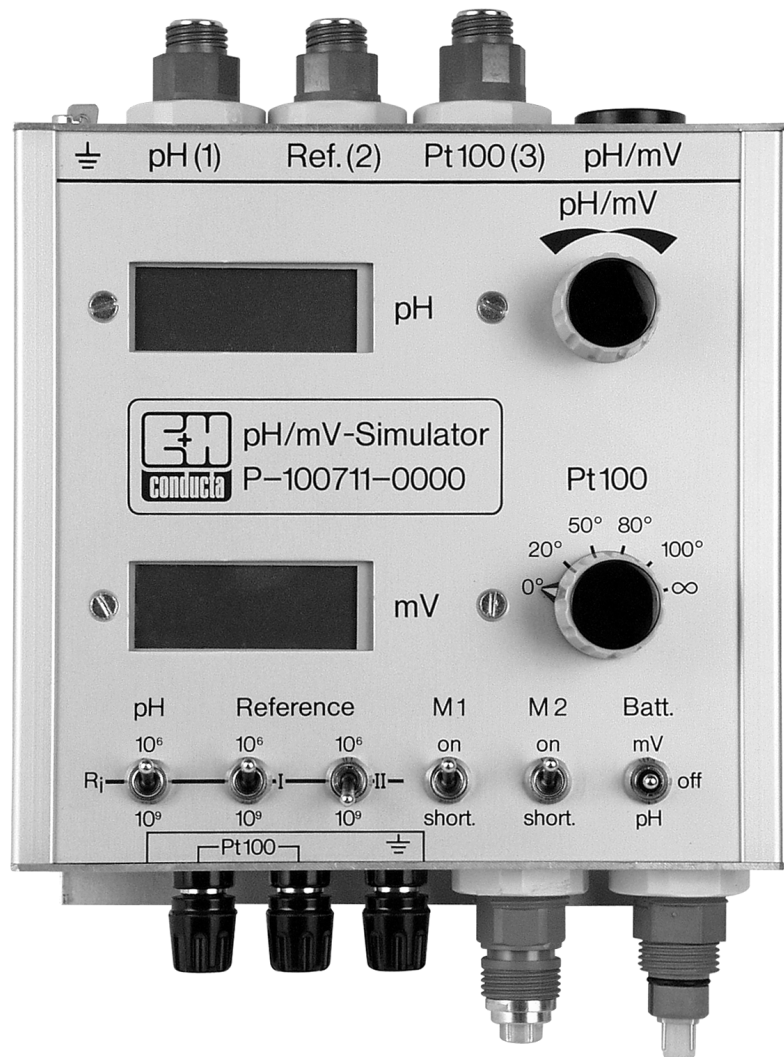


Simulator P 100 for Transmitters pH/ORP/Temperature Measurement

Operating Instructions



Contents

1	Safety instructions	4	4	Operation	8
1.1	Safety symbols	4	4.1	Simulator	8
1.2	Designated use	4	4.2	Adapter box	12
1.3	Installation, commissioning and operation ...	5	5	Troubleshooting	13
1.4	Operational safety	5	6	Technical data	14
1.5	Return	5	6.1	Simulator	14
2	Identification	6	6.2	Adapter box	14
2.1	Nameplate	6	6.3	Case	14
2.2	Scope of delivery	6	7	Index	15
2.3	Acceptance of goods, transport, storage	6			
3	Wiring	7			
3.1	Wiring diagram	7			
3.2	Functional description	7			

1 Safety instructions

1.1 Safety symbols

To avoid damage to persons and property, always pay attention to the safety instructions in these Operating Instructions. The following symbols are used to provide you with important information:



Warning!

This symbol alerts you to hazards which could cause serious injuries as well as damage to the instrument if ignored.



Caution!

This symbol alerts you to possible faults which could arise from incorrect operation. They could cause damage to the instrument if ignored.



Note!

This symbol indicates important items of information.

1.2 Designated use

1.2.1 Simulator

The pH/mV simulator can be used for the following test purposes (testing of measuring instrument, cables, connectors):

- Transmitter with Sensopac CPA 320, pH/mV electrode with reference electrode monitoring, OrbiSint W CPS 13-0TD1 double reference electrode
- Transmitter with Sensopac CPA 320, two pH/mV electrodes with reference electrode OrbiSint W CPS 13-0TD1
- Transmitter with standard assembly, one or two combined pH/mV electrodes
- Transmitter with standard assembly, pH/mV electrode with separate reference system
- Test of transmitter input impedance
- Test of cable impedance
- Simulation of a Pt 100 temperature sensor by means of switchable equivalent resistances

The following electrode and assembly tests are possible in conjunction with the hand-held pH instrument PM 7 or PM 9 and the adapter box (a pH/mV simulator accessory):

- OrbiSint W CPS 13-0TD1, both systems in combination with a pH or redox electrode
- Any electrode combination consisting of a pH or redox electrode and a separate reference electrode

Only the CPM 380 hand-held instrument with adapter ANM or CPM 381 hand-held instrument with cable CPK 3-01D0 is needed to test standard combined electrodes or the OrbiSint W CPS 13-0TD1 electrode (reference system versus comparison system).

1.2.2 Adapter box

While the simulator is used to test the pH/mV instrument, cables and connectors, the adapter box and an additionally required hand-held instrument (CPM 380, CPM 381) are used to test pH, mV and reference electrodes in the following cases:

- Separate reference and measuring systems
- Two reference systems exist (OrbiSint W CPS 13-0TD1)



Note!

The manufacturer is not liable for damage caused by improper use or use for purposes other than the designated use.

1.3 Installation, commissioning and operation



Warning!

- If the simulator is used improperly or other than for its designated use, it may pose a hazard, e.g. due to improper connection.
- Technical personnel must have read and understood these operating instructions and must adhere to them.
- Always follow the regulations in your country pertaining to the opening and repairing of electrical instruments.

1.4 Operational safety

The instruments have been designed and tested according to the state of the art and left the factory in perfect functioning order.

The manufacturer reserves the right to change the technical data in line with technical progress at any time. You can obtain information on the current version of these Operating Instructions and possible additions from your E+H sales centre.

1.5 Return

If the simulator has to be repaired, please return it *cleaned* to the E+H responsible sales centre. Please use the original packaging. You can find the address on the last page of these instructions.

2 Identification

2.1 Nameplate

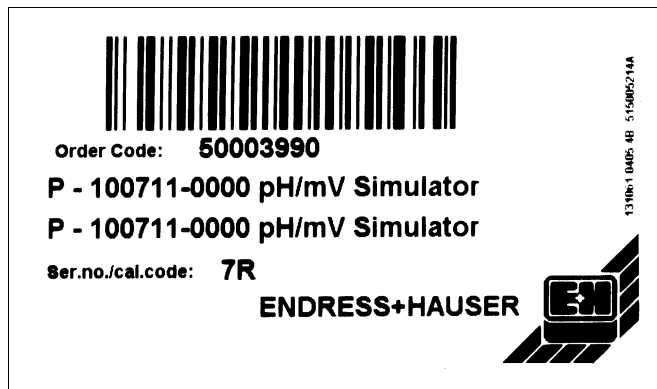


Fig. 1: Nameplate Example

2.2 Scope of delivery

Check the scope of delivery using your order and the delivery documents for:

- Completeness
 - Simulator
 - Adapter box
 - Coaxial adapter AKX
 - Case
- Instrument type and version acc. to the nameplate
- Operating Instructions 311C/07/en

A hand-held pH instrument, e.g. CPM 380 or CPM 381, is additionally required for a complete measuring system test.

2.3 Acceptance of goods, transport, storage

Make sure the contents are undamaged! If any damage is found, inform your postal service, freight handler, or forwarding agent. Keep any damaged goods until matters have been clarified.

Check that the scope of supply is complete.

For storage and transport purposes, pack the instrument so that it is protected against impact and humidity. The original packaging offers the best protection. Also, the approved ambient conditions must be observed (see »Technical data«).

- If you have any questions, please contact your supplier or your nearest Endress+Hauser sales centre (see the back page of these Operating Instructions).

3 Wiring

3.1 Wiring diagram

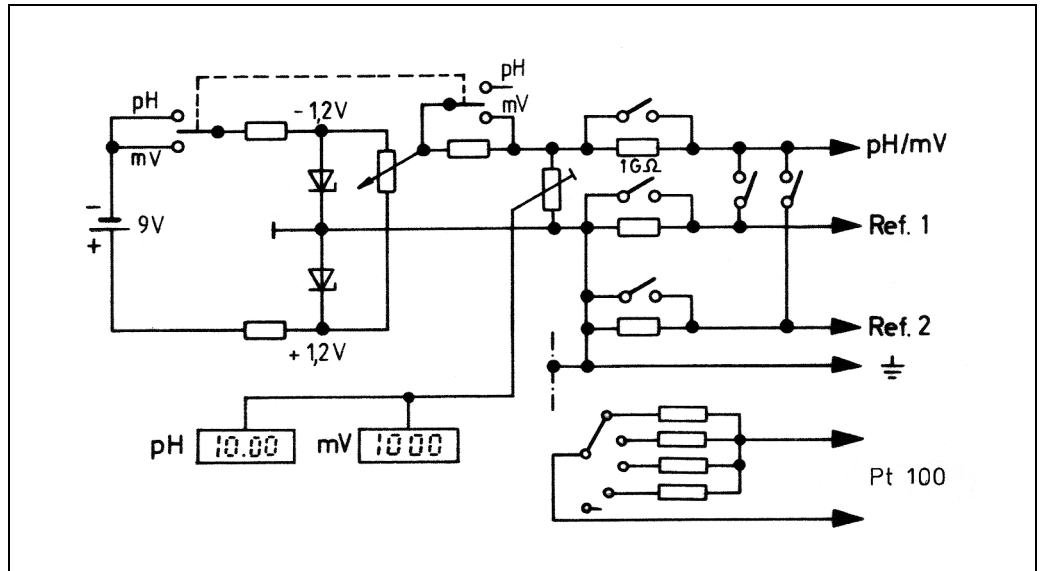


Fig. 2: Wiring diagram of simulator

3.2 Functional description

pH/mV simulator

The battery voltage is stabilized to ± 1.25 V by two reference diodes.

This voltage supplies a ten-turn potentiometer used for infinitely variable pH/mV value adjustment.

When the ON switch is set to "pH", the range is limited to approx. ± 400 mV; at the same time, the internal resistance is increased by approx. 1 M Ω .

pH/mV display

The two displays always show the pH value and the mV value, respectively.

Temperature simulator

The Pt 100 values for 0 $^{\circ}$ C, 20 $^{\circ}$ C, 50 $^{\circ}$ C, 80 $^{\circ}$ C and 100 $^{\circ}$ C are simulated using fixed resistances.

When the temperature switch is set to ∞ , a broken Pt 100 line or interruption of the Pt 100 resistance is simulated.

Input impedance test

The pH output and both reference outputs can be switched to increase their resistance from 1 M Ω to 1 G Ω (10^9 Ω). Transmitter input impedance and cable isolation can be tested.

Measuring circuit difference test

For devices with 2 input measuring circuits, the reference outputs can be individually shorted against the pH output ($\cong 0$ mV = pH 7 in the shorted circuit).

Battery voltage influence

Since the displays always show the actual voltage values for pH and mV, there is no error indication if the battery is discharged (however, the pH/mV value is no longer stable).

4 Operation

4.1 Simulator

4.1.1 Front view and operating elements

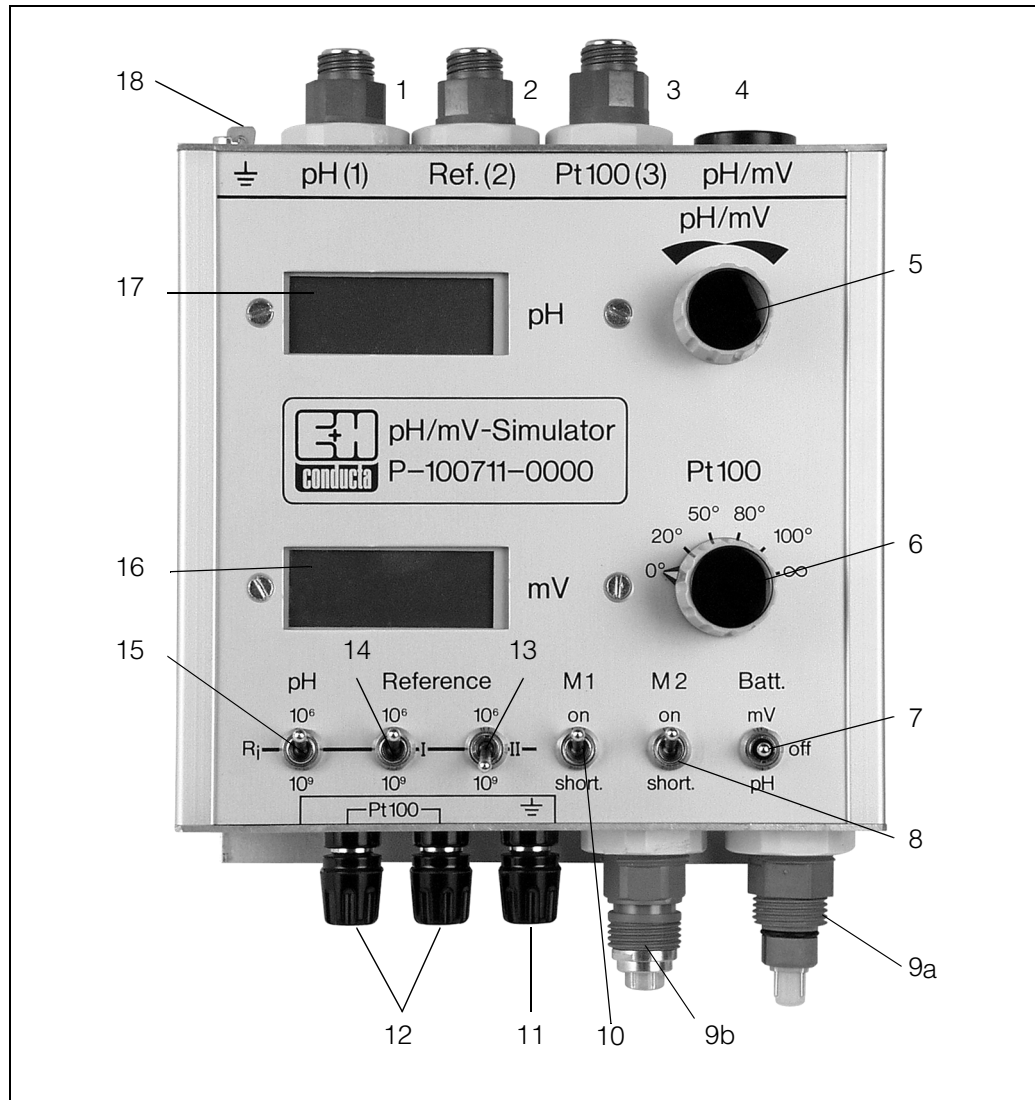


Fig. 3: Operating elements of simulator

- | | |
|------------------------------------------------|-------------------------------------------------------------------------------|
| 1: pH/mV output (GSA) | 10: Short-circuit measuring circuit 1 |
| 2: Reference 1 and 2 outputs (GSA) | 11: PE/PMC connected to housing |
| 3: Pt 100 output (GSA) | 12: Pt 100 output |
| 4: pH/mV output (DIN 19262) | 13, 14, 15: pH and reference system resistance switches (high/low resistance) |
| 5: pH/mV setting | 16: Liquid crystal display for mV |
| 6: Temperature setting | 17: Liquid crystal display for pH |
| 7: ON/OFF switch | 18: protective earth connector for housing grounding, connected with pos. 11 |
| 8: Short-circuit measuring circuit 2 | |
| 9a: pH/mV and Pt 100 output for TOP 68 / CPK 9 | |
| 9b: pH/mV and Pt 100 output for TSA / CPK 7 | |

4.1.2 Simulator connection

Measuring point	Description	Plug-in head no. on simulator (see fig. 3)
Transmitter with Sensopac CPA 320, OrbiSint W CPS 13-0TD1 electrode with <u>one</u> single pH/mV electrode	The plug-in heads 1, 2 and 3 on the Sensopac CPA 320 are removed and connected to ports 1, 2 and 3 on the simulator. The PE/PMC spade connector is also moved to the simulator (\neq protective earth connector).	1, 2, 3
Transmitter with Sensopac CPA 320, OrbiSint W CPS 13-0TD1 electrode with <u>two</u> single pH/mV electrodes	Connect plug-in head 2 to simulator port 2. The pH measuring circuit 2 is tested with plug-in head 1 on simulator port 1. The pH measuring circuit 1 is tested with plug-in head 3 on simulator port 1. It is not possible to test both circuits at the same time.	2 1 1
Transmitter with standard assembly with one or two combined pH/mV electrodes	The plug-in heads of the electrodes to be tested are connected to simulator ports 1 and 2. Connect the simulator PE/PMC in case of symmetrical high-impedance connection.	1, 2
Transmitter with standard assembly with single pH/mV electrode and separate reference system	Connect the plug-in head of the measuring electrode to simulator port 1 and the plug-in head of the reference electrode to simulator port 2. Connect the simulator PE/PMC in case of symmetrical high-impedance connection.	1, 2
Instruments with pH input via DIN 19262 coaxial socket	Remove the coaxial DIN connector from the assembly and connect it to simulator or check the device directly with a coaxial adapter cable.	
Instruments with pH input via BNC socket	Use cable CPK3-01B0.	1

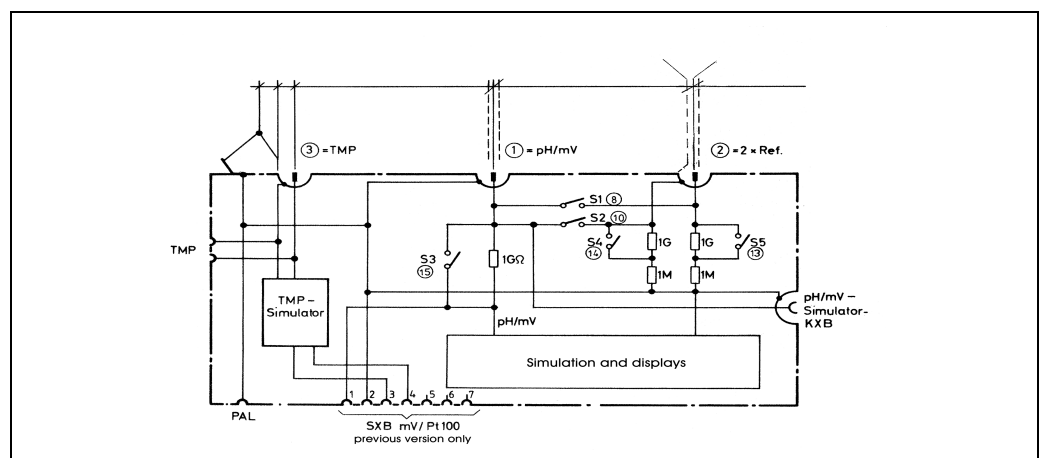


Fig. 4: Circuit diagram simulator

4.1.3 Simulator operation

Operating element	Description
Main operating elements	pH/mV setting with 5, temperature setting with 6 and the displays for pH 17 and for mV 16 are valid for all operating modes.
Basic switch settings: 7 8 10 13 14 15	pH or mV, depending on application, center = off normal = on (short. = reference 1 short-circuited to pH) normal = on (short. = reference 2 short-circuited to pH) normal = $10^6 \Omega$ normal = $10^6 \Omega$ normal = $10^6 \Omega$
Transmitter with CPA 320, OrbiSint W CPS 13-0TD1 with <u>one</u> single pH/mV electrode	All simulator switches have the functions described on the front panel.
Transmitter with CPA 320, OrbiSint W CPS 13-0TD1 with <u>two</u> single pH/mV electrodes	All simulator switches have the functions described on the front panel but the Pt 100 simulator is <u>not</u> used. The CPA 320 plug-in heads 1 and 3 are to be connected to simulator port 1 alternately.
Transmitter with standard assembly, one or two combined pH/mV electrodes	In case of two combined electrodes use sockets 1 and 2, set switch 8 to pos. "short". To perform the high-impedance test, the plug-in heads are to be alternately connected to 1. Test with 15.
Transmitter with standard assembly, single pH/mV electrode with separate reference system	Use switch 15 to perform the measuring circuit high-impedance test. Use switch 14 to test the reference input impedance (only in case of symmetrical high-impedance connection to transmitter).

4.1.4 Calibration

- Measure the battery voltage: min. 7 V
- Measure the stabilised voltage: $\pm 1.2 \dots 1.3$ V
- Connect a DMV (2 V DC range) between the reference potential (e.g. housing) and the pH/mV output (1, 4 or 9).
- Set the ON switch 7 to mV. Adjust the internal "mV" multi-turn trimmpot until the "mV" display shows the DVM value.
- Set the ON switch 7 to pH. Turn the internal "pH" multi-turn trimmpot until the "pH" display shows 14.00; the DVM must show -406 mV ($7 \text{ pH} \times 58 \text{ mV} = 406 \text{ mV}$, i.e. $0 \dots 14 \text{ pH} \cong +406 \dots -406 \text{ mV}$).

4.1.5 Functional test of simulator

Check No.	Measuring points	Switch position	DMV display
1	Coax 4 both poles	15 = 10 ⁶ 15 = 10 ⁹	- 406 mV - 4 mV
2	Plug-in head 1 both poles	15 = 10 ⁶ 15 = 10 ⁹	- 406 mV - 4 mV
3	2 outside to 1 inside	13 = 10 ⁶ 8 = short. 13 = 10 ⁹	- 370 mV 0 mV - 4 mV
4	2 inside to 1 inside	14 = 10 ⁶ 10 = short. 14 = 10 ⁹	- 370 mV 0 mV - 4 mV
5	9a (TOP 68), pins 1 and 2 9b (TSA), protective contacts	15 10 ⁶	- 406 mV
6	9a: pins 4 and 5 9b: backstanding contacts or banana plugs "Pt 100"	6 = 0 °C 20 °C 50 °C 80 °C 100 °C	100.0 Ω 107.7 Ω 119.5 Ω 130.8 Ω 138.4 Ω

- Use DVM with Ri = 20 MΩ for checks no. 1 to 5
- Switch mV/pH (→ fig.no. 3, p. 8, pos. 7) in pos. "mV"
- Adjust display to pH 14.00 with check no. 5
- Do not change these settings on checks 1 to 5
- Use ohm-meter (DVM range 0 ... 200 Ω) for check no. 6

4.2 Adapter box

4.2.1 View and connecting elements

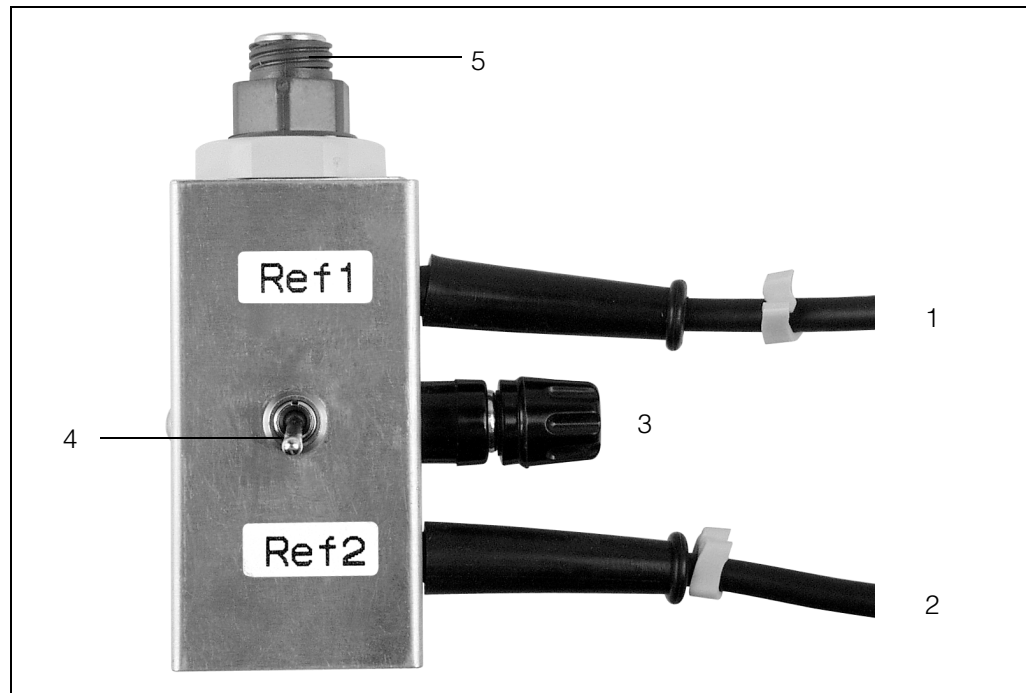


Fig. 5: Adapter box

4.2.2 Adapter box connection

- The hand-held instruments CPM 380/CPM 381 are connected to output 5. Use adapter ANM for temperature sensor simulation on CPM 380 or cable CPK 3-01D0 for CPM 381.
- The plug-in head 1 is connected to the pH/mV electrode.
- The plug-in head 2 is connected to the reference electrode.
- If there is interference or if the measured value fluctuates, the measuring setup is to be grounded using socket 3.

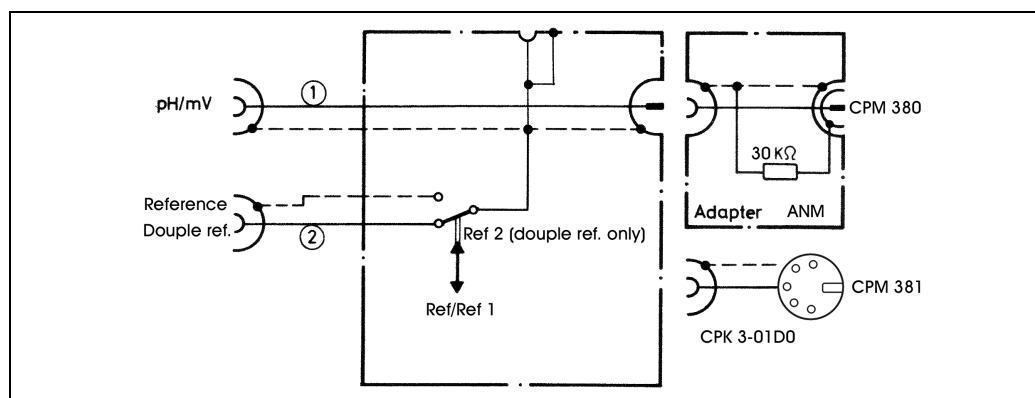


Fig. 6: Circuit diagram adapter box

4.2.3 Adapter box operation

- Normally the switch 4 is set to "Ref I".
- When using the OrbiSint W CPS 13-0TD1 465, the second reference system can be selected with switch 4 ("Ref 2" position).

5 Troubleshooting

Error	Possible cause	Remedy
Measuring instrument display is unstable	No potential matching	Connect the simulator housing and potential matching connector on the instrument.
	Interference with high-impedance test	Connect simulator and instrument to PE/PMC, do not touch measuring setup.
Display value is implausible	Incorrect mode of operation	Observe instructions in chapters 4.1.3 and 4.1.4. Determine the correct operating mode and connections according to the appendix for different measuring setups.
Simulator display is unstable	Low battery	Replace the battery.

6 Technical data

6.1 Simulator

Feature	Technical data
pH simulation range	pH 0 ... 14
Redox simulation range	-1200 mV ... +1200 mV
Temperature simulation range	0 °C, 20 °C, 50 °C, 80 °C, 100 °C
Internal resistance pH/mV	switchable, $10^6 \Omega$ / $10^9 \Omega$
pH/mV simulation connectors	<ol style="list-style-type: none"> 1. Plug-in head GSA 2. Plug-in head TSA 3. Plug-in head TOP 68 4. Coaxial DIN socket DIN 19262
Temperature simulation connectors	<ol style="list-style-type: none"> 1. Electrode plug-in head 2. 4 mm pole terminals 3. via TSA plug 4. via TOP 68 plug
Housing / screen connectors	<ol style="list-style-type: none"> 1. 4 mm pole terminal 2. 6.3 mm AMP spade connector
pH simulation value display	LCD, 3 1/2 digits
mV simulation value display	LCD, 3 1/2 digits
Temperature simulation value display	rotary switch with scale
pH/mV adjustment	infinitely variable with ten-turn potentiometer
Auxiliary energy	9 V battery, type IEC 6F22, life approx. 100 hours
Dimensions (L x W x H)	approx. 200 x 160 x 60 mm

6.2 Adapter box

Feature	Technical data
Input	2 cables with plug-in heads GSA
Output	built-in plug-in head GSA
Ground / screen	4 mm pole terminal
Dimensions (L x W x H)	approx. 100 x 60 x 40 mm (without connecting cable)

6.3 Case

Feature	Technical data
Dimensions (L x W x H)	385 x 290 x 71 mm
Total weight, including accessories	approx. 2.3 kg

7 Index

A

Acceptance of goods 6
 Adapter box
 Connection 12
 Operation 12
 View 12

C

Checking the connection 8
 Commissioning 5

D

Designated use 4
 Adapter box 5
 Simulator 4

E

Electrical connection 7

F

Functional description 7

I

Installation 5

N

Nameplate 6

O

Operation 5, 8
 Adapter box 12
 Simulator 8
 Operationally safety 5

R

Return 5

S

Safety instructions
 Designated use 4
 Installation, commissioning and operation 5
 Operationally safety 5
 Return 5
 Symbols 4
 Safety symbols 4
 Scope of delivery 6
 Simulator
 Calibration 10
 Connection 9
 Designated use 4
 Functional test 11
 Operation 8, 10
 Storage 6

T

Technical data 14
 Transport 6
 Troubleshooting 13

U

Use, designated 4

W

Wiring diagram 7

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