ANALYTICAL EQUIPMENT FOR

VZOR

ECOLOGY AND POWER INDUSTRY

MAPK-901
pH-METER

Operation Manual

АЯ 74

Nizhny Novgorod
2011

VZOR will appreciate any suggestions and comments aimed at product quality improvement.

If you have any trouble with the instrument performance, please contact us in writing or by phone.

Postal address: 603106, Russia, Nizhny Novgorod, POB 253

Telephone: + 7 (831) 229-65-67, 412-29-40

E-mail: market@vzor.nnov.ru

Website: www.vzornn.com

C O N T E N T S

1 DESCRIPTION AND OPERATION

1.1 Purpose

1.1.1 Product name and identification

pH-meter with a combined electrode:
MAPK-901 pH-meter TU 4215-023-39232169-2007.

pH-meter with individual electrodes:
MAPK-901/1 pH-meter TU 4215-023-39232169-2007.

1.1.2 Purpose

pH-meter is used to measure hydrogen ion activity index (pH), aqueous solution temperature and electromotive force (U).

1.1.3 Applications

pH-meter is used in heat engineering, various industries and agriculture.

1.1.4 Type of measuring convertor unit:

- working with the sensitive element to measure pH;
- without galvanic separation of input and output;
- as a portable small-size unit with an integrated display;
- with a submersible sensitive element; and
- with electronic pre-amplifier integrated with the transducer.

Types of electrodes in various pH-meter versions are shown in Table 1.1.

Table 1.1 − Types of applicable electrodes

pH-meter version	Type of applicable electrodes	No in National Register	Manufacturer
MAPK-901	ЭСК-10601/7(К80.7) combined glass electrode	16767-03	IT Measuring Equipment NPO LLC, Moscow, Russia
	ЭСКЛ-08М combined laboratory glass electrode	6530-99	Gomel Measuring Instrumentation Factory RUP, Gomel, Belorussia Republic
	201020/51-10-04-22-120/000 combined pH-electrode with gel filler	−	JUMO GmbH & CO Fulda Germany

Table 1.1 (Continue)

pH-meter version	Type of applicable electrodes	No in National Register	Manufacturer
МАРК-901/1	ЭС-10601/7(К80.7) glass electrode	16393-03	IT Measuring Equipment NPO LLC, Moscow, Russia
	ЭСр-10101-3,0(К80.4) reference electrode	17908-02	
	ЭСр-10103-3,0(К80.4) reference electrode	17908-02	
	ЭСЛ-43-07СР laboratory glass electrode	2875-98	Gomel Measuring Instrumentation Factory RUP, Gomel, Belorussia Republic
	ЭВЛ-1М3.1 laboratory auxiliary electrode	2189-99	

Note − Types of electrodes used are specified on ordering pH-meter.

1.2 Main parameters

1.2.1 By resistance to climatic load the pH-meter version belongs to B4 group according to GOST 12997-84.

1.2.2 By resistance to mechanical action the pH-meter version belongs to L1 group according to GOST 12997-84.

1.2.3 By protection from environmental exposure the pH-meter (except electrodes) version belongs to IP30 category according to GOST 14254-96.

1.2.4 By resistance to atmospheric pressure the pH-meter version belongs to P1 group according to GOST 12997-84 (atmospheric pressure from 84 to 106.7 kPa).

1.2.5 Parameters of analyzable fluid

1.2.5.1 Analyzable fluid temperature range (aqueous solutions) on pH measurements is the same as pH-meter temperature compensation range shown in Table 1.2 and is governed by the type of electrode used.

Table 1.2 − pH-meter temperature compensation range

Type of electrodes used	pH-meter temperature compensation range, °C
ЭСК-10601/7(К80.7) combined glass electrode	from 5 to 50
ЭСКЛ-08М combined laboratory glass electrode	
201020/51-10-04-22-120/000 combined pH-electrode with gel filler	
ЭС-10601/7(К80.7) glass electrode	
ЭСр-10101-3,0(К80.4) reference electrode	
ЭСр-10103-3,0(К80.4) reference electrode	

Table 1.2 (Continue)

Type of electrodes used	pH-meter temperature compensation range, °C
ЭСЛ-43-07СР laboratory glass electrode	from 5 to 40
ЭВЛ-1М3.1 laboratory auxiliary electrode	

1.2.6 Operating conditions:

– ambient air temperature, °C ……..……. from plus 1 to plus 50;

– ambient air relative humidity at temperature of plus 35°C and below without moisture condensation, %, maximum ……...…….. 80;

– atmospheric pressure, kPa (mm of Hg) ……... from 84.0 to 106.7 (from 630 to 800).

1.2.7 The pH-meter is powered up from a self-contained power supply with voltage 2.4 to 3.4 V (two AA alkaline dry cells) or two nickel-metal hydride batteries (AA).

1.2.8 Power consumption at rated supply voltage of 3.0 V, mW, maximum……..……..... 20.

1.2.9 When the source voltage lowers,  is indicated.

1.2.10 The electrode system in the pH-meter may be set to the parameters shown in Table 1.3.

Table 1.3 − Parameters of electrode system

Slope of electrode system hydrogen curve in the linear part thereof, at least (in absolute figures)	Coordinates of electrode system isopotential point	
	E_i, mV	pH_i, pH
minus 52.2 mV/pH (at temperature of 20 °C)	18±30	6.7±0.3
	0±45	7.0±0.3

1.2.11 Dimensions and weight of the pH-meter main components are shown in Table 1.4.

Table 1.4 − Dimensions and weight of the pH-meter main components

pH-meter version	Identification of components	Dimensions, mm, maximum	Weight, kg, maximum
МАРК-901, МАРК-901/1	ВР24.01.000 convertor unit	175×85×35	0.40
	ВР24.01.300 temperature sensor	∅12×120	0.05
МАРК-901	ЭСК-10601/7(К80.7) glass combined electrode	∅12×170	0.10
	ЭСКЛ-08М glass laboratory combined electrode	∅20×175	
	201020/51-10-04-22-120/000 (Jumo) combined pH-electrode with gel filler	∅12×170	

Table 1.4 (Continue)

pH-meter version	Identification of components	Dimensions, mm, maximum	Weight, kg, maximum
MAPK-901/1	ЭС-10601/7(К80.7) glass electrode	∅12×170	0.10
	ЭСр-10101-3,0(К80.4) reference electrode		
	ЭСр-10103-3,0(К80.4) reference electrode		
	ЭСЛ-43-07СР glass laboratory electrode	∅13×160	
	ЭВЛ-1М3.1 auxiliary laboratory electrode		

1.2.12 Conditions of transportation in shipping crates as per GOST 12997-84:

– temperature, °C ……..……..…….. from minus 5 to plus 50;
– air relative humidity at 35 °C, % ……..…….. 95;
– sinusoidal vibration of 5-35 Hz frequency, shift amplitude of 0.35 mm in direction shown by the "Top" sign on a crate.

1.2.13 Safety requirements

– average time between failures (except electrodes), h, minimum ….. 20000;
– mean recovery time, h, maximum ……..…….. 2;
– pH-meter average life span, years, minimum .....……..……... 10.

1.3 Technical data

1.3.1 Range of hydrogen-ion activity index measurements by pH-meter at analyzable fluid temperature of (25.0±0.2) °C, pH .....…..... 0.000 to 12.000.

1.3.2 The range of pH-meter allowable basic absolute accuracy on measuring pH at analyzable fluid temperature of (25.0±0.2) °C and ambient air temperature of (20±5) °C, pH:

– for MAPK-901 ..... ±0.10;
– for MAPK-901/1 ...……. ±0.05.

1.3.3 The range of pH-meter allowable complementary absolute accuracy on measuring pH caused by changes in analyzable fluid temperature within pH-meter temperature compensation range as shown in Table 1.2, pH:

– for MAPK-901 ..... ±0.20;
– for MAPK-901/1 …….. ±0.10.

1.3.4 The pH-meter analyzable fluid temperature measuring range, °C……..……..... 0.0 to plus 50.0.

1.3.5 The range of pH-meter allowable basic absolute accuracy on measuring analyzable fluid temperature at ambient air temperature of (20±5) °C, °C ..... ±0.3.

1.3.6 The range of pH-meter allowable complementary absolute accuracy on measuring analyzable fluid temperature caused by deviation of ambient air temperature from the normal one (20±5) °C per each ±10 °C within the operating temperature range from plus 5 to plus 50 °C, °C ……..…..…….. ±0.1.

1.3.7 pH-meter U measuring range, mV …… from minus 1.000 to plus 1.000.

1.3.8 The range of transducer allowable basic absolute accuracy on U measurements at ambient air temperature of (20±5) °C, mV …….. ±2.

1.3.9 The range of transducer allowable complementary absolute accuracy on U measurements caused by deviation of ambient air temperature from the normal one (20±5) °C per each ±10 °C within the operating temperature range from plus 5 to plus 50 °C, mV ……. ±1.5.

1.3.10 The range of transducer allowable complementary absolute accuracy on U measurements caused by resistance effect in the measuring electrode circuit per each 500 MΩ at variations from 0 to 1.000 MΩ, mV …..……... ±0.5.

1.3.11 Transducer pH measuring range, pH ……... from 0.00 to 15.00.

1.3.12 The range of transducer allowable basic absolute accuracy on pH measurements at ambient air temperature of (20±5) °C, pH ...…….. ±0.02.

1.3.13 The range of transducer allowable complementary absolute accuracy on pH measurements caused by variations of analyzable fluid temperature from 0 to plus 50 °C (transducer temperature compensation accuracy), pH ……. ±0.03.

1.3.14 The range of transducer allowable complementary absolute accuracy on pH measurements caused by deviation of ambient air temperature from the normal one (20±5) °C per each ±10 °C within the operating temperature range from plus 5 to plus 50 °C, pH …… ±0.01.

1.3.15 Transducer output (reading) setting time, s, maximum ……..…….. 10.

1.3.16 pH-meter output (reading) setting time, s, maximum ……..…….. 15.

1.4 Apparatus components

1.4.1 According to version and delivery set the apparatus is composed of:

- convertor unit with temperature sensor;
- electrodes as shown in Table 1.1; and
- tools and accessories kit.

1.5 Design and operation

1.5.1 pH-meter general data

MAPK-901 (MAPK-901/1) pH-meter is a small-size microprocessor instrument used to measure pH or U and temperature of aqueous solutions.

Measured temperature, pH and U (depending on measurement conditions) are read from a digital liquid crystal display (hereafter display) with the least significant digit 0.1 °C; 0.001 pH or 0.1 mV.

According to the version, the pH-meter may use a combined electrode or individual electrodes (measuring electrode and reference electrode).

When pH-meter is turned off, current time is indicated.

1.5.2 pH-meter operating principle

The pH-meter operation is based on the potentiometric analyzable solution pH measuring method.

The electrode system immersed in an analyzable solution generates U linearly dependent on pH value.

Signals (U) from the electrode system and temperature sensor are applied to the convertor unit where they are amplified and digitized.

The measured U of the pH-meter electrode system is translated into pH value in view of analyzable solution temperature, i.e. temperature compensation occurs automatically. The compensation relates to only U variations of the electrode system.

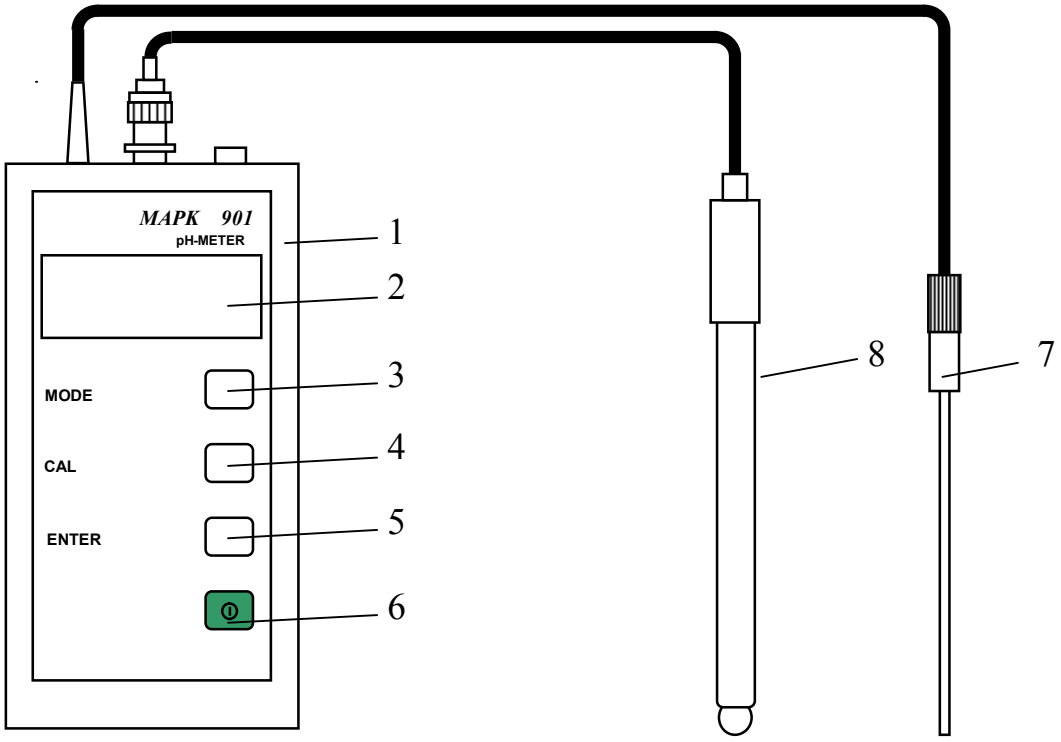
1.5.3 pH-meter design

MAPK-901 pH-meter is shown in Figure 1.1a and MAPK-901/1 pH-meter is illustrated in Figure 1.1b.

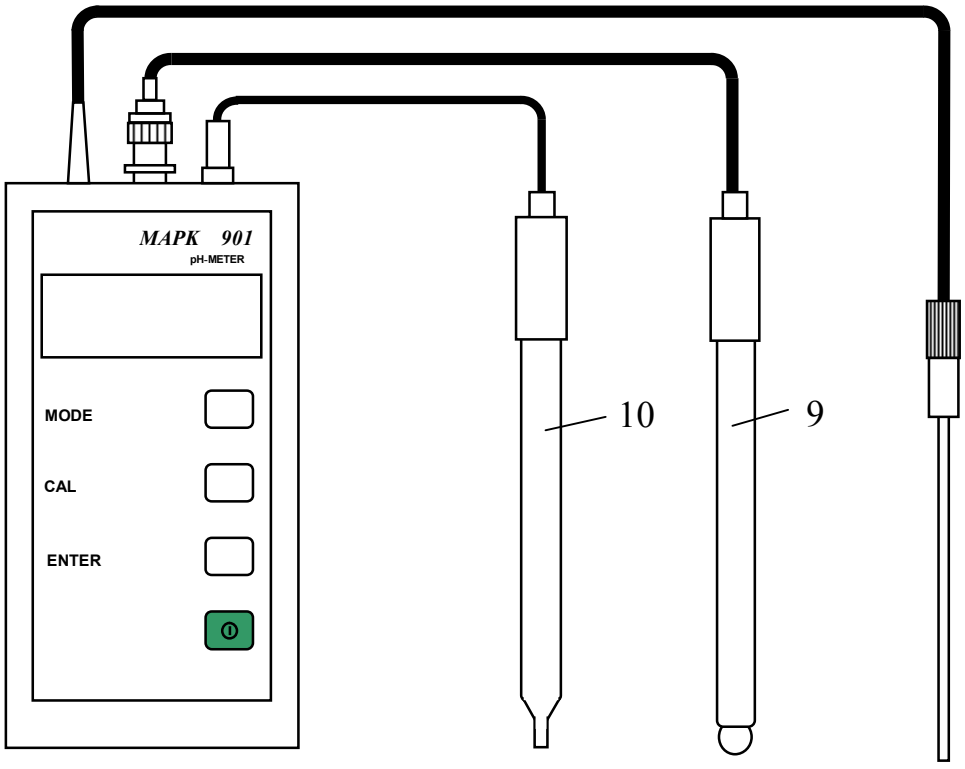
The convertor unit 1 enclosed in a plastic casing, transforms signals from the electrode system, displays measurement.

The convertor unit front panel carries:

– a display screen 2 to show measured pH, U, temperature, and indicate battery charge;


MAPK 901
pH-METER
MODE
CAL
ENTER
1
2
3
4
5
6
7
8

a


MAPK 901
pH-METER
MODE
CAL
ENTER
9
10

b

Fig. 1.1

– key 3, the “**MODE**” button for choosing measuring mode (pH, U, or temperature);

– key 4, the “**CAL**” button for choosing calibration mode;

– key 5, the “**ENTER**” button for entering information during calibration into memory; and

– key 6,  , for turning analyzer on and off.

The convertor unit rear panel bears a cover of the dry cell compartment.

Temperature sensor 7 is connected with convertor unit with nondetachable connection. In accordance with analyzer version, the upper end face of the MAPK-901 pH-meter convertor unit is connected with double-junction electrode 8 (Fig. 1.1a), or with measuring electrode 9 and comparison electrode 10.

1.6 Measuring instruments, tools and appliances

The pH-meter maintenance shall additionally require the following tools and appliances not included into the delivery set:

– 2 mm screwdriver;

– 2 cm^3 syringe to fill an electrode with electrolyte;

– K-2-1000-50 flask;

– B-1-250 beaker;

– KCl solution of 3 mol/dm^3 concentration;

– HCl solution of 0.1 mol/dm^3 concentration.

2 INTENDED USE

2.1 Operating limitations

2.1.1 The pH-meter is used to measure hydrogen-ion activity index (from 0 to 12 pH), temperature of aqueous solutions (from 0 to plus 50 °C), and U (from minus 1.000 to plus 1.000 mV).

2.1.2 When working with pH-meter, protect electrodes and convertor unit from shocks since fragile materials have been employed in their design.

2.1.3 On pH measurements electrodes are to be immersed in a solution at least 16 mm deep.

2.1.4 Electrolyte level in electrodes on measurements is to be above the analyzable solution level.

2.1.5 Avoid pH, U and temperature measurements in solutions containing hydrofluoric acid or salts thereof and substances that form deposits and films on electrode surfaces as well as operation and storage of dry electrodes.

2.2 Safety Precautions

2.2.1 Electric safety of operating personnel is ensured due to use of self-contained DC power supply of voltage from 2.2 to 3.4 V.

2.2.2 The pH-meter is to be operated by people who acquainted themselves with this manual and safety rules for handling reagents.

2.3 pH-meter preliminary operating procedures

Before use unpack pH-meter, check components and make sure that the apparatus is free of damage.

If the pH-meter stayed in cold environment, keep it at room temperature for at least 8 h and then start preliminary operating procedures.

2.3.1 Connection of power supply

To connect power supply, remove the dry cell compartment cover on the rear panel of the convertor unit. Install two AA alkaline dry cells or two charged AA nickel-metal hydride batteries according to marking in the compartment. Close the dry cell compartment cover.

With a power supply installed in the battery compartment, the analyzer can indicate time, when turned off. The dot between hours and minutes flickers at an interval of 1 s.

Time indication may be switched off and on again by pressing the **MODE** button, with the analyzer off.

Proceed as follows to correct time:

- press the **CAL** button, minutes will start blinking on the display;
- use the **MODE** and **ENTER** buttons to set the minute value;
- press the **CAL** button, hours will start blinking on the display;
- use the **MODE** and **ENTER** buttons to set the hour value;
- press the **CAL** button to complete time setting, the analyzer goes into the time indication mode.

Switch on the analyzer and check if the display shows pH or temperature readings in mV, or °C respectively.

IMPORTANT: OBSERVE POLARITY when connecting power supply. Otherwise this may cause pH-meter failure!

If voltage lowers to 2.4 mV, the ⊞ sign blinks, telling that it is important to replace AA-type alkaline batteries or charge batteries.

If voltage lowers to 2.2 mV, the ⊞ sign burns. Measuring error cannot be identified. It is important to replace AA-type alkaline batteries or charge batteries immediately.

2.3.2 To make electrode (electrodes) available

2.3.2.1 Make electrode (electrodes) available in compliance with the electrode certificate (certificates) attached to the delivery set.

2.3.2.2 Connect electrode (electrodes) to the convertor unit as shown in Fig. 1.1a or 1.1b according to pH-meter version.

2.3.3 pH-meter calibration

2.3.3.1 General guidelines

When operating the apparatus, periodically calibrate it with connected electrodes. Calibration is to be carried out against buffer solutions comprising Category 2 pH working standards that meet GOST 8.135-2004 and TU 2642-002-42218836-96 Specifications.

Prior to calibration the reference electrode or combined electrode filling hole is to be opened.

The pH-meter is to be calibrated at buffer solution exhibiting 1.65 and 9.18 pH values and temperature of (20±5) °C. In this case temperatures of the two calibration solutions shall not differ by more than 0.5 °C.

2.3.3.2 pH-meter calibration procedure

1 Clean electrode (electrodes) and temperature sensor in distilled water, first, (in two vessels in succession) and then in the first buffer solution against which calibration is to be undertaken which exhibits pH=1.65 at solution temperature of 25.0 °C.

2 Power up the pH-meter.

3 Place pH-electrode (electrodes) and temperature sensor in the fresh buffer solution pH=1.65 at solution temperature of 25.0 °C and leave for 10 min.

4 Press the "**CAL**" button, the indicator should show the following:

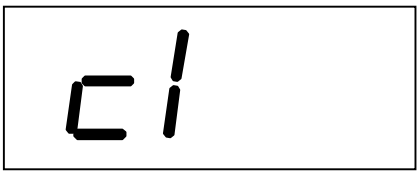


Fig. 2.1

5 Press the "**ENTER**" button, and the « C » starts blinking.

6 Later, the pH value of the first buffer solution starts blinking on the indicator in accordance with Table A.1 (it depends of buffer solution temperature).

7 Press the "**ENTER**" button. Calibration against the first buffer solution is done. Indicator will be in accordance with Fig. 2.2.

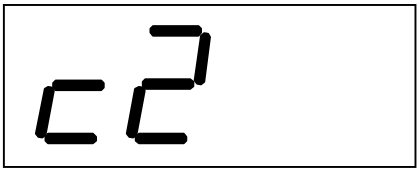


Fig. 2.2

8 Remove electrodes and temperature sensor from the buffer solution pH=1.65 at solution temperature of 25.0 °C.

9 Wash electrodes in distilled water (in two vessels in succession) and then in a volume of the second buffer solution, in which calibration will be held, pH=9.18 at solution temperature of 25.0 °C.

10 Place electrodes and temperature sensor in fresh second buffer solution pH=9.18 at solution temperature of 25.0 °C and leave for 10 min.

11 Press the "**ENTER**" button, and the « C » starts blinking.

12 Later, the pH value of the second buffer solution starts blinking on the indicator in accordance with Table A.1 (it depends of buffer solution temperature).

13 Press the "**ENTER**" button. Calibration against the second buffer solution is done. The pH-meter shall go to the measurement mode.

During calibration one can leave this mode by pressing the "**MODE**" button.

If the analyzer was not switched off after leaving calibration mode, and calibration against first buffer solution was finished, calibration may be continued from calibration against the second buffer solution. To do so, press the "**CAL**" button twice and precede calibration against the second buffer solution (p. 9).

The procedure of calibration is finished only when calibration against the second buffer solution is finished.

If the indicator, shown on Fig. 2.3 appears during calibration, one should leave calibration mode and check buffer solutions' quality, pH-electrode and connecting cables.

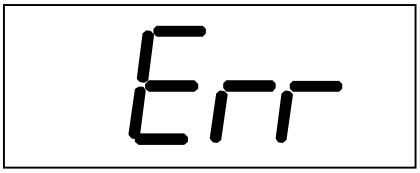


Fig. 2.3

2.4 Measurement procedure

2.4.1 Procedure of measurements without the protective enclosure

Components of the pH-meter must be available for operation according to 2.3.

Prior to measurements open the electrode filling hole and remove the protective cap.

Wash an electrode (electrodes) and temperature sensor in distilled water and immerse into the analyzable solution. On pH measurements an electrode is to be immersed in a solution at least 16 mm deep. Electrolyte level in an electrode on

measurements is to be above the analyzable solution level.

On pH or U measurements take readings after they have stabilized.

Usually in measurements using electrodes readings stabilize within maximum of 10 min. However, in some solutions at temperature close to 0 °C readings may stabilize within 15 min.

Storage between measurements is to meet requirements set out in the electrode (electrodes) certificates. To reduce electrolyte consumption in the electrode, the electrode filling hole is to be closed within idling periods.

2.4.2 Procedure of measurements using the protective enclosure

The protective enclosure protects electrodes in measurements and in pH-meter haulage. It is supplied as agreed to by a customer with any type of electrodes except ЭСКЛ-08М and ЭСКЛ-08М.1 combined laboratory glass electrodes.

Moisten an electrode (electrodes) and the sensor in distilled water and place them in the protective enclosure in the sockets as shown in Fig. 2.4.

Prior to measurements screw out the protective enclosure base and proceed with measurements as described in 2.4.1 immersing the enclosure with electrodes and temperature sensor into a solution.

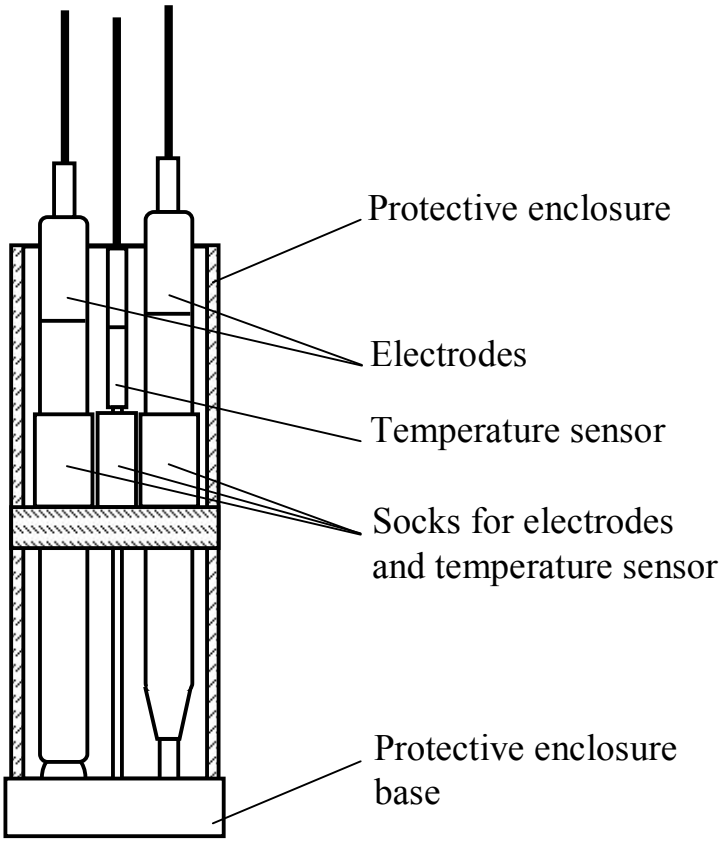


Fig. 2.4

On completion of measurements wash electrodes and the protective enclosure with distilled water and screw the base onto the enclosure.

In case of long breaks in measurements remove the electrode (electrodes) from the protective enclosure and store them as described in their certificates.

To reduce electrolyte consumption in the electrode, the electrode filling hole is to be closed within idling periods.

2.5 Troubleshooting

2.5.1 Probable causes and remedies are laid down in Table 2.1.

Table 2.1

Trouble and symptoms	Probable cause	Remedy
1 pH-meter is not powered up	Poor contact with power supply	Open the dry cell compartment and clean contacts of convertor unit, dry cells or batteries
	Supply voltage is below 2.2V	Replace dry cells or charge batteries
2 pH-meter readings are unstable	Cable rupture or poor contact in the electrode cable connector	Check for safe contact or repair cable rupture
3 In measurements in different buffer solutions apparatus readings remain nearly the same when pH-electrode (electrodes) is transferred from one buffer solution into another one	Defective electrode (one of electrodes)	Replace electrode
4 During calibration against buffer solutions the "***Err***" message appears on the screen	Cable rupture or poor contact in the electrode cable connector	Repair rupture. Ensure safe contact
	Defective electrode	Replace electrode

2.5.2 Setting of predetermined parameters of electrode system pH calibration

Setting of predetermined parameters of electrode system pH calibration is used for checking the transducer if pH-meter readings seem to be doubtful.

To set predetermined parameters, proceed as follows:

- turn off pH-meter pressing the ⏻ button;
- press the "**ENTER**" button and holding it turn on the pH-meter pressing the ⏻ button (message "***donE****" should appear on the indicator)*;
- depress "**ENTER**" button;
- turn the analyzer off and on.

To check the transducer apply *E* U to the transducer input, mV, according to the Table 2.2.

Table 2.2

pH value	Voltage, applied to the transducer input, mV
0,00	407,7
3,00	233,2
6,00	58,7
9,00	-115,8
12,00	-285,8
15,00	-453,6

Note – Given voltage values accord with 20 °C temperature.

3 Maintenance

3.1 pH-meter scheduled maintenance

3.1.1 On-going inspection of the convertor unit, electrodes and connecting cables for damage.

3.1.2 Cleaning of dirty external surfaces of the convertor unit using soft detergents.

3.1.3 pH-meter calibration against buffer solutions according to 2.3.3.

pH-meter calibration against buffer solutions is to be undertaken:

- once a month;
- if pH-meter proper workability is doubtful;
- after pH-meter repair or long storage; and
- on electrode replacement.

4 DELIVERY SET

4.1 Delivery set is shown in table 4.1.

Table 4.1

Description and identification of components	Version	
	MAPK-903	MAPK-903/1
1 BP48.01.000 convertor unit with BP48.01.400 temperature sensor	1	1
2 ЭСК-10601/7(К80.7) combined glass electrode	1*	–
3 ЭСК-10601/4(К80.7) combined glass electrode	1*	–
4 ЭСКЛ-08М combined laboratory glass electrode	1*	–
5 ЭСКЛ-08М.1 combined laboratory glass electrode	1*	–
6 201020/51-10-04-22-120/000 combined pH-electrode with gel filler	1*	–
7 ЭС-10601/7(К80.7) glass electrode	–	1*
8 ЭС-10601/4(К80.7) glass electrode	–	1*
9 ЭСр-10101-3,0(К80.4) reference electrode	–	1*
10 ЭСр-10103-3,0(К80.4) reference electrode	–	1*
11 ЭСЛ-43-07СР laboratory glass electrode	–	1*
12 ЭВЛ-1М3.1 laboratory auxiliary electrode	–	1*
13 BP48.04.000 tools and accessories kit	1	1
14 BP48.00.000РЭ Operation Manual	1	1
* Type of electrodes shall depend on version and as agreed to by a customer.		

ATTACHMENT A

(*reference*)

pH of standard buffer solutions versus temperature

Table A.1

Temperature, °C	Chemistry of buffer solutions					
	$KH_3(C2O_4)_2 \times 2H_2O$ tetraoxalate, 2-aqueous, (25.219 ppt)	$KHC_4H_4C_5$ potassium hydrotartrate, saturated at 25 °C, (7.868 ppt)	$KC_8H_5O_4$ potassium hydrophthalate (10.120 ppt)	$KH_2PO_4 + Na_2HPO_4$ potassium dihydrophosphate (3.3880 ppt) +sodium monohydrophosphate (3.5330 ppt)	$Na_2B_4O_7 \times 10H_2O$ sodium tetraborate, 10-aqueous (3.8064 ppt)	$Na_2CO_3 + NaHCO_3$ sodium carbonate (2.6428 ppt) + sodium carbonate, acidic (2.0947 ppt)
	1.65	3.56	4.01	6.86	9.18	10.00
0	-	-	4.000	6.961	9.475	10.273
5	-	-	3.998	6.935	9.409	10.212
10	1.638	-	3.997	6.912	9.347	10.154
15	1.642	-	3.998	6.891	9.288	10.098
20	1.644	-	4.001	6.873	9.233	10.045
25	1.646	3.556	4.005	6.857	9.182	9.995
30	1.648	3.549	4.011	6.843	9.134	9.948
37	1.649	3.544	4.022	6.828	9.074	9.889
40	1.650	3.542	4.027	6.823	9.051	9.866
50	1.653	3.544	4.050	6.814	8.983	9.800
60	1.660	3.553	4.080	6.817	8.932	9.753
70	1.67	3.57	4.12	6.83	8.90	9.730
80	1.69	3.60	4.16	6.85	8.88	9.73
90	1.72	3.63	4.21	6.90	8.84	9.75
95	1.73	3.65	4.24	6.92	8.89	-

NOTE!

In pH-meter MAPK-901 #_____ is realised the function of measuring pH, adjusted to 25 °C in accordance with MU 34-70-114-85.

pH is reduced to pH_{25} in the range from plus 5 to plus 50 °C.

To measure pH of "pure" water, use is to be made of the FM-901/903 BP24.16.100.

The FM-901/903 flow-through module stabilizes water flow from a sampler, ensures metering and visual control of water flow rate to the combined electrode. It is intended to measure pH_{25} in water with specific conductance over 0.2 μS/cm. At conductance below 0.2 μS/cm measurement accuracy is not regulated.

To see pH_{25} measured value one should press the "**MODE**" button until **pH25** symbol appears on indicator's right part.

pH of highly dilute alkaline and acid solutions as a function of analyzable fluid temperature computed on the basis of the data from MU 34-70-114-85