

1. Installation

Before startup make sure that the slide switch (Fig. 1) for setting the mains voltage is in the right position depending on the country where the device is used (230 V / 115 V).

Carefully check the delivery scope for completeness. Accessories might be included. Only skilled persons are allowed to work on the open device or the terminals. The device must then be voltage-free.

For installation, observe the rules and instructions effective on site. The fitting position is arbitrary. The ambient temperature may be between -5°C and $+50^{\circ}\text{C}$ but should be constant. Do not expose the device to direct heat or sunlight. Connect the controller to the enclosed wiring diagram.

2. Wiring

2.1 General

The supply voltage must be connected according to the technical regulations effective on site. Besides, it must be ensured that the voltage supply lines are not run directly near or in the same channel parallel to the measurement lines. Interferences from other electrical sources would adulterate the measurement. Mains lines and measurement lines may only cross rectangularly when close to each other.

2.2 Remote switchoff

The controller functions and output of the TOPAX Industry can be switched off by an external contact (e.g. flow monitor, circulating pump, etc.). If this external contact is not connected, the display will show "Remote switchoff", and the corresponding controller output of both automatic control systems will be 0 %, i.e.: the relays are not working.

If no external contactor is used, terminals 18 and 42 must be connected.

2.3 Admissible lines

For the measurement lines the information given under 2.1 applies in the same way, i.e.: they must not run parallel to or directly near mains or power lines. Besides, the admissible lengths must be observed with due regard to the sensor used. It is of decisive importance if the lines are used for high-impedance (e.g. pH value) or low-impedance (e.g. chlorine sensor) measurements. In the case of high-impedance measurements, it must be ensured in particular that the (plug) connections are dry and clean and that brittle lines due to extreme bending do not occur. The screened lines normally used for this purpose must meet the quality requirements.

Important!

The screening may only be connected to ground at one cable end (preferably at amplifier/controller). For high-impedance measurements, use through cables from the sensor to the measurement input, if possible. Cable extensions by means of plugs or terminal sockets increase the risk of interferences due to contamination, humidity or excessive transfer resistance.

3. General operating instructions

Before opening the TOPAX Industry, the mains voltage must be disconnected. Only then may the additional circuit boards be installed or removed and all connections be made. Violation of this instruction may result in the failure of the TOPAX Industry and the loss of warranty.

The TOPAX Industry are protected internally by a 0.125 A quick-action fuse. After closing and starting the TOPAX, it carries out a self-test and should be ready for use after about 5 seconds. If not, the device is faulty and must be checked.

If the measuring input is defective or a measuring range is exceeded, the display shows "Equip channel 1!!" The TOPAX Industry is not working.

The control output is either relay K11 and relay K12 or the continuous current output (option).

The TOPAX Industry has another slot which can only be equipped with an amplifier for temperature measurement and/or temperature compensation in the case pH measurement. The temperature can be transmitted via the 0/4...20 mA signal. If temperature compensation is required this function must be programmed during calibration of the pH combination electrode.

On connecting the power supply the TOPAX checks which measuring amplifier has been installed.

Attention:

The measuring amplifier is not identified if - on startup of the controller - the final value of the measuring range has been exceeded!

The sensors must be calibrated during first startup. If the calibration has not been carried out, measuring is not possible.

Use the instructions (see measuring amplifiers) for calibration.

4. Technical description

The TOPAX Industry are equipped with two displays and four keys.

Display 1:

LC display, 13 mm, numerical
- to indicate the measured value

Display 2:

LC display, 5 mm, alphanumeric, 2-line
- to indicate the programming steps
- to show the settings

Programming of the TOPAX Industry is carried out in plain language. Seven different codes are available for programming.

Code 51: Two-point calibration (e.g. pH value); set-points

Code 52: Single-point calibration (e.g. chlorine measurement with potentiostat); set-points

Code 53: Set-points

Code 54: Controller parameters

Code 55: Controller characteristics



Code 56: Types of controller outputs


Code 95: Service menu

For a detailed description of the individual codes, refer to the functional diagrams.



4.1 Key functions

The controller has four keys for operation and programming.

Key	Function
ESC	<ul style="list-style-type: none"> - Return to initial position - Reset the cursor to the first digit of the number during calibration The function is carried out after releasing the key.
 bzw. 	<ul style="list-style-type: none"> - Setting of numerical values - Setting of the controller type - Setting of controller characteristics - Setting of the measuring range, free chlorine only - Setting of the language - Setting of pH increase or pH reduction

	<ul style="list-style-type: none"> - Setting of time and date - Safety switchoff ON/OFF The function is carried out on pressing the key. Fast adjustment of the numerical values is possible by keeping the keys for increasing value or for reducing value pressed.
	<ul style="list-style-type: none"> - Changing to the other menu items without storing the values in the main memory of the TOPAX Industry The function is carried out after releasing the key.

4.2. Storage

For the confirmation of all values and functions, first press key  and then additionally key . Release simultaneously. A star (*) on the right of the programming display shows that the data have been stored.

5. Startup

Before startup make sure that an external switch possibly connected is closed. If not, terminal strips 42 and 18 in the TOPAX must be bridged!

5.1. Sensor connection

On delivery, the TOPAX Industry are equipped with the measuring modules ordered. Depending on these measuring modules, the sensors must be connected.

Attention!

For controller for free chlorine, the measuring range must selected by means of the DIL switch.

One switch may be activated only !

For connection of the chlorine measurement with potentiostat or diaphragm-covered sensor, please adhere to the corresponding separate wiring diagrams!

5.2 Calibration and adjustment of set-points (Code 52 and Code 51)

-Code 52:
single-point calibration, only slope input of set-points

-Code 51:
two-point calibration, zero-point and slope input of set-points

Note:

After the TOPAX Industry has been calibrated once, you are not asked anymore in the display for calibration. In the case of a voltage failure, the calibrated values are not lost but are reused!

A new calibration is necessary only if :

- the measurement must be checked.
- a new measuring module has been fitted, (in this case, "PLEASE CALIBRATE!" is shown in the display).
- the sensor has been replaced.

Connect the relevant sensors for calibration. The external switch at terminals 18 and 42 must be closed. If the connection between these terminals is open, the controller output signal is set to 0 % (switched off) and display 2 shows "Remote switchoff". Then calibration is not possible!

Section 12 describes in detail how to calibrate the sensors.

5.3 Controller output type (Code 56)

The following control variable outputs can be chosen:

- Pulse duration (relay output):

10...60 sec cycle duration,




Depending on the deviation and the set controller parameters, the relay pulls up or drops over the set cycle duration. Example: If the cycle duration is 30 seconds, and the controller output is 40 %, the relay pulls up for 12 seconds and it does not for 18 seconds.





- 3-point step (relay output):

for servomotors, relay output (e.g. for chlorine control valve C7700). In this case, always connect a repeating potentiometer (resistance 1...10 kOhm).

Calibration of the repeating potentiometer

It is possible to define a switching hysteresis, lowest value: 2%

Confirm the switching hysteresis using keys  and . Press  to continue. The servomotor is brought automatically to a stop position. The display of the numerical values changes between 0 and 255 or between 255 and 0 depending on how the repeating potentiometer is connected.

Confirmation in stop position: either 0 % (CLOSE) or 100 % (OPEN) (Changeover with keys  or ; confirmation by pressing keys  and  simultaneously). Then the servomotor is brought automatically to the other stop position and turned off by means of the limit switch. Calibration is terminated.

- ON/OFF (relay output):

If the set value is exceeded the relay switches either to open or to close (selectable).

- Pulse frequency (relay output):

10...100 pulses per minute (e.g. for solenoid metering pumps).

The pulse frequency depends on the deviation and the set controller parameters, i.e.: at a controller output of e.g. Y=25 % and a pulse frequency of 100 pulses/min., the controller sends 25 pulses/min.

- Continuous output (impressed current)

(optional) only with additional circuit board inserted 0/4....20 mA, display programmable

Furthermore the measuring range for the input amplifier to measure the free chlorine concentration can be set with code 56.

- Measuring range 0...1.00 mg/l (preset)
- 0...2.00 mg/l
- 0...5.00 mg/l
- 0...9.99 mg/l

The set measuring range must correspond to the switch position at the measuring module.

5.4 Setting of controller characteristics and the alarms (Code 55)

It is possible to choose between:

- Proportional Controller (P)
- Proportional-Integral Controller (PI)
- Proportional-Integral-Derivative Controller (PID)
- 2-side controller (e.g. for acid/lye metering) with P, PI or PID action
- Ratio controller

(When using the TOPAX as a ratio controller, the measuring input for the second measured value must be defined under service code 95.)

Code 95 - item "Type of current input"

This second measuring input is connected to terminals 11 (+) and 35 (-). The ratio can be set from 1:0.1 to 1:10.

The values for parameters Xp (%), Tn (min), Tv (sec) are set under code 54.

- Follow-up control

The output signal is influenced directly by the input, i.e.: with an input signal of e.g. 0...20 mA, the output of the controller (Y) is directly proportional to the current intensity. Any output signal can be used for this setting.

Types of alarm

- no alarm
- MIN
- MAX
- MIN & MAX

The alarm values are set under code 54.

5.5 Setting of controller parameters and alarm values (Code 54)

Setting can only be carried out for those parameters which have been defined with code 55.

The following controller parameters are preset in the TOPAX:


Xp 50 %
Tn 15 min
Tv 20 sec

Furthermore spreading (zoom function) of the current outputs is possible for remote transmission of the measured values and the alarm values.

5.6 Adjustment of the set-point (Code 53)

The set-point can only be determined with code 53.

5.7 Service code (Code 95)

To switch from one program item to another, press  key.

Program version:

Program which is stored in the EPROM

Date:

Date of manufacture of the device

Ser.No.:

Serial number of the device

Chan 1:

Physical value of the input amplifier

Slot 1

Chan 2:

not available

Chan 3:

not available

Chan 4:



Physical value of the input amplifier

Working time:

Operating time of the device

Safety shutdown :

Safety switchoff **ON** <= **OFF**

can be activated or deactivated by pressing  or .

Device No.:

The input of the device number is required if the TOPAX Industry is part of a data network and is connected to a printer or a PC.

dT =.....min :

Time between two printouts (only for program version 1.06).

Date

To set the date (only with fitted "real-time clock" circuit board)

Time

To set the time (only with fitted "real-time clock" circuit board)

Type of current input:

The current input must be activated if the TOPAX Industry is to be used as ratio controller or if a disturbance variable is to be processed as second input signal.

The current input can be set to:

0...20 mA
4...20 mA
20...4 mA

See also detailed description on ratio controller (Code 55 - Setting of Controller Characteristics) and on Superimposition of Disturbance Variables.

Alarm delay time

applies also to safety switchoff and can be set between 0 and 60 minutes.

Oper. language

Setting of the language for programming and operation. Available language combinations are English/German or Englisch/French or English/Spanish.

Resetting system (Code "2293")

Note: All values must be programmed again after a reset.

A reset should only be carried out by a specialist. A reset becomes necessary if the TOPAX Industry does not work properly or after exchanging the EPROM. All programmed values are then set back to the condition as supplied.

6. Safety switchoff

The controllers are equipped with a safety switchoff function which can be deactivated with service code 95 and which is active during automatic operation.

Mode of action:

If, due to a defective sensor or another unforeseen function, the controller output is more than 95 % over a settable time period (alarm delay time), an alarm is released for this channel and the corresponding controller output is set to 0 %. This time is the same as the alarm delay time and is set under service code 95. It can be between 0 and 60 minutes. After safety switchoff, the error must be eliminated. Then the displayed alarm can be confirmed by pressing the "ESC" key.

7. pH value controller



Increase or reduce pH value

The pH value controller function in the TOPAX Industry allows to increase or reduce the pH value. The setting is performed with code 54 (control direction -pH or +pH).

-pH means that the control output is increasing if the actual value exceeds the set-value (reduce pH), +pH means that the control output is increasing if the actual value falls below the set-value (increase pH).

With this controller also temperature compensation is possible. For this purpose the temperature measurement module must be integrated and the temperature sensor (Pt 100) must be connected. The temperature of the buffer solution has to be entered during calibration of the pH value. The Pt 100 must be connected when commissioning the TOPAX.

8. Manual operation

The controllers can be adjusted manually. To activate this feature, go to the display of the relevant slot and press  and  simultaneously. It is then possible to adjust the controller output manually to 0% or 100% for pulse frequency, pulse duration or ON/OFF or continuously output for 3-point step output or continuous 0/4...20 mA controller output). Press "ESC" key to return to automatic operation.

9. Disturbance variable imposition

The disturbance variable is superimposed directly on the output signal of the controller. This independent input is an analog signal which can be set to:

0...20 mA

4...20 mA and

20...4 mA.

It is possible to evaluate this current signal at ratios of **1: 0.1 to 1:10.**

Upon delivery, the disturbance variable function is deactivated. The current signal is activated and set under service code 95, and it is assigned under code 54 "Setting of controller parameters".

If the disturbance variable is activated, it must also be connected to terminals 11 and 35 of the TOPAX Industry. If not, the controller output is 0 % and the controller is not working.

Die maximum controller output of the TOPAX corresponds to the disturbance variable (disturbance variable = 50% - controller output = max. 50 %). The value set for the disturbance variable can be viewed in the status display.

10. Serial computer interface

To connect the TOPAX Industry to a PC, SPC or printer it can be equipped with a serial computer interface.

Setting of the serial interface at the computer or printer

9600 Baud

8 Bit

1 Stopbit

PARITY: NONE

10.1 Required PC system configuration

Computer: 386 or higher (IBM or 100% compatible)

RAM: memory: min. 4 MB

Graphic support: VGA or better

Free serial interface COM 1 or COM 2

Software: DOS 5.0 or higher
Windows 3.1 or 3.11,
Win 95/98 or higher
Windows NT

1 TOPAX with RS 232 interface (max. data line length 10m)

1 to 15 TOPAX with RS 485 interface and interface converter RS 485 <=> RS 232

10.2 General

The installation location of this interface is shown on the drawing of the main board. Terminals 9 (GND), 34 (TxD) and 33 (RxD) at the TOPAX Industry are used for connection. Under menu 'Service' (code 95) a number between 1 and 15 must be entered for each connected device.

10.3 Serial interface RS 232

With the RS 232 interface data transmission of max. 10 m can be ensured. A single TOPAX Industry can be connected to a PC via this interface. For allocation of the cables and plugs please refer to the drawing. For installation use a three-wire shielded control cable.

10.4 Serial interface RS 485

The additional circuit board of the RS 232 computer interface is replaced by the RS 485 one. The TOPAX Industry identifies automatically which computer interface has been inserted. With the RS 485 interface data transmission over a distance of max. 1,000 m is possible. Up to 15 device can be connected to a network via one PC. For installation use a two-wire, shielded control cable. The data line is connected directly to the terminals of the TOPAX Industry. Intermediate connections might affect the data transmission. The data line must be terminated with 120 Ohm resistors on both sides.

In most cases PCs are fitted with a RS 232 interface. Therefore the data must be "translated" using a RS 232 <=> RS 485 interface converter. If the interface converter Part No. 78106 is used, the 120 Ohm terminating resistor is already integrated. For connection and setting of the interface converter please refer to drawing. Connect the jumpers on the circuit board of the RS 485 according to drawing. The jumpers on the RS 485 circuit board of the last TOPAX Industry switch the 120 Ohm terminating resistor and provide the voltage supply of the data line.

If the last TOPAX Industry is set voltage-free, the jumpers on the RS 485 circuit board of another TOPAX Industry must be connected correspondingly, as otherwise the data transmission cannot be ensured anymore!

Technical data

Supply voltage:

230/115V / 50-60 Hz
24V /50-60 Hz (optional)

Power consumption:

8 W

Ambient temperature:

-5°C to + 55 °C



Relay rating :

230 V /50 Hz; 3 A voltage-free contacts


10.5 Visualization software "TopView"

TopView allows to control and graphically display the measured values of networked TOPAX Industry via a PC under Windows 3.1 or Windows 95/98 or NT. Different versions are available which can be used according to the user's requirements. With TopView Mini a remote display of all important parameters, their temporal course (24h) as well as internal and external alarms. TopView Mini is free of charge for all TOPAX Industry. The standard version additionally allows to manage measurement records, to export data for Excel applications and remotely adjust controller parameters.

11. Displays during automatic operation

During automatic operation, various values can be displayed by pressing keys  or . The value shown at last remains in the second line of display 2.

The following values can be displayed :

- Set-point of slot 1
W1 =
- Controller output of slot 1
Y1=
- Deviation of slot 1
X1-W1 =
- Relay switching conditions of slot 1
K11 = K12 =
- Illustration of relay switching conditions
Relay ON = 
Relay OFF = (nothing)
Disturbance variable z
(only if current input is set)
- Time, date
(only with fitted "real-time clock" circuit board)

Enclosure: 240 X 160 X 90 mm (WxHxD)
with mounting frame suited to be installed in a switch cabinet

Protection class: IP 65 with closed PG screwings

Controller type

- Set-value control
- ratio control
- 2-side control (pH-value),
pH increase or pH reduction
- follow-up control

Controller characteristics:

P, PI, PID
Proportional band Xp 1...500 %
Reset time Tn 0...200 min
Derivative action time Tv max. 20 % of Tn

Control output: Relay output
- ON/OFF
- Pulse frequency 10...100 pulses/min
- Pulse duration 10.....60 seconds
- 3-point step controlling with position repeating signal
Current output
- 0/4...20 mA

Current output for remote data transmission
max. load 0/4...20 mA (not voltage-free)
500 Ohm

Control input for a 2nd measured value
(Disturbance variable or ratio input)
- Influence of disturbance variable
- Ratio setting
0/4...20 mA or 20...4 mA,
input resistance 200 Ohm
0,1...10fold amplification
1:0.1 to 1:10

Serial computer interface (optional): RS 232 C or RS 485

PG screwings 4 X PG 11; 4 X PG 9; 6 X PG 7

**Technical data of input measuring amplifier
(the measuring inputs are physically separated)**

**Controller for free
chlorine value**

Connection: line-up terminal,
with multicore cable end
max. 0.5 mm²
without multicore cable end
max. 1.0 mm²

Measuring method:

open sensor with mechanical
cleaning apparatus or
diaphragm-covered sensor

Ammetric
Measuring range adjustable
1: 0...1.00 mg/l
2: 0...2.00 mg/l
3: 0...5.00 mg/l
4: 0...9.99 mg/l

Supplementary electronic unit for
connection of a potentiostatic sensor

Measuring range adjustable
1: 0...1.00 mg/l
2: 0...2.00 mg/l

Controller for measured pH value

Connection: by means of a BNC plug connector
for combination electrodes

Measuring range: pH 0...14

Controller for measured REDOX potential value

Connection: by means of a BNC plug connector
for combination electrodes

Measuring range: 0...1000 mV

Controller for measured 0/4...20 mA input value (universal)

Connection: line-up terminal with multicore cable end max. 0.5 mm²
without multicore cable end max. 1.0 mm²
Input resistance: 50 Ohm

Measuring input: 0/4...20 mA
Display: 0...100 % (standard)
Display freely programmable

Measuring input temperature
Sensor: Pt 100

line-up terminal with multicore cable end max. 0.5 mm²
without multicore cable end max. 1.0 mm²

Measuring range: -10...150°C
Connection: Three-wire lead

Module for continuous controller output

Load: max. 500 Ohm

0/4...20 mA, 20...4 mA

Real-time clock module

With buffer battery: life 10 years

Standard setting: CET

Cables recommended for the connection of the TOPAX Industry

- Mains voltage	(PG 11)	NYM-I 3 x 1.5 mm (í 9.1 mm)
- Relay output (ATE motor)	(PG 11)	NYM-I 4 x 1.5 mm (í 9.8 mm)
- Relay output (pulse frequency)	(PG 11)	NYM-O 2 x 1.5 mm (í 8.7 mm)
- Relay output (alarm)	(PG 11)	NYM-O 2 x 1.5 mm (í 8.7 mm)
- PC or printer connection: Computer cable	(PG 7)	J-2 (St) Y St III Bd LAN (í 5.7 mm) 2 x 2 x 0.6 Bd
- Connection current outputs Communication line	(PG 9)	J-Y (St) Y 4 x2x0.6 mm (í 6.5 mm)
- Position repeating signal of ATE motor Communication line	(PG 7)	J-Y (St) Y 2x2x0.6 mm (í 5.0 mm)
- Continuous control output Communication line	(PG 7)	J-Y (St) Y 2x2x0.6 mm (í 5.0 mm)
- Chlorine sensor input	(PG7)	LIYY 2x 0,25 mm (í 4.6 mm)
- Remote switchoff input Communication line	(PG7)	J-Y (St) Y 2x2x0.6 mm (í 5.0 mm)

12. Measuring input for free chlorine

12.1 Open sensor and diaphragm-covered sensor

During startup the module must be calibrated depending on the sensor used.

The sensor is identified automatically.

Technical data

Input - current signal:

Measuring range 1	200 μ A
Measuring range 2	450 μ A
Measuring range 3	1000 μ A
Measuring range 4	2000 μ A

Measuring range:

DIL-switch 1:	0... 1.00 mg/l
DIL-switch 2:	0... 2.00 mg/l
DIL-switch 3:	0 ... 5.00 mg/l
DIL-switch 4:	0 ... 9.99 mg/l

(Set the DIL switch on the measuring module depending on the measuring range.)


Accuracy: 1 % after calibration

ATTENTION: During calibration the measuring range must be set under menu item "Calibration" according to the switch position on the measuring module.

Calibration of free chlorine sensor

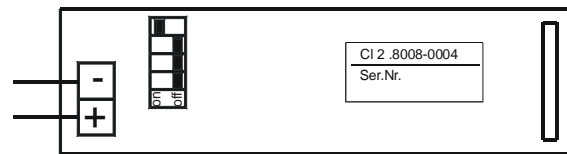
1. Set measuring range.
2. Set DIL switch on the measuring module depending on the measuring range.
3. Set calibration code.
4. Carry out zero calibration.
For this purpose, the sensor must be operated with chlorineless water. If the physical value on the display does not change anymore, it must be confirmed (approx. 10 μ A). The calibrated values are stored in the working memory of the device on confirming the display.

5. Carry out slope calibration.

The sensor is operated with test water. If the physical value does not change anymore in the display, the amount of chlorine contained in the test water is determined using the DPD method. (Take test water at the sensor.) This value is set at the controller separately for each digit of the value. The number under which the cursor blinks is changed. The calibrated values are stored in the working memory of the device on confirming the display. The slope value of the chlorine sensor is displayed using the  key. It is usually about 35 μ A.

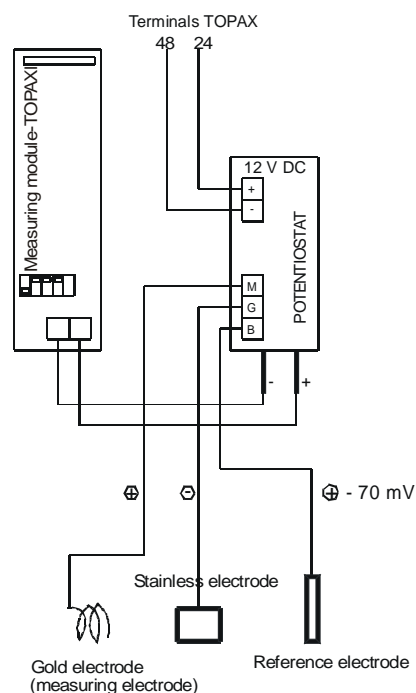
6. Return to automatic operation.

Measuring module "free chlorine"



12.2 Potentiostat

The input amplifier converts and processes the signal of the potentiostatic sensor for free chlorine. During startup the module must be calibrated depending on the sensor used. The measuring module is identified automatically.



Technical data

Measuring range:

DIL-switch 1: 0... 1.00 mg/l

DIL-switch 2: 0... 2.00 mg/l

(Set the DIL switch on the measuring module depending on the measuring range, the switch is located at the lower circuit board).

Calibration

1. Set measuring range (under code 56).
2. Set DIL switch on the measuring module depending on the measuring range.
3. Set calibration code 52.
4. Carry out slope calibration.
The sensor is operated with test water. The amount of chlorine contained in the test water is determined with the help of the DPD method (take test water at the sensor). Set this value at the controller by pressing keys ▲ or ▼ (separately for each digit of the number). The calibrated values are stored in the main memory of the TOPAX by pressing keys ▲ and □ simultaneously. The * symbol in the display confirms storing. The sensor slope is displayed using the □ key. It is usually about 50 µA.
5. Return to automatic operation with ESC.

To be observed in the case of retrofitting

Due to tolerances of the components on the potentiostat electronic unit and of the measuring amplifier for free chlorine, it is possible that the zero point at the measuring range input is not exactly 0µA.

Therefore it is absolutely necessary to carry out a two-point calibration on first startup of a chlorine measurement with potentiostat (**only in the case of retrofitting**).

As a precondition sample water must flow through the electrode for some time.

Please proceed as follows:

- Enter calibration code 51 at TOPAX.
- Set zero-point by disconnecting the gold electrode (the zero point adjusts after some seconds).
- Confirm the value as 0.00 mg/l.
- Go on to slope calibration.
- Connect gold electrode.
- Determine and chlorine concentration by means of the DPD method and set value.
- Confirm value.

In the following calibration can always be carried out under code 52.

Test instructions for potentiostat electronic unit

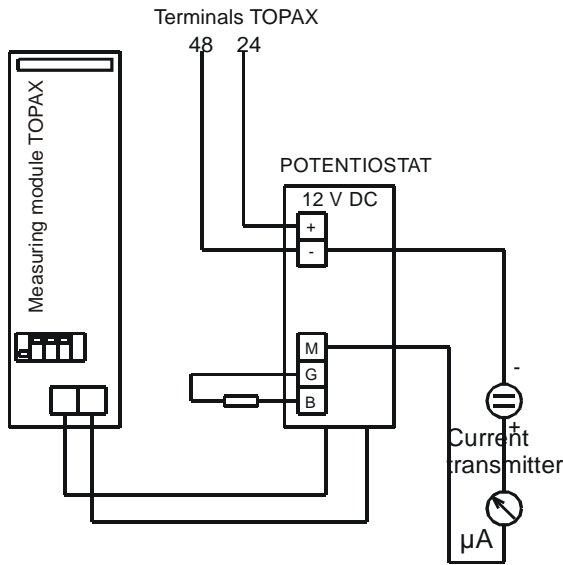
Test points

1. Voltages:
 - U (B-M) 70 mV
 - U (G-M) approx. 3.2 V

2. Current: The current at the measuring input corresponds to the µA value shown on the TOPAX Industry display.

Simulation of the measurement without chlorine

- Disconnect gold electrode
- The display at the TOPAX Industry (µA) changes to 0 µA.
- Current transmitter (µA): Connect + to terminal „M“.
- Current transmitter (µA): Connect - to TOPAX Industry ground (terminal 48).
- Disconnect counterelectrode and reference electrode and connect a 3 MOhm resistor to terminals B and G instead.
- With the current transmitter a continuous current can now be applied to the measuring input (max. 100 µA), the display (µA) at the TOPAX Industry must show the same current value that is set.



The voltage actually measured is shown in the display of the TOPAX and must be confirmed after a reaction time of about 1 minute. Please take into account that the physical value does not change anymore on confirmation. In the case of older combination electrodes, the reaction time may be longer.

The combination electrode is linked to the BNC plug connector and the measuring module. The measuring module is identified automatically by the TOPAX and can be inserted into slots 1, 2 or 3.

Technical data

Input: voltage signal from the pH combination electrode
 Input resistance: 1000 MOhm
 Measuring accuracy: 1% (after calibration)

13. Measuring module for pH value

This input amplifier measures and processes the pH value.

The pH combination electrode measures the voltage which exists in the water due to the pH value.

This voltage is defined by the Nernst voltage which depends on the temperature of the medium to be measured (see corresponding technical literature or standard specifications).

The temperature dependence of the Nernst voltage is shown in the following table:

t (°C)	U (mV)	t (°C)	U (mV)	t (°C)	U (mV)
0	54.20	35	61.14	70	68.08
5	55.19	40	62.13	75	69.08
10	56.18	45	63.12	80	70.07
15	57.17	50	64.12	85	71.06
20	58.16	55	65.11	90	72.05
25	59.16	60	66.10	95	73.04
30	60.15	65	67.09	100	74.04

The Nernst voltage is measured between the pH glass electrode and a reference electrode. Mechanically these two electrodes are integrated in a pH combination electrode.







The measuring module must be calibrated on startup. Calibration of the combination electrode is carried out under Code No. 51.

Two buffer solutions are required. They are used to measure defined voltages in connection with the pH combination electrode.

Calibration

1. Zero calibration

Plunge the pH combination electrode into a buffer solution which meets or is close to the zero point of the electrode. The ideal zero point of the electrode is pH 7.00 but the real zero point slightly differs from this value. For zero calibration, a buffer solution with a pH value of 6.80 at 20°C is available (preset at TOPAX). If the pH combination electrode is plunged into this solution, the voltage shown in the display of the TOPAX can theoretically amount to 11.63 mV (at 20°C). The measured physical value is however always different from the theoretical one.

If another buffer solution is used, the value for this solution can be set using keys  or . Each digit must be entered separately. The digit under which the cursor blinks is changed. To move the cursor forward, press the  key, to move it backward, press the  key. If the voltage does not change anymore, this value is allocated to the set pH value and is stored in the main memory of the TOPAX by pressing keys  and  simultaneously.

2. Slope calibration

Clean the combination electrode before slope calibration (rinse with distilled water).

The glass electrode must not be rubbed off as otherwise it would be charged statically, thus causing faulty measurements!!!

For slope calibration, the second buffer solution must differ at least 2 pH units from the zero point. A buffer solution with a pH value of 9.27 at 20°C is offered by JESCO. If another buffer solution is used for slope calibration, the value for this solution must be set at the TOPAX Industry (see zero calibration). If the pH combination electrode is plunged into this solution, the voltage shown in the display of the TOPAX Industry can theoretically amount to -132.02 mV (at 20°C). The measured physical value is however always different. If the voltage does not change anymore in the display, it is stored in the main memory of the TOPAX by pressing keys ▲

and □ simultaneously.

After calibration, the slope of the combination electrode can be displayed by pressing the □ key. According to the German standard specifications, the slope of the combination electrode should be between 53 mV and 59 mV. If the actual slope differs considerably from these values, check the combination electrode or the connecting cable and the plug connectors.

Voltages of some buffer solutions

pH-value	Voltage (20° C)
4.65	136.68 mV
3.06	229.15 mV
6.80	11.63 mV
9.27	-132.02 mV



View

14. Measuring module for REDOX potential

Technical data

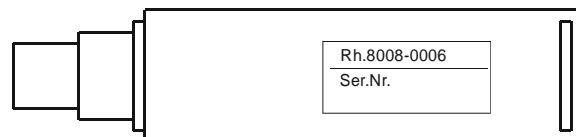
Input: voltage signal from the REDOX combination elec.
 Input resistance: 1000 MOhm
 Measuring accuracy: 1% (after calibration)

The input amplifier converts and processes the REDOX potential.

The REDOX potential is measured by means of the REDOX combination electrode. It measures the voltage existing in the water due to oxidizing and reducing ions. The measuring module must be calibrated on startup. A buffer solution is required for calibration. This buffer solution is used to measure a defined voltage in connection with the REDOX combination electrode (given value: 468 mV). If other buffer solutions are used, this value can be changed. During calibration, the voltage actually measured is shown in the display. This value slightly differs from the given value of the buffer solution, the difference should however not be more than approx. 10%. After a certain reaction time (about 1 minute) this value does not change anymore and must be confirmed according to the instructions. This calibrated values are to store in the main memory.

In the case of older combination electrodes, the reaction time may be longer or the measured value may differ considerably from the buffer solution value. This indicates that the combination electrode must be checked and replaced, if necessary. The combination electrode is linked to the BNC plug connector and to the measuring module.

The measuring module is identified automatically by the TOPAX.



View

15. Measuring module for temperature

The measuring module is identified automatically. Calibration is not required. Only connect a Pt100 sensor.

Temperature compensation

If the pH value is to be compensated, the temperature measuring module must be inserted. During calibration of the pH value the temperature of the medium to be measured must be entered.

Display of the temperature

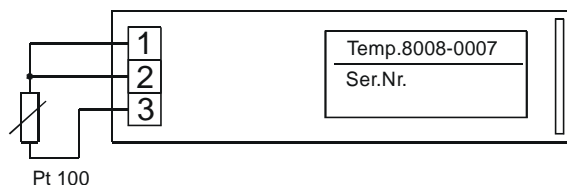
After the measuring module is fitted and the Pt 100 is connected, the temperature can be shown in the status display by pressing key ▲ or ▼. The second line of the alphanumeric display then indicates:

A three-wire lead is used for connection. If the Pt100 is connected with a two-wire cable, terminals 1 and 2 must be bridged, the cable resistance then enters into the measurement as an error. Therefore realize three-wire leads in the case of larger distances.

The measuring module must always be installed in voltage-free condition. Before switching on the power supply connect the sensor, otherwise the measuring module will not be identified!!

Technical data

Sensor Pt 100
 Measuring range -10°C ... 150°C
 Measuring accuracy 1 %



The measuring module can be calibrated during startup, depending on the application. The user sets a current signal with two points (examples see below).

For this purpose different current signal values have to be entered for zero and slope calibration and have to be assigned to the controller.

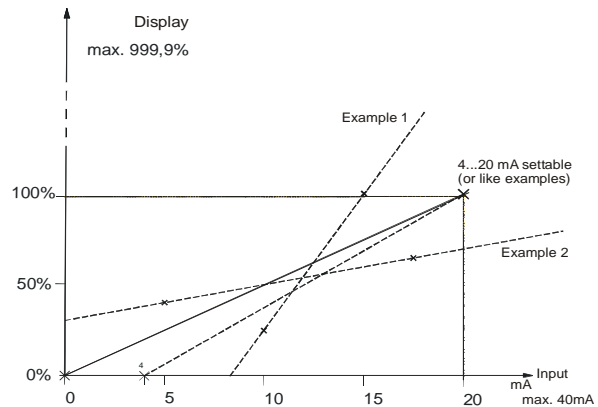
Each current signal can be allocated a display by operating keys ▲ or ▼. After confirmation the values are stored in the main memory of the TOPAX Industry.

On delivery (Part.-No. 46101004) the TOPAX Industry is calibrated so that the 0...20 mA signal is allocated 0...100 % in the display.

Technical data

Input : current signal
 max. 20 mA
 Input resistance : 50 Ohm
 Measuring accuracy : 1 %

Examples of settings

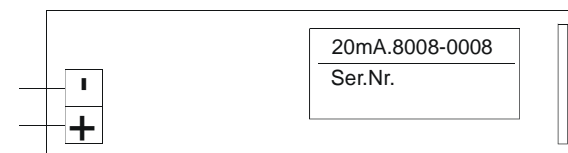


	Standard	Example 1	Example 2
Zero p.	0.0mA=0%	10.0mA=25%	5.0mA=40%
Slope	20.0mA=100%	15.0mA=100%	15.5mA=65%

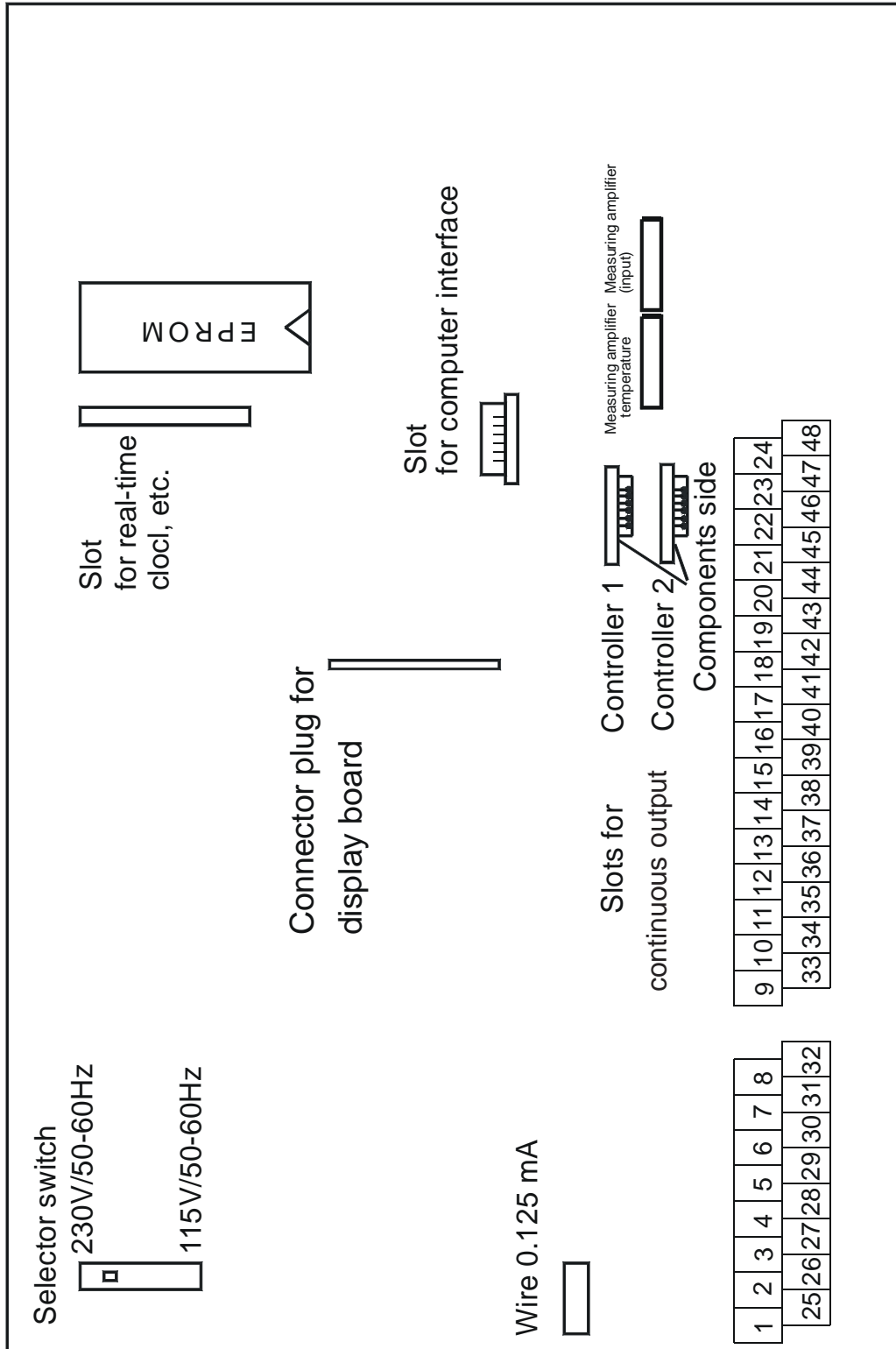
16. Measuring module 0/4...20 mA

This input amplifier converts and processes an impressed current signal 0/4...20 mA.

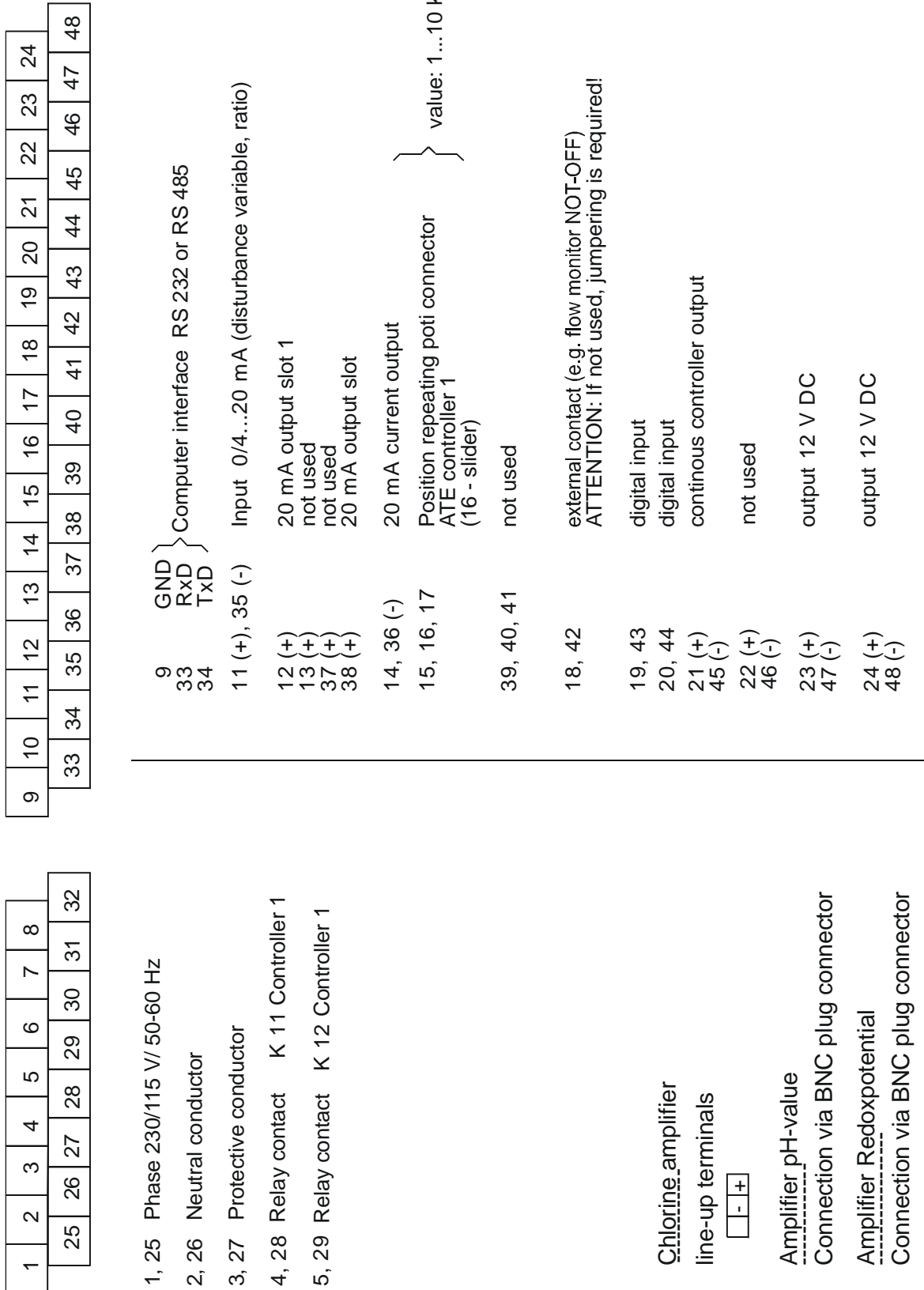
View



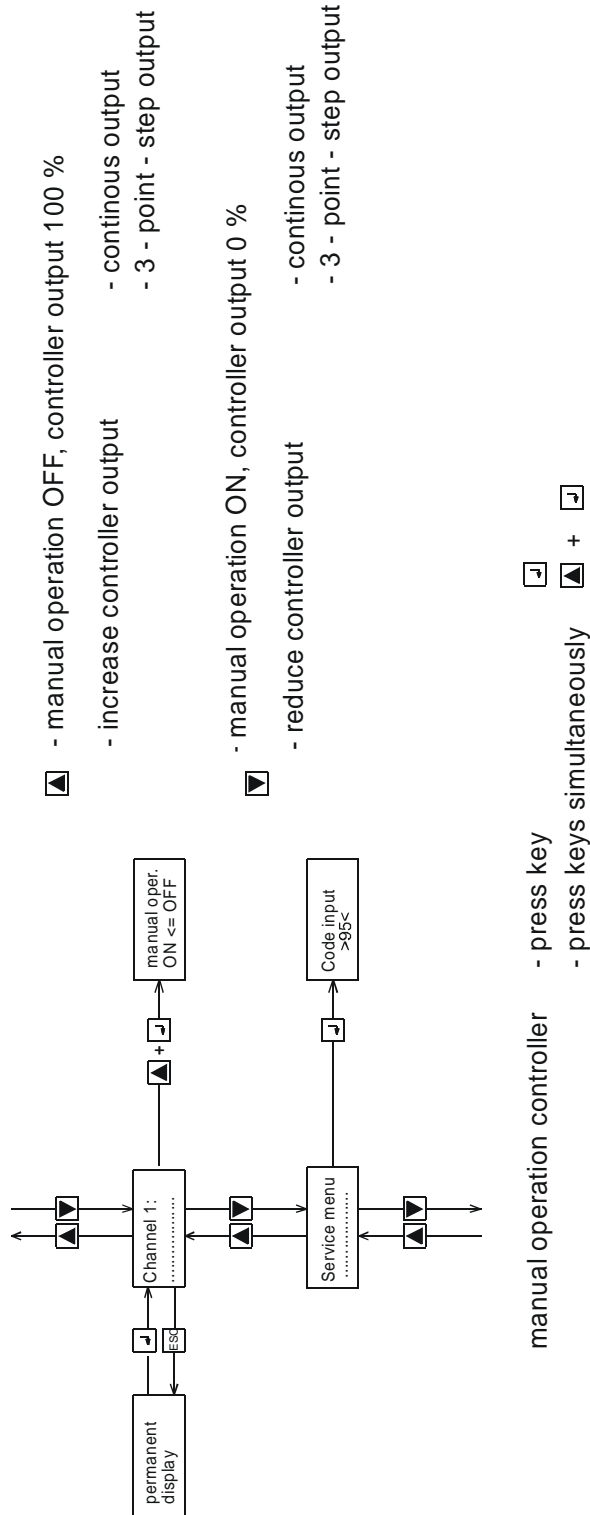
View:
Main circuit board with slots



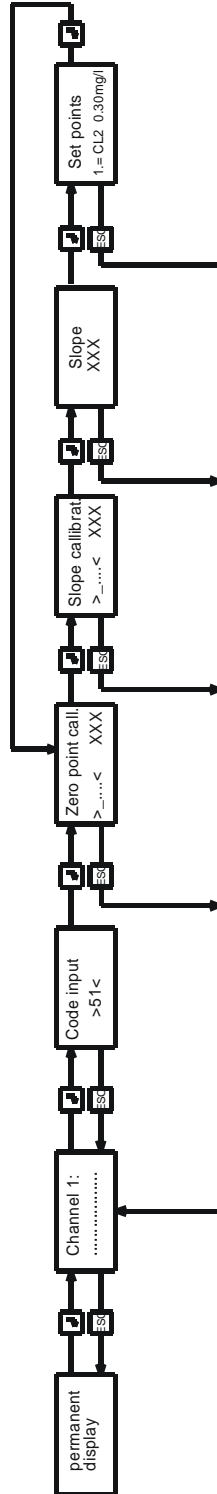
Terminal wiring diagram



Menu guidance
Manual operation setting



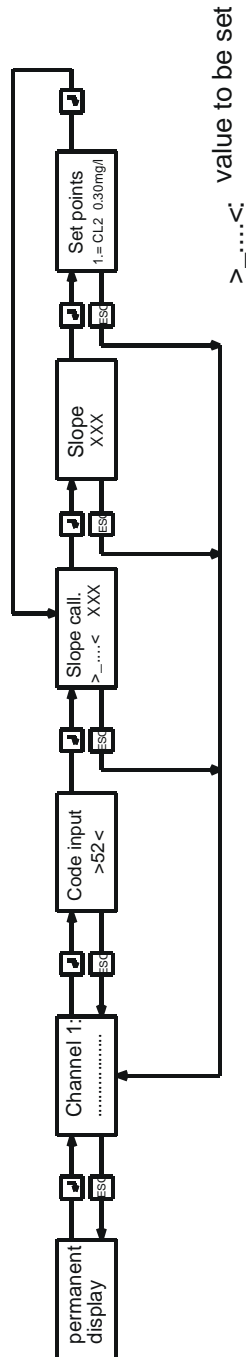
Code 51: Slope calibration, set-points



Key functions

- or to change the numerical values
 - simultaneous to store the set values will be confirmed by * in the display
 - : to reset the cursor to the initial position or to return to amplifier display
 - : to move the cursor
- >_...< : value to be set
 XXX : physical value

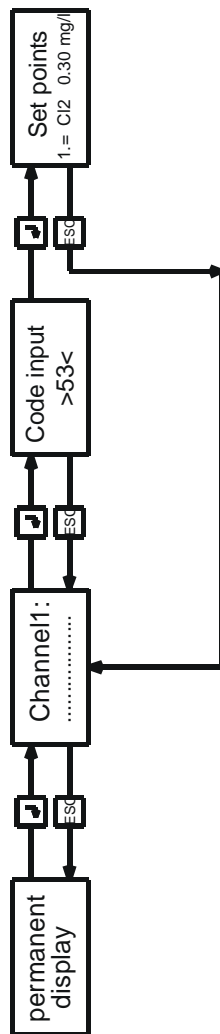
Code 52: Slope calibration, set-points



Key functions

- ▼ or ▲ to change the numerical values
- ▶ to store the set values; will be confirmed by * in the display
- ESC : to reset the cursor to the initial position or to return to amplifier display
- ▶ : to move the cursor

Code 53: Set-points

Key functions

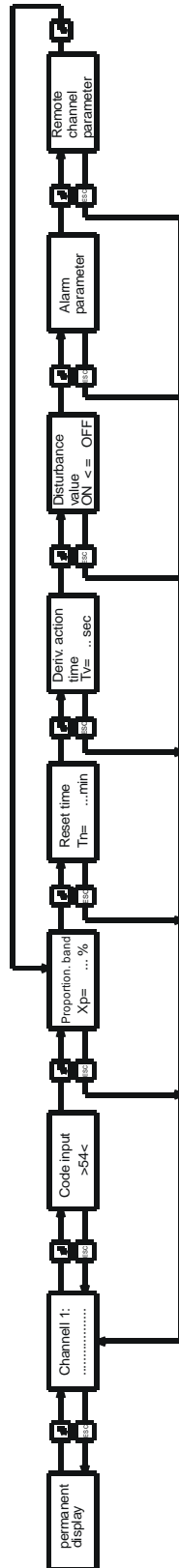
▼ or ▲

to change the numerical values

simultaneous ▼▲

to store the set values
will be confirmed by * in the display

Code 54: Control parameters, alarm values



Controller parameters

Xp: 1...500 %

Tn: 0...60 min

Tv: max. 20 % of Tn

Disturbance 0...20 mA , (settable using service code)
value: 4...20 mA,
20...4 mA

Alarm parameter

Set alarm parameter according to activated

function: min, max, or min & max

Delay settable using service code : max. 60 min

Spreading of remote channel parameters

Assignment: 0...20 mA } (settable using Code 56)

4...20 mA

20...4 mA

Key functions

▼ or ▲

: - to change the numerical values

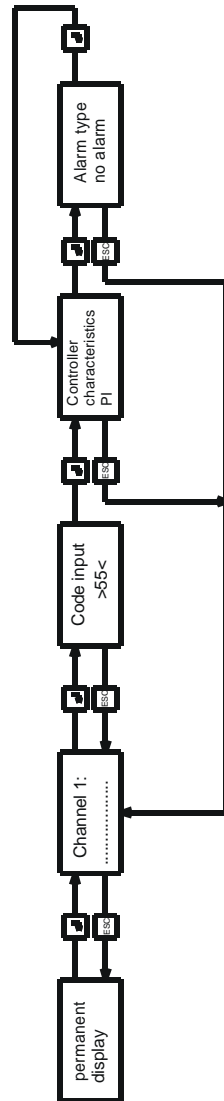
- Disturbance value ON or OFF

▲▼

: to store the set values

will be confirmed by * in the display

Code 55: Controller characteristics, alarm type



Key functions

- ▶ or ◀
- ◀▶ simultaneous
- ▶ to change controller characteristics
- ◀ to change alarm type
- ◀ to store the set value
- ▶ will be confirmed by * in the display

Controller characteristics

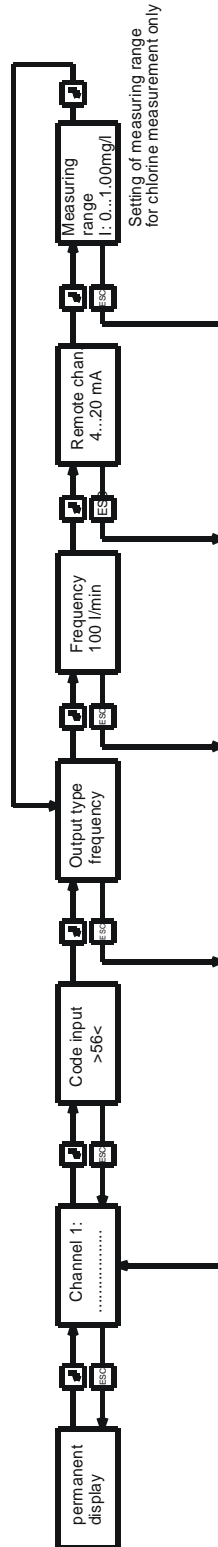
- P, PI, PID
- follow up control
- ratio control

Ratio control and two-side control settable as P, PI or PID - controller

Alarm type

- no alarm
- min - alarm
- max - alarm
- min & max - alarm

Code 56: Controller output type, remote channel parameter (current output)



Key functions

- ▼ or ▲
- ▲ or ▼
- ▲ or ▼ simultaneous
- ▲ or ▼ to store the set functions, will be confirmed by * in the display

Remote channel

- 0...20 mA
- 4...20 mA
- 20...4 mA

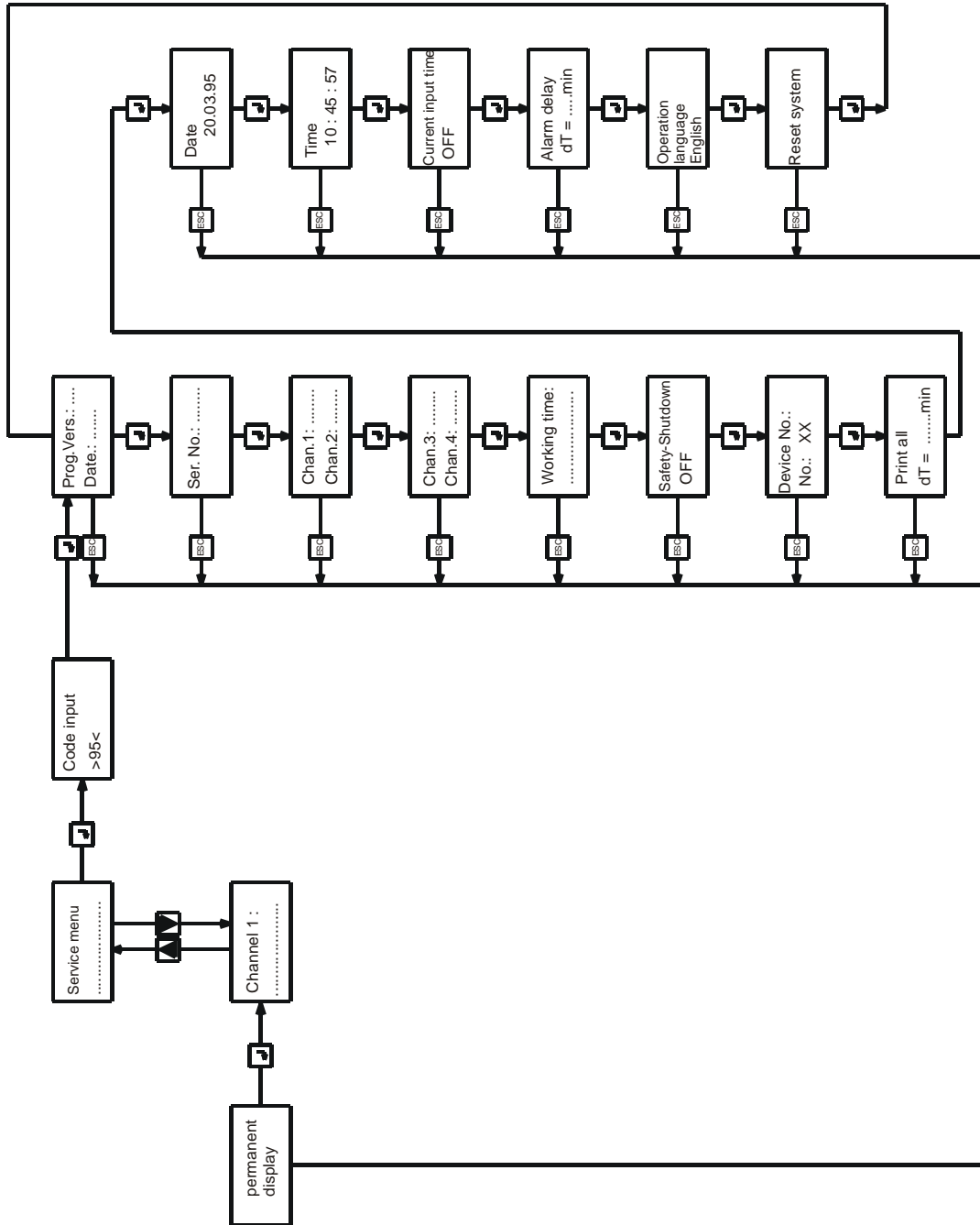
Output type

- * Pulse duration
- * Frequency
- * 3-point step
- * ON / OFF
- * Continuous output (only with card inserted)

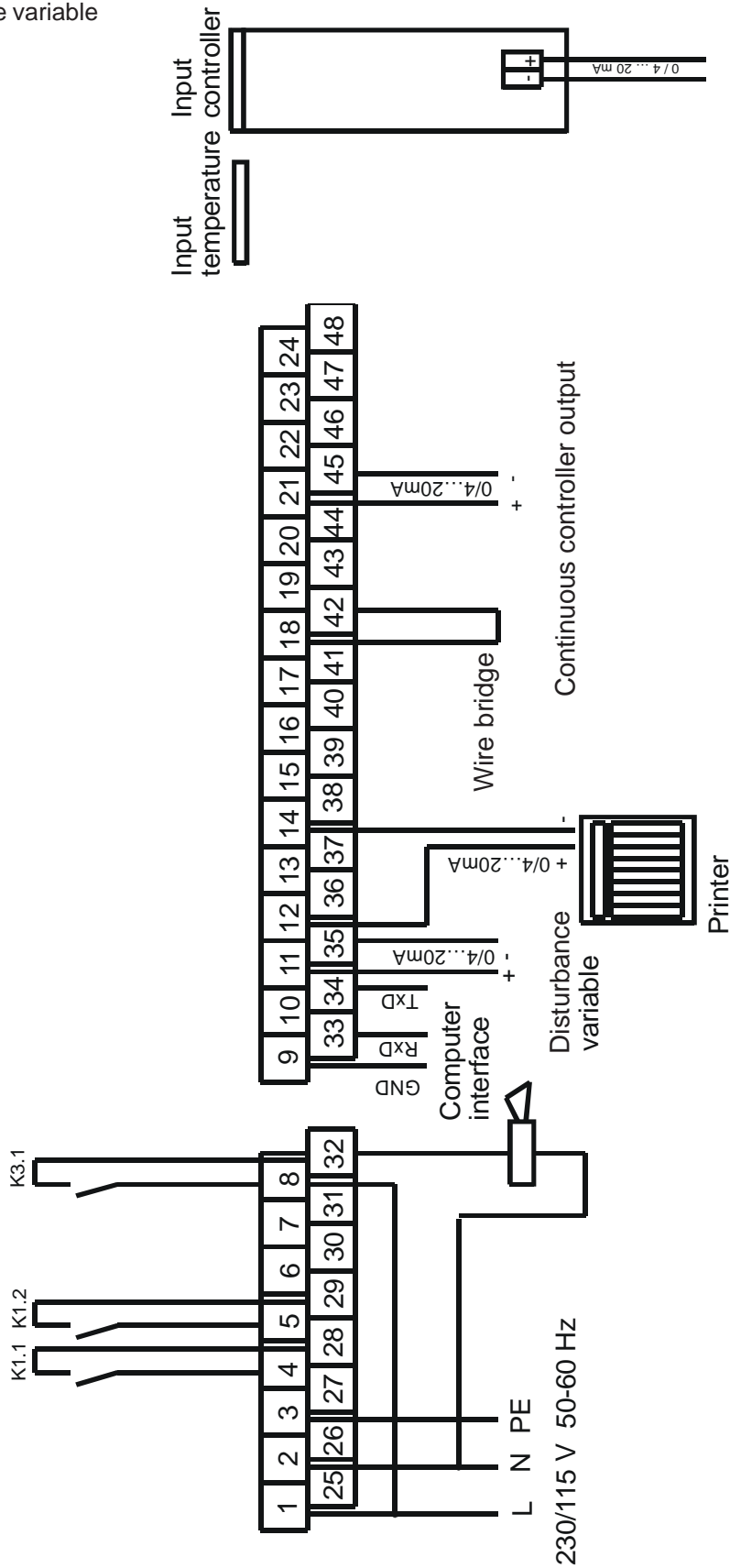
Parameter (depending on output type)

- * Pulse duration 10...60 sec
- * Frequency 10...100 Imp./min
- * 3-point step with position repeating signal via potentiometer (1...10 k Ohm)
- * ON / OFF
- * Continuous output 0...20 mA
- 4...20 mA
- 20...4 mA

Code 95: Service menu

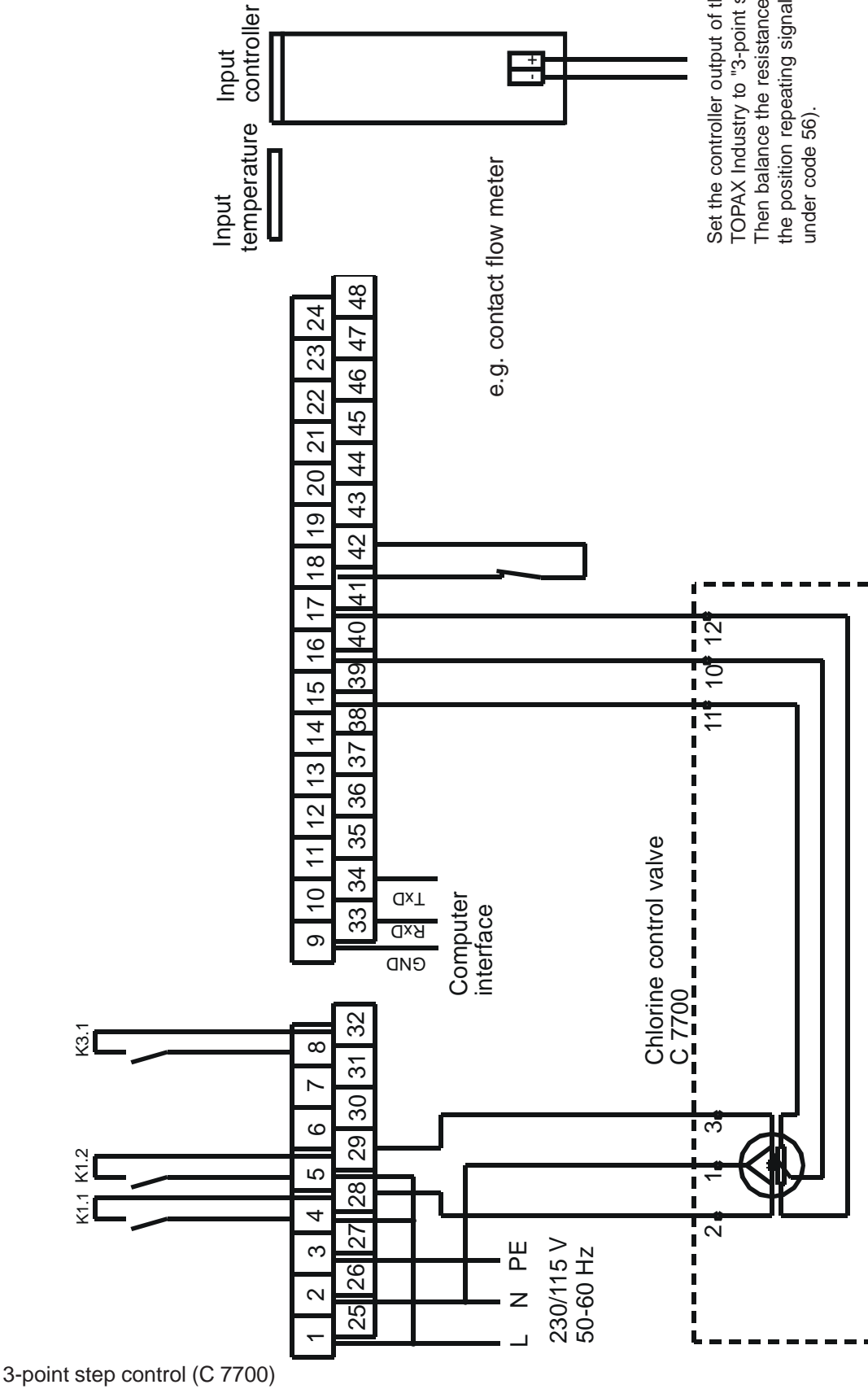


Continuous control
 Input: 0/4...20 mA
 und disturbance variable



TOPAX Industry

Input: free chlorine



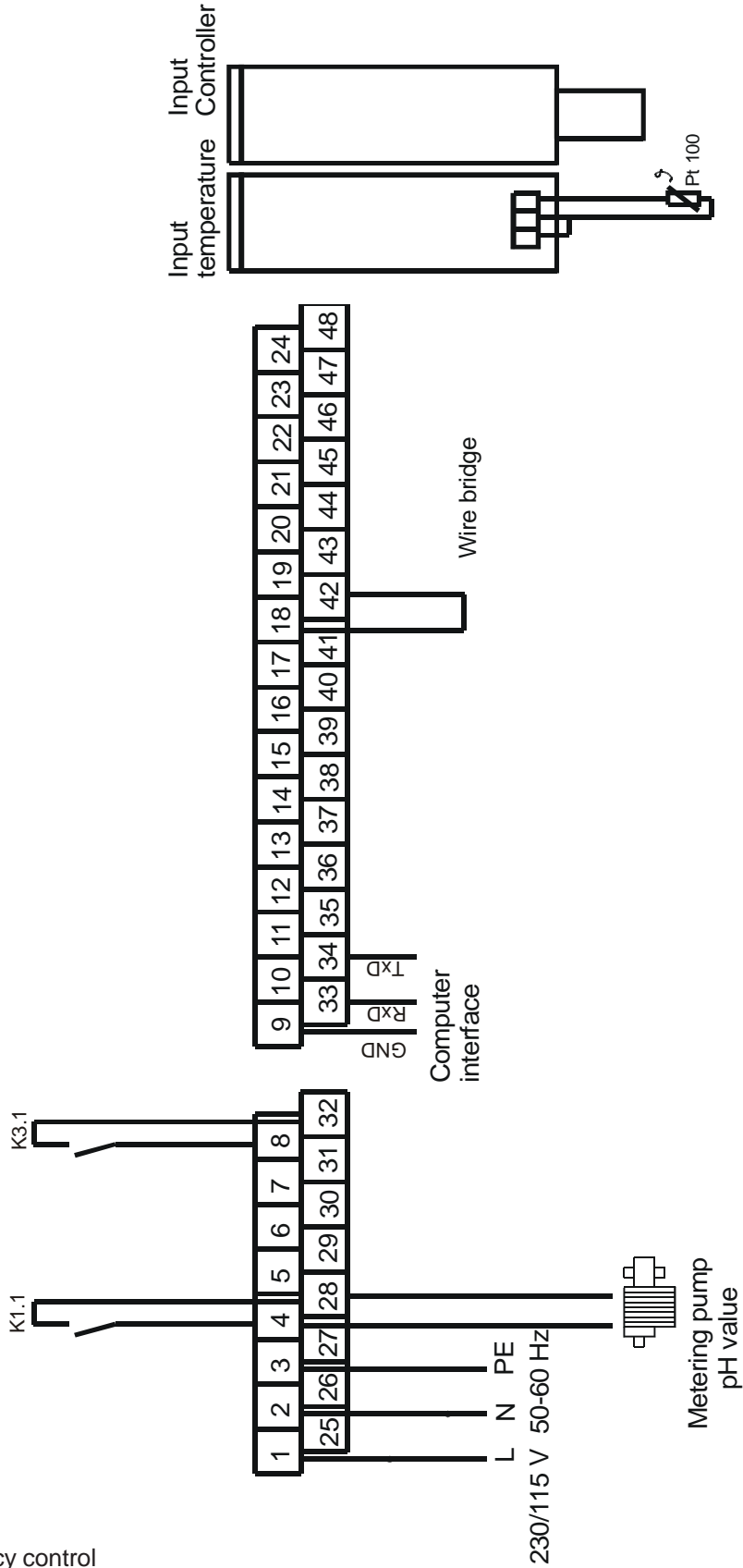
Set the controller output of the TOPAX Industry to "3-point step". Then balance the resistance with the position repeating signal (both under code 56).

3-point step control (C 7700)

TOPAX Industry

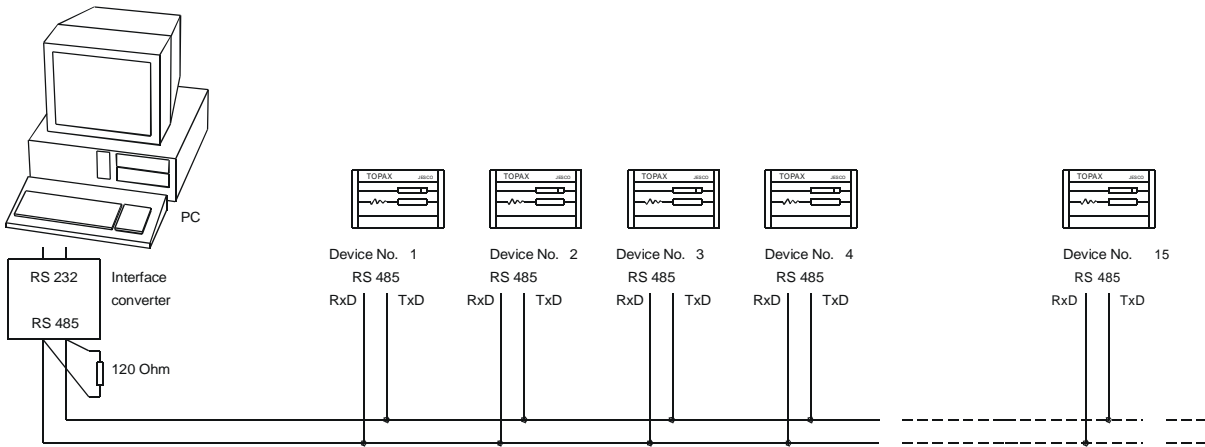
(Increase and reduce)

Input: pH value with temperature compensation



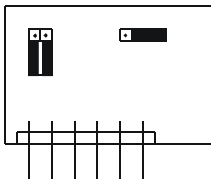
Pulse frequency control

Connection and networking with a PC

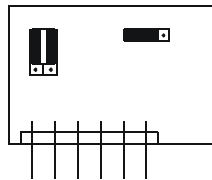


Jumper setting on the RS 485 circuit board

all TOPAX except of the last



last TOPAX



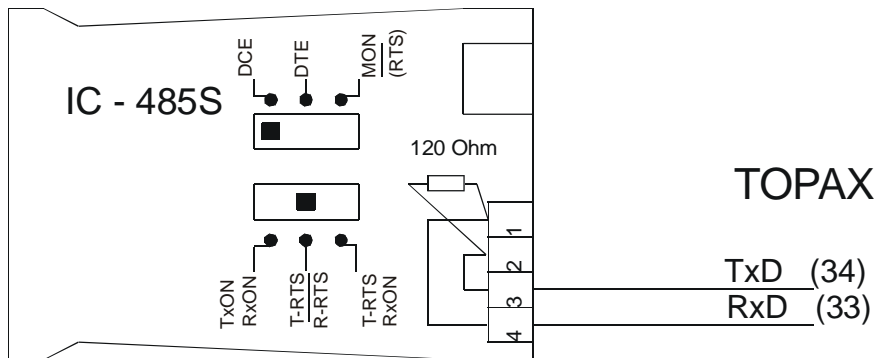
Terminal allocation of TOPAX Industry

TxD = Terminal 34

RxD = Terminal 33

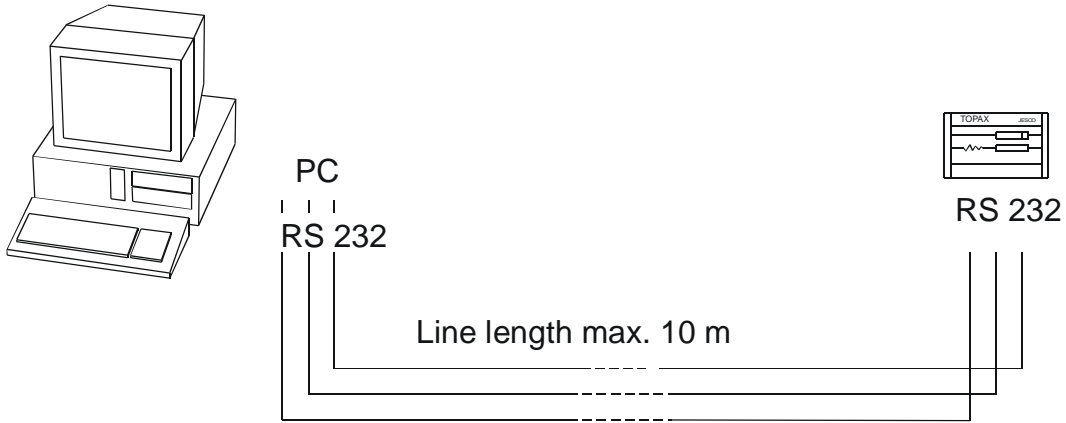
Interface converter - switch position and wiring

(Part No.: 78106)



The terminals and the socket are wired internally 1:1.
 The bus lines of TOPAX Industry (RxD and TxD) are wired internally with a R=120 Ohm resistor.
 Terminals 1 and 4 as well as 2 and 3 are internally bridged.

Connection with a PC - RS 232



PIN 5 GND	PIN 7 GND	_____	GND	Terminal 9
PIN 2 RxD	PIN 3 RxD	_____	TxD	Terminal 34
PIN 3 TxD	PIN 2 TxD	_____	RxD	Terminal 33
PIN 7 RTS	PIN 4 RTS	_____		
PIN 8 CTS	PIN 5 CTS	_____		
PIN 6 DSR	PIN 6 DSR	_____		
PIN 1 DCD	PIN 8 DCD	_____		
PIN 4 DTR	PIN 20 DTR	_____		