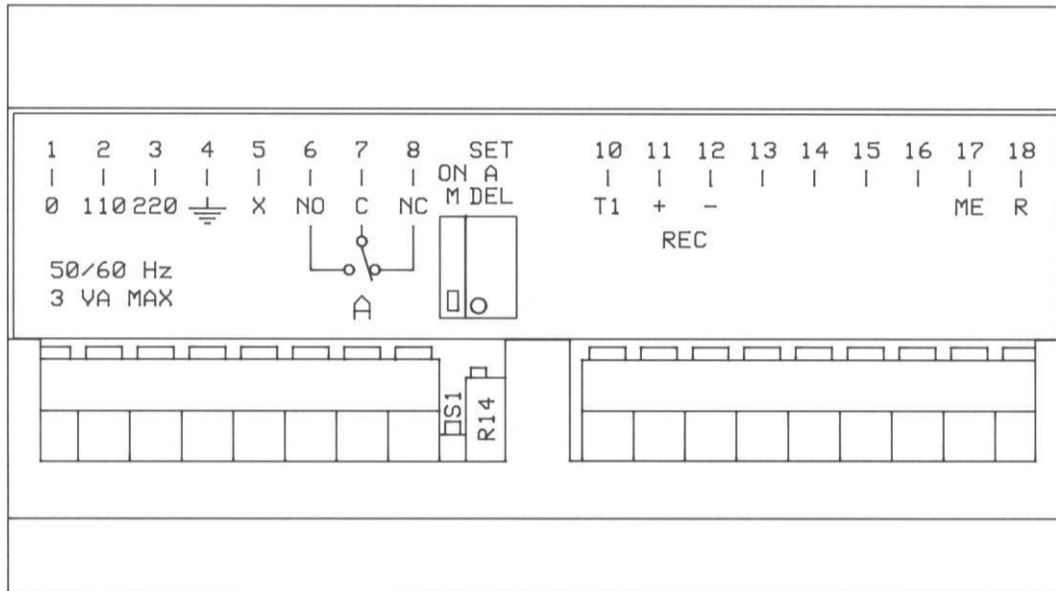


- | | |
|---------|-----------------------------------|
| 1. 2. | 110 V power supply |
| 1. 3. | 220 V power supply |
| 4. | Ground (power) |
| 5. | RC antispark |
| 6. 7. | Relay A N.O. contacts |
| 7. 8. | Relay A N.C. contacts |
| 10. | Ground (signal) |
| 11. | Recorder output (+) |
| 12. | Recorder output (-) |
| 13. 14. | NTC input (A.T.C.) |
| 17. | Reference input (LO) |
| 18. | pH input (HI) |
| R14 | Relay A delaying control |
| SI | Relay A inverting function switch |

Fig. 2



MV 3645
REAR PANEL CONNECTIONS



- | | |
|-------|-----------------------------------|
| 1. 2. | 110 V power supply |
| 1. 3. | 220 V power supply |
| 4. | Ground (power) |
| 5. | RC antispark |
| 6. 7. | Relay A N.O. contacts |
| 7. 8. | Relay A N.C. contacts |
| 10. | Ground (signal) |
| 11. | Recorder output (+) |
| 12. | Recorder output (-) |
| 17. | Metal electrode input |
| 18. | Reference electrode input |
| R14 | Relay A delaying control |
| S1 | Relay A inverting function switch |

Fig. 3



DIMENSIONS
(measures in mm)

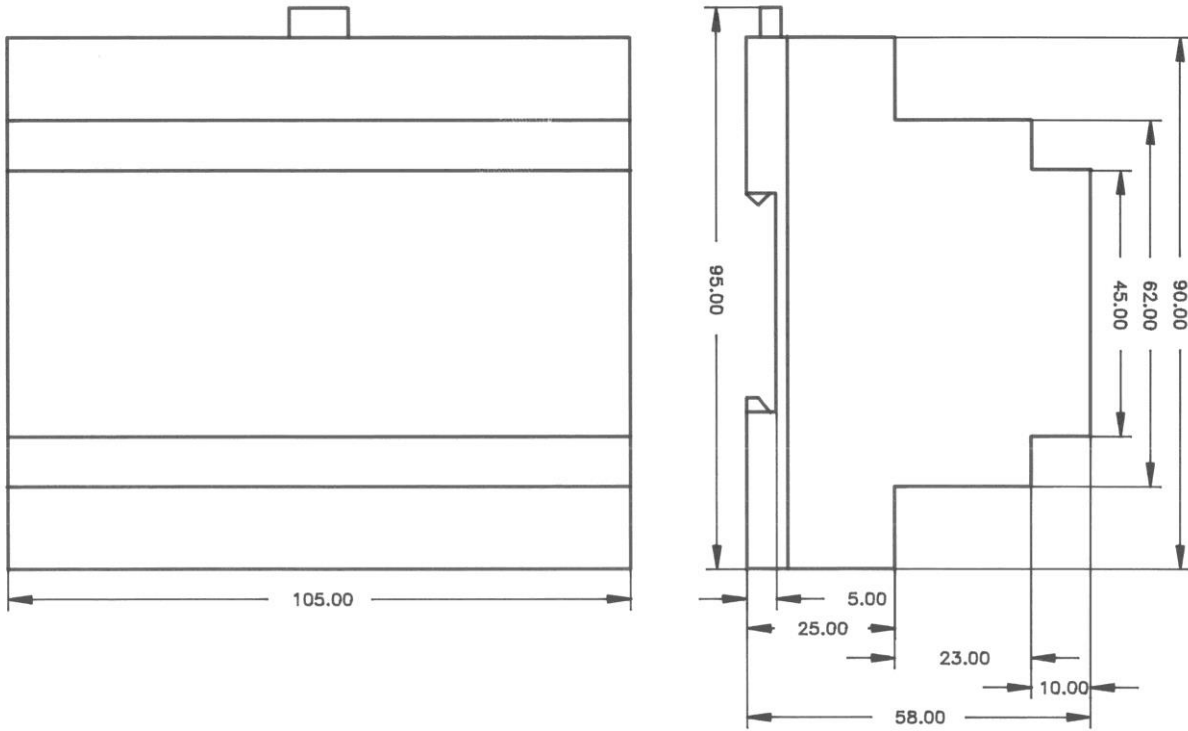


Fig. 4



WARRANTY CERTIFICATE

- 1) *Your product is covered by Nieuwkoop B.V./B&C Warranty for 5 years from the date of shipment. In order for this Warranty to be valid, the Manufacturer must determine that the instrument failed due to defective materials or workmanship.*
- 2) The Warranty is void if the product has been subject to misuse and abuse, or if the damage is caused by a faulty installation or maintenance.
- 3) The Warranty includes the repair of the instrument at no charge. All repairs will be completed at the Manufacturer's facilities in Aalsmeer, The Netherlands.
- 4) Nieuwkoop B.V./B&C assumes no liability for consequential damages of any kind, and the buyer by accepting this equipment will assume all liability for the consequences of its use by the Customer, his employees, or others.

REPAIRS

- 1) In order to efficiently solve your problem, we suggest You to ship the instrument along with the Technical Support's Data Sheet (following page) and a Repair Order.
- 2) The estimate, if requested by the Customer, is free of charge when it is followed by the Customer confirmation for repair. As opposite, if the Customer shall not decide to have the instrument repaired, he will be charged to cover labour and other expenses needed.
- 3) All instruments that need to be repaired must be shipped pre-paid to B&C Electronics. All other expenses that have not been previously discussed will be charged to Customer.
- 4) Our Sales Dept. will contact You to inform You about the estimate or to offer you an alternative, in particular when:
 - the repairing cost is too high compared to the cost of a new instrument,
 - the repairing results being technically impossible or unreliable
- 5) In order to quickly return the repaired instrument, unless differently required by the Customer, the shipment will be freight collect and through the Customer's usual forwarder.



TECHNICAL SUPPORT
Data sheet

In case of damage, we suggest You to contact our Technical Support by email or phone. If it is necessary for the instrument to be repaired, we recommend to photocopy and fill out this data sheet to be sent along with the instrument, so to help us identifying the problem and therefore accelerate the repairing process.

ESTIMATE

REPAIR

COMPANY NAME

ADDRESS

ZIP

CITY

REFER TO MR./MISS.

PHONE

MODEL

S/N

DATE

Please check the operator's manual to better identify the area where the problem seems to be and please provide a brief description of the damage:

- SENSOR
- POWER SUPPLY
- CALIBRATION
- DISPLAY
- ANALOG OUTPUT
- SET POINT
- RELAY CONTACTS
- PERIODICAL MALFUNCTIONING

➤ **DESCRIPTION**

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TO MEASURE  TO KNOW

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