NPP «Avtomatica»

www.avtomatica.ru

Manufacturer of liquid analyzers

Conductometers, ION meters
pH/ORP meters, pNa meters,

Vladimir, Russia

NPP Avtomatica – Established in **1991**

27 *year* of design and manufacture of measurement devices

Team:
- 5% with PhD (Eng.Sc) degree;
- 40% with higher education.

Licenses, Certificates

ISO 9001-2015

Licenses of RosAtomNadzor for disign and manufacture of equipment for Nuclear Power Plants.

Certificate **IQNet.**

Work orginization principes:

- purchase of components from permanent suppliers certified to ISO-9001;
- check of incoming components;
- quality plan work;
- organization of acceptance testing in conjunction with the customer;
- complete set of documentation for installation, commissioning, operation, maintenance and repair;
- production capacity (per year):

more than **6000** devices;

- warranty period of devices operation **24 months**.

Our products

Analysers

- Conductometers
- ORP/pH-meters
- Dissolved oxygen meters
- Turbidimeters
- Sodium meters

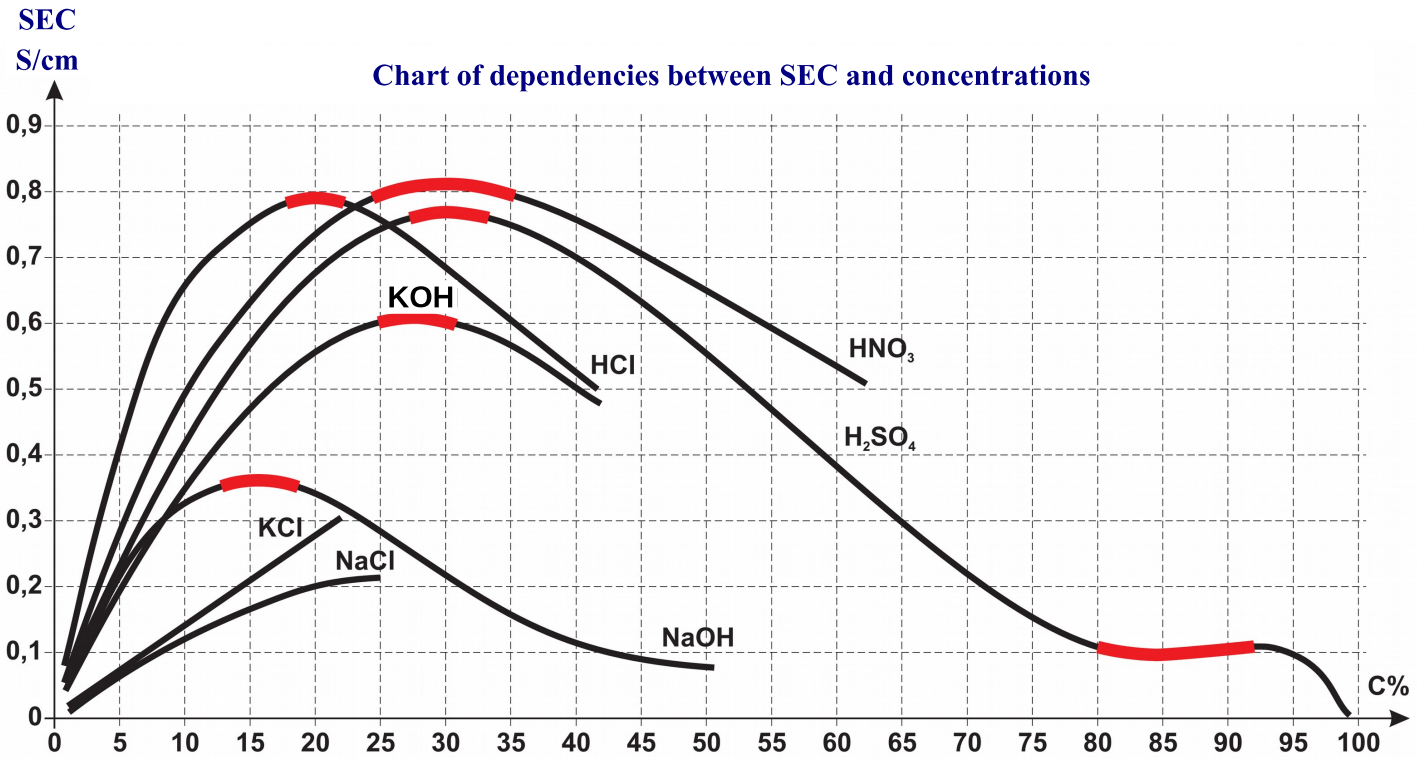
Measurment instruments

- Temperature transmitters
- Pressure transmitters
- Transmitters of Liquid Level
- Controllers
- Process Control System

Licenses of Rosatomnadzor for design and manufacture of equipment for nuclear power plants.

ISO 9001-2015 - certificate of the Federal Agency for Technical Regulation and Metrology

Certificate **IQNet.**

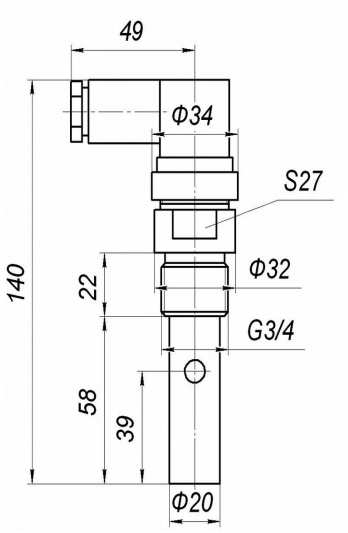


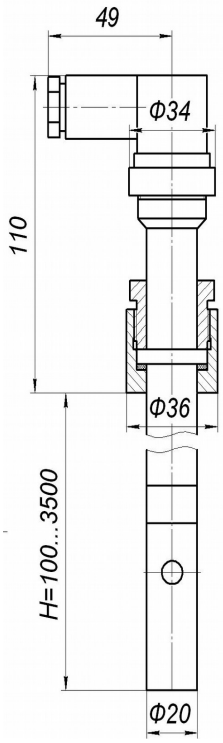
Conductometer — concentration meter C-31xx

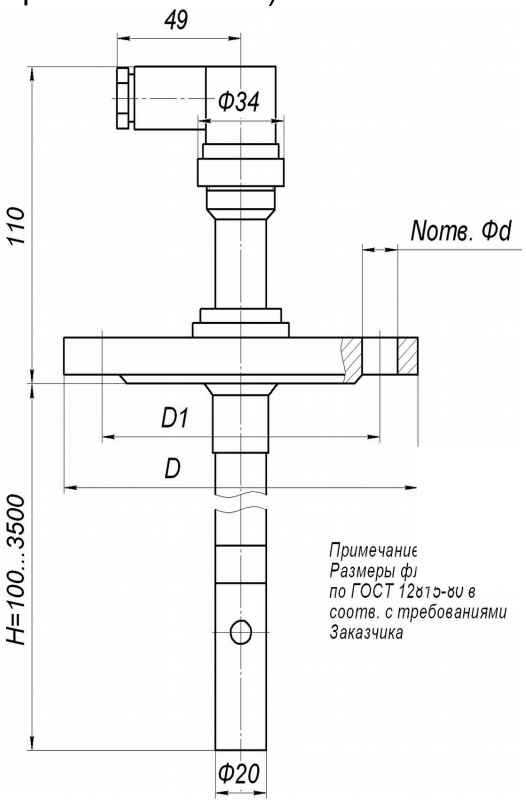
With passive primary transducers (sensors)	Transmitters	With active primary transducers (sensors)
    **C-3122.P** **C-3122.P.I**	 **C-3110**  **C-3130**	  **C-3122.x.NP** **C-3101M.x.NP** 
Output signals: analog current, RS-485, relay	Output signals: analog current, or RS-485	Output signals: analog current, RS-485 (C-3122.x.NP), relay
L<10м	**L<800м**	**L<800м**

Types of installation of immersion contact sensors for SEC measurement

Temperature of analyzed liquid: **<95°C, <200°C** (Hi temperature version)
Pressure of analyzed liquid: **<1,6 MPa**
Material of sensors:
Stainless steel, Ti, Ta, SS316







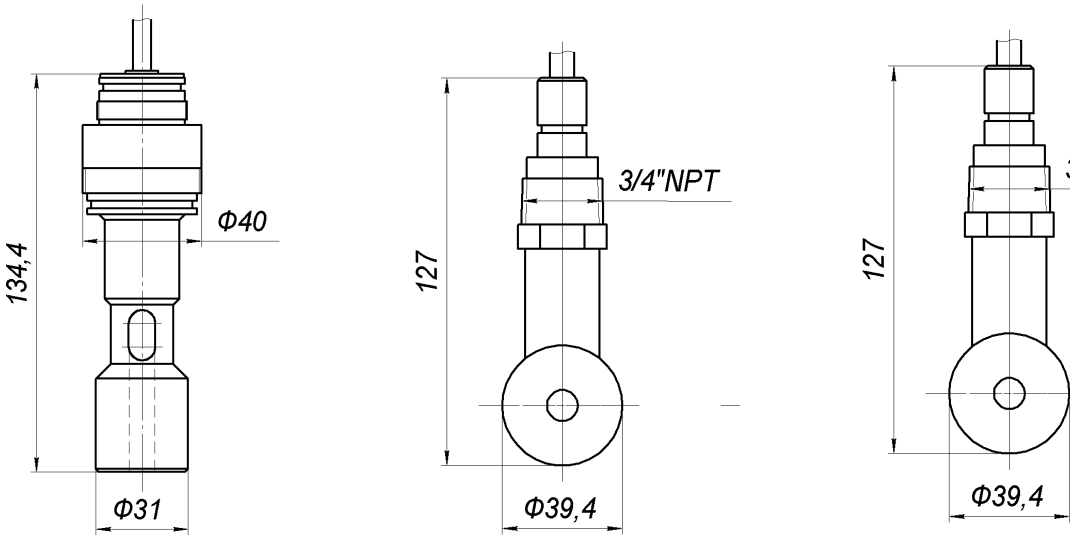
4-pole contact SEC sensors

Benefits.

1. Value of the transient resistance and resistance of the connecting wires do not affect the measurement results.
2. Polarization is completely excluded.
3. Wider measurement range (as down to μS/cm, and more upper).
4. Less sensitive to contamination and less demanding maintenance.
5. No leakage currents.
6. Can work with contaminated, aggressive fluids.
7. Designed to work in radiation area, remotedly from the electronic unit (up to 20 m).

10 μS/cm. 700 mS/cm; P <20 bar; T <110 °C

Contactless inductive SEC sensors



Model	SI-315	ES-1-A	DDG-GY
Material	PVDF	PP	PFA (Teflon)
Tmax, °C	80	105	100
Pmax,MPa	0,3	0,6	0,6

Contactless inductive SEC sensors

Benefits

1. Made of corrosion-resistant materials. Suitable for all acids and alkalis.

2. No polarization effect.

3. Can work with contaminated and “sticking” liquids.

4. Wide measuring range.

5. Distance from measuring device or transmitter up to 50m

6. Tested at absorbed dose of 130,000 Gy

Limitations

1. Temperature inertion.

2. Cannot measure low SEC

3. Require a distance from a pipe wall of not less than 30mm

Analyzers for Nuclear Power Plants. Specifications

External influencing factors (EIF)		Categories (groups) of EIF	EIF parameters	International standart
Resistance to radiation:	- absorbed dose rate of the sensor		max 1,3·10^5 Gy	
	The electronic block of PT is resistant to the effect of the integral absorbed dose of ionizing radiation		max 150 Gy	
Seismic resistance		Category II for NP-031-01 (Rus)	- stable operating at seismic influences with intensity of 9 points on MSK-64 scale	IEC 60980, ANSI/IEEE Std 344-1987 scale EMS-98
Resistanse to electromagnetic influence		IV by GOST 32137 (Rus), criterion A	- stable with 16 types of electromagnetic influences and very hard electromagnetic environment - stable operating under electromagnetic influences	Directive 2014/30/EC series of standards IEC 61000
Stability to mechanical influences in accordance with GOST 12997 (Rus)		V2	stable with mechanical influences : freq (10-150) Hz acceleration 19,6 m/s^2 offset 0,15 mm	----
Climatic version in accordance with GOST 15150 (Rus)		T5; TH3, TH4 (tropical version)	(+1..+35) °C, humidity 98 % (+1..+45) °C, humidity 98 % PT is resistant to mold fungi	IEC 60721 IEC 60068

C-3101.x.NP Conductometer — concentration meter for Nuclear Plants

C-3101.x.NP - Conductometer-concentration meter (analyzer) is a single-channel measuring instrument and consists of a primary transducer (PP) and measuring instrument (PI). The analyzer is designed for use in hard environments, namely: for seismic resistance, climatic conditions, radiation resistance, difficult conditions for electromagnetic compatibility (EMC).

Measurment range:	(0...1); (0...10); (0...100); (0..1000) µS/cm (0...1); (0...10); (0...100); (0..1000) mS/cm concentration of solutions of acids, alkalis, salts
Functions:	Measurement, Indication, Alarm, Thermal compensation, Conversion
Seismic resistance:	Category II for NP-031-01 (Rus)
Electromagnetic compatibility:	IV by GOST 32137 (Rus), criterion A
Radiation resistance:	Sensing PP unit is resistant to Absorbed dose rate of – up to **1,3x10^5 Gy** Electronic PP unit is resistant to Absorbed dose rate of **<150 Gy**
Safety class:	**3, 4** (NP-001-15 Rus)
Output signals:	analog (0..5), (0..20) or (4..20) mA; 2 relay

Hydropanel HP**-3122** with C**-3122.P**

Benefits:

1. Automatic Measurement:
- Conductivity1 (C1), Conductivity2 (C2), Conductivity`s difference ΔC=C1-C2;
- Temperature (T);
- Flow (F).

2. Control of depletion of ion exchange resin in the filter.

3. Alarms when parameters go beyond setpoints (C1,C2,ΔC,T,F).

4. Calibration without dismantling.

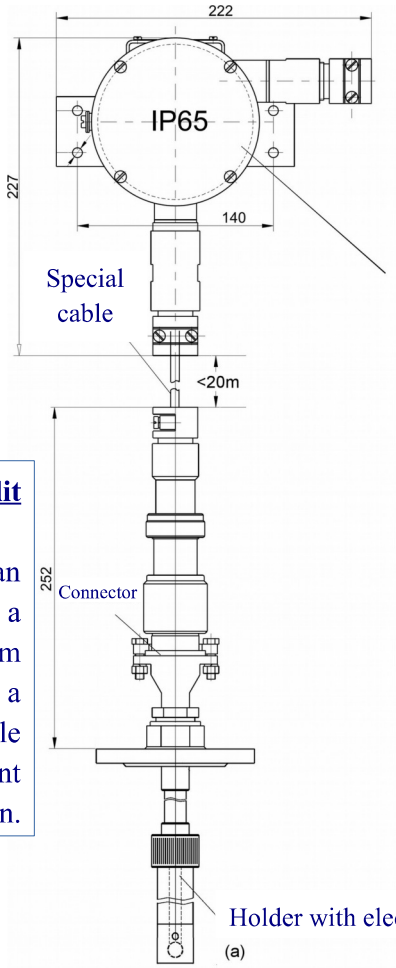
5. Material – stainless steel.

C-3122.x.NP Two channel conductometer — concentration meter for Nuclear Plants

C-3122.x.NP – is a two-channel measuring instrument and consists of one or two active primary transducers (PP) and one wall mounted measuring device (PI). The analyzer is designed for use in hard environments, namely: seismic, climatic , radiation conditions, difficult conditions for electromagnetic compatibility (EMC).

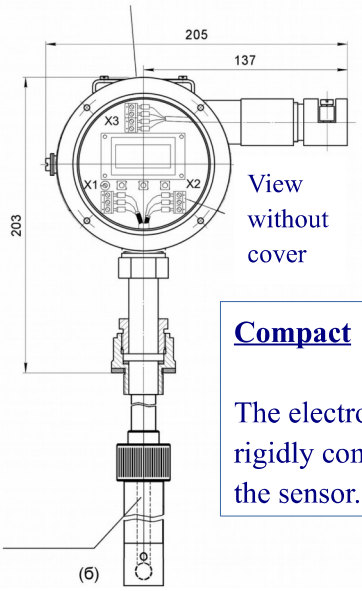
Measurment range:	(0...1); (0...10); (0...100); (0..1000) µS/cm (0...1); (0...10); (0...100); (0..1000) mS/cm concentration of solutions of acids, alkalis, salts
Functions:	Measurement, Indication, Alarm, Thermal compensation, Conversion Trends indication, Data logging
Seismic resistance:	Category II for NP-031-01 (Rus)
Electromagnetic compatibility:	IV by GOST 32137 (Rus), criterion A
Radiation resistance:	Sensing PP unit is resistant to Absorbed dose rate of – up to **1,3x10^5 Gy** Electronic PP unit is resistant to Absorbed dose rate of **<150 Gy**
Safety class:	**3, 4** (NP-001-15 Rus)
Output signals:	2 analog (0..5), (0..20) or (4..20) mA; RS-485, 4 relay

Types of conductometer primary transducers for nuclear power plants



Split

The electronic unit can be mounted to a distance of 20 m from the sensor using a special non-flammable cable that is resistant to radiation.



Compact

The electronic unit is rigidly connected to the sensor.

C-3110, C-3110.Ex Conductometer-concentration meter with contact sensor

The conductometer-concentration meter (analyzer) is a transmitter: a monoblock single-channel measuring instrument consisting of an electronic unit and a sensing unit, which is installed directly on the monitored object.

The sensor is rigidly connected to the electronic unit or can be mounted at a up to 5m distance from the electronic unit .

Designed to measure and monitor the specific electrical conductivity (SEC) solutions of salts, alkalis and acids. On the basis of the known dependences between the SEC and the concentration of the analyzed component, the transmitters can be used as salt meters and concentration meters (C — 3110.K).

Measurment ranges:	(0...10); (0...100); (0..1000) mS/cm (0...25) %, (95...100) % H2SO4; (0...17) %; (0...20) %, (35...70) % HNO3; (0..10) %, (20...40) % NaOH; (0...20) %, (0...230) g/l NaCl etc.
Functions:	Measurement, Indication, Thermal Compensation, Transformation
Explosion proof:	**1ExdIICBT6X**
Output signals:	analog (0..5), (0..20) or (4..20) mA or RS-485

C-3130, C-3130.I-Ex Conductivity meter with inductive sensor

The conductometer-concentration meter (analyzer) is a transmitter: usually a monoblock single-channel measuring instrument consisting of an electronic unit and a sensor, which is installed directly on the monitored object.

The sensor is rigidly connected to the electronic unit or can be mounted at a up to 20 m distance from the electronic unit.

Sensor of analyzer is inductive, contactless, made of a material having high chemical resistance to acids and alkalis. The robust design and smooth surface of the sensor, as well as a large-diameter of hole, provide low probability of contamination. It also privides the possibility of easy cleaning of the sensor and the ability to work with contaminated liquids.

Measurment ranges:	(0...10); (0...100); (0..1000) mS/cm (0...25) %, (95...100) % H2SO4; (0...17) %, (23...50) % HCl; (0...20) %, (35...70) % HNO3; (0..10) %, (20...40) % NaOH; (0...20) %, (0...230) g/l NaCl etc.
Functions:	Measurement, Indication, Thermal Compensation, Transformation
Explosion proof:	**1ExdIICBT6X**
Output signals:	analog (0..5), (0..20) or (4..20) mA or RS-485

Industrial pH/ORP-meters

With passive primary transducers (sensors)	Transmitters	With active primary transducers (sensors)
 **pH-4131**		 **pH-4121**
 **pH-4122.П**	**pH-4101**	 **pH-4110**
		 **pH-4122**
Output signals: analog current, RS-485, relay	Output signals: analog (0..5), (0..20), (4..20) mA, or RS-485	 Output signals: analog current, RS-485 (exclude pH4121), relay
L<10м	**L<800м**	**L<800м**

pH-4121.NP industrial pH/OPR-meter for Nuclear Plants

pH-4121.NP is a single-channel measuring instrument and consists of a primary transducer (PP) and a measuring instrument (PI).

PP consists of an electronic unit and a holder, in which a pH electrode is installed.

The pH meter is intended for use in hard environments, namely: seismic resistance, hard climatic conditions, radiation resistance, difficult environment for electromagnetic compatibility (EMC).

pH Measurment range:	(0...14) pH
ORP Measurment range:	(-1500...1500) mV
Functions:	Measurement pH/ORP, Temperature; Alarming; Thermal compensation, Indication, Signal conversion
Seismic resistance:	Category II for NP-031-01 (Rus)
Electromagnetic compatibility:	IV by GOST 32137 (Rus), criterion A
Radiation resistance:	Resistant to Absorbed dose rate of pH-electrodes – up to **$3{,}0 \times 10^3$ Gy** Electronic PP unit is resistant to Absorbed dose rate of **<150 Gy**
Safety class:	**3H, 4H**
Output signals:	analog (0..5), (0..20) or (4..20) mA; 2 relay

pH-4122.NP Two channel industrial pH/ORP-meter for Nuclear Power Plants

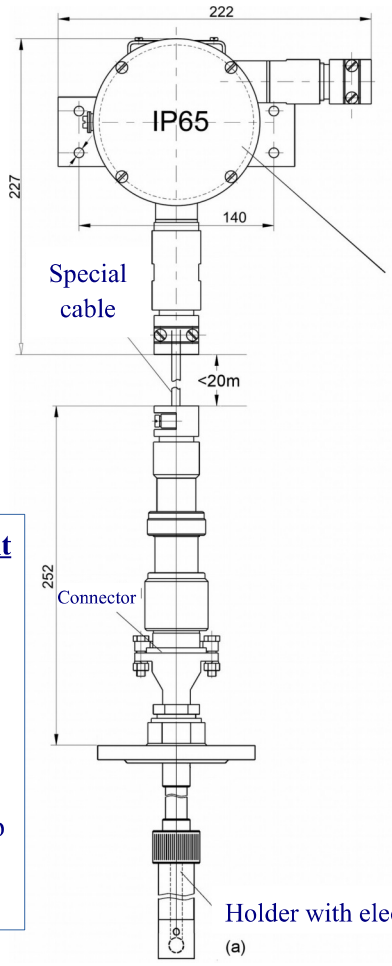
pH-4122.NP is a two-channel analyzer and consists of one or two primary transducers (PP) and measuring instrument (PI). PP consists of an electronic unit and pH-electrode installed in the holder.

pH meter designed for use in hard environments. **For use in radiation areas, holder with a pH-electrode can be mounted at a up to 20 m distance from the electronic unit of the PP with a special cable .**

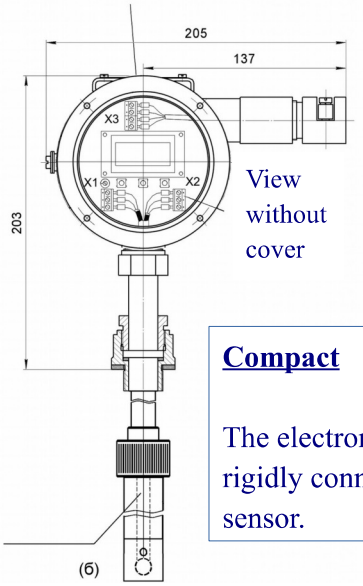
Automatic diagnosis of the electrode function is available.

pH Measurment range :	(0...14) pH
ORP Measurment range:	(-1500...1500) mV
Functions:	Measurment of pH/ORP, Temperature; Alarm; Thermal compensation, indication, signal conversion
Seismic resistance:	Category II for NP-031-01 (Rus)
Electromagnetic compatibility:	IV by GOST 32137 (Rus), criterion A
Radiation resistance:	Resistant to Absorbed dose rate of pH-electrodes – up to **$3{,}0 \times 10^3$ Gy** Electronic PP unit is resistant to Absorbed dose rate of **<150 Gy**
Safety class:	**3H, 4H**
Output signals:	analog (0..5), (0..20) or (4..20) mA; RS-485, 4 relay

Types of pH-meters primary transducers for nuclear power plants



Transducer



Split

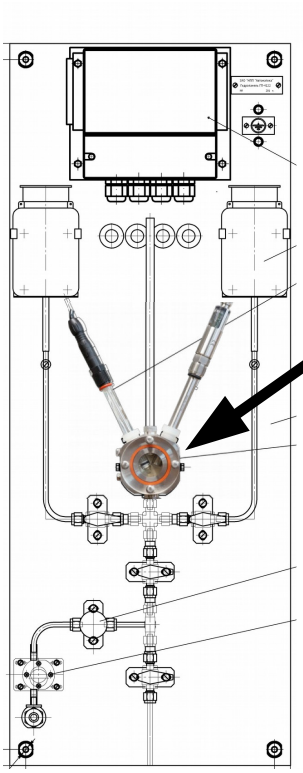
The electronic unit can be mounted to a distance of 20 m from the sensor using a special non-flammable cable that is resistant to radiation.

Compact

The electronic unit is rigidly connected to the sensor.

Hydropanels **HP-41xx** with **pH-4122.P**

HP-4122.1



HP-4122.2

Innovative stainless steel measuring cell with a transparent window for visual observation.

Benefits:
1. Automatic Measurement:
- pH
- Temperature (T);
- Flow (F).

2. Thermal compensation

3. Current output (4..20) мА, RS-485 interface.

4. Alarms when parameters go beyond settings (pH, T);

5. Calibration without dismounting

6. Ionotrode Electrode for High Purity Water

7. Data logging, charts

pH/ORP meter pH**-4101.Ex**

«S»

«D»

«I»

pH-4101 is designed to automatically measure the pH/ORP of the analyzed liquid and can be completed with flow type or immersion type holders for the combined electrode.

pH meter-transmitter provides measurement, indication of pH/ORP and fluid temperature, conversion of measured pH/ORP to a unified DC signal (4..20) mA or RS-485 digital signal.

pH meters pH4101.I-Ex (electronic unit of PP in this case "I") have the type of explosion protection "flameproof enclosure" marked "1Ex d IIB T6 X" according to GOST R 52350.1 (Rus).

pH Measurment ranges:	(0...14) pH
ORP Measurment ranges:	(-1500...1500) mV
Functions:	Measurement pH/ORP, Temperature; Signaling; Thermal compensation , Indication, Conversion of signals to (4..20) mA, RS-485
Resistance to dust and water:	IP65
Resistance to vibrations:	V2
Output signals:	analog (0..5), (0..20) or (4..20) mA or RS-485

Provides maximum accuracy over a long period of time.

Stable measurements in samples with low conductivity of not less than **0.2 µS/cm**

Side tap for tube to 3M KCl electrolyte vessel

IonoTrode

InchTrode

MS VP
Polilyte Plus

Polilyte Pro

Characteristics

- operating temperature: **0..140 °C**
- pressure: **0..6; 0..50 bar**

- connections
  - MS – contactless **MemoSens**
  - VP - detachable
  - cable

- Chemical resistance: to HF, CO_2

- with electrolyte pressurization

- SinglePore technology, triple diaphragm for working in contaminated solutions

DO-5101 Dissolved oxygen analyzer

Designed to measure the concentration of dissolved oxygen and the temperature of the analyzed liquid.

Consists of one amperometric sensor, a flow meter (optional) and a wall-mounted measuring instrument.

It is completed with submersible fittings or the HP-5101 hydropanel with a flow measuring cell for the analysis of highly pure water.

Measurement ranges:

O_2:
(0,0...1999) µg/dm^3, (0,0...2000...20000) µg/dm^3
(0...2,000...19,99) mg/dm^3
(0...200) %

Flow - (0,9...48) l/h

Functions: measurement, charts, thermal compensation, compensation for changes in atmospheric pressure, salinity compensation, calibration to atmospheric air

Output signals: two analog (current); RS-485; three relay

DO-5102 Two channel dissolved oxygen analyzer

Designed to measure the concentration of dissolved oxygen and the temperature of the analyzed liquid.

Consists of one or two amperometric sensors, a flow meter (optional) and a wall-mounted measuring instrument.

It is completed with submersible fittings or the HP-5101 hydropanel with a flow measuring cell for the analysis of highly pure water.

Measurement ranges:

O_2:
(0,0...1999) µg/dm^3, (0,0...2000...20000) µg/dm^3
(0...2,000...19,99) mg/dm^3
(0...200) %

Flow - (0,9...48) l/h

Functions: measurement, charts, thermal compensation, compensation for changes in atmospheric pressure, salinity compensation, calibration to atmospheric air

Output signals: two analog (current); RS-485; four relay

DO-5111 Dissolved oxygen analyzer optical

Designed to measure the dissolved oxygen and the temperature of the analyzed liquid, with digital and graphical indication of the measured parameters.

It consists of a single optical sensor with a fluorescent sensitive surface, and a measuring instrument for switchboard or wall mounting.

Measurement ranges:

O_2 (0..2000,00) µg/dm^3
T (0..85) ^{O}C (max 140 ^{O}C)
P (-1..0..+12) bar
Responce time 90 c.
Flow (0,9...48) l/h

Benefits of optical dissolved oxygen sensors over membrane sensors

- low inertia, fast response;
- independence of measurements from the sample flow rate;
- durable construction - no fragile membrane;
- does not require polarization (unlike membrane sensors);
- high measurement stability;
- weak dependence on contamination and air bubbles;
- does not require permanent maintenance;
- large time interval between calibrations.

Functions: indication of measured values, charts, thermal compensation, compensation for changes in atmospheric pressure, salinity compensation, calibration by athmosphere air

Output signals: two analog (current); RS-485; four relays

APK-5112 Two channel Dissolved oxygen analyzer optical

Designed to measure the dissolved oxygen and the temperature of the analyzed liquid, with digital and graphical indication of the measured parameters.

It consists of a single optical sensor with a fluorescent sensitive surface, and a measuring instrument for switchboard or wall mounting.

Sensor cleaning by liquid stream is available.

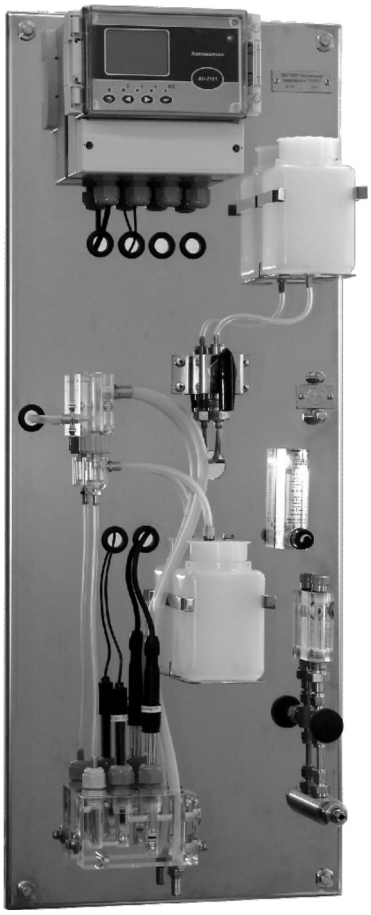
Measurement range:

O_2	(0..20,00) µg/dm^3;
	(0..200) %
T	(-5..50) ^{O}C
P	manual set
Flow	(0,9...48) l/h

Functions: indication of measured values, charts, thermal compensation, compensation for changes in atmospheric pressure, salinity compensation, calibration by athmosphere air

Output signals: two analog (current); RS-485; four relays

SA-7101 Sodim analyzer industrial



Sodium analyzer SA-7101 (analyzer) is designed for measuring activity level (pNa) and mass concentration (cNa) of sodium ions in chemically demineralized water, high pressure boilers, steam condensate and turbines. It also designed to monitor the quality of H+ cation-exchange filters.

The analyzer provides measurements of temperature of the analyzed fluid and of degree of hydrogen ions (pH) activity.

Measurement range:	**pNa**	(2,36... 8,36)
	cNa	(0,1...100000) µg/dm^3
	pH	(0...14) pH
	Flow	(0,9...48) l/h
Functions:	Measurement, Indication, Alarm, Thermal Compensation, Transformation, Charts, Data logging	
Output signal:	two analog (current); RS-485; eight relays	
Alkalinizing agent:	diethylamine, ammonia	

TA-8122 Turbidity analyzer

Designed to measure the turbidity of water and water solutions.

Measurement method – nephelometric.

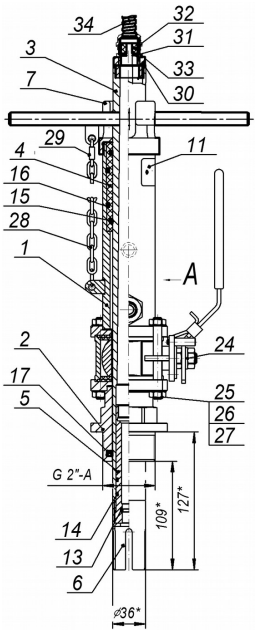
Optical turbidity sensors TU 8355, TU 8555, TU 8325, TU 8525 are connected to the controller TA-8122.

Submersible sensors TU8355, TU8325 have a nozzle for cleaning optical lenses with compressed air.

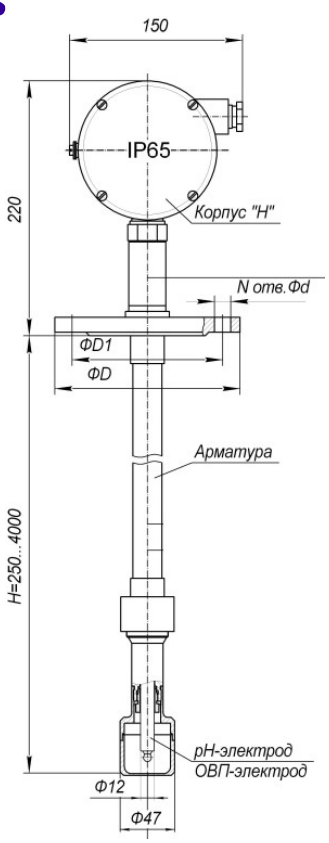
Flow sensors TU 8555, TU 8525 are installed in a flow measuring cell TU 910 or tee.

Measurement: range	**turbidity:** sensors TU 8355, 8555	(0…100,0); (0…1000); (0…10000) **FTU**
	turbidity: sensors TU 8325, 8525	(0…4,000); (0…40,00); (0…400,0) **NTU**
	Flow: (0,9...48) l/h	
Functions:	Measurement, Indication, Alarm, Thermal Compensation, Conversion, Charts, Data logging, Self-diagnosis of lens cleanliness, Checking fluid presence, Checking exterior lighting; Cleaning the sensors with compressed air	
Output signals:	two analog (current); RS-485; four relays	

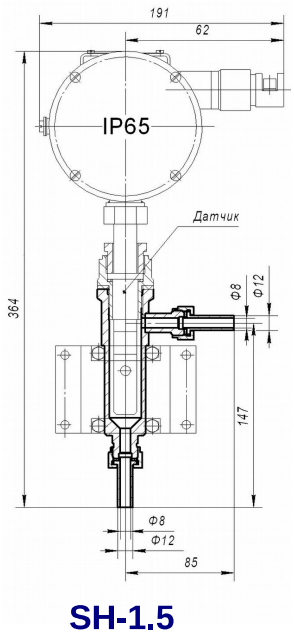
Holders (fittings) for electrodes and sensors



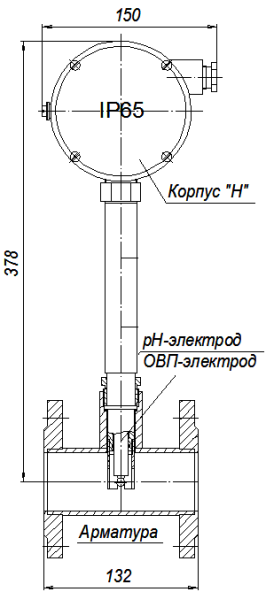
SHP-4



SHP-1.1

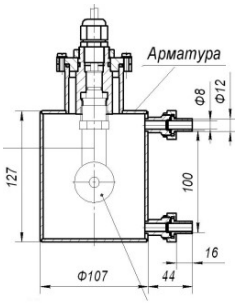


SH-1.5



Присоединение фланцевое

LH-1.1



SH-1.4

Installation of analyzers in cabinets

Cab-1 (IP54)
ambient temperature
(+5 .. +50) ° C

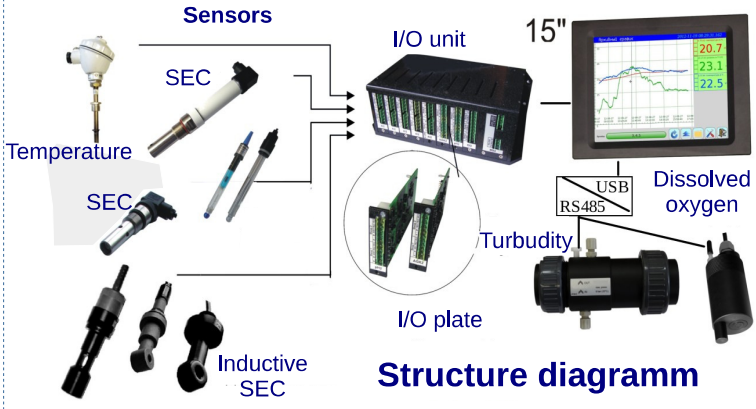
Cab-2 (IP54)
ambient temperature
(-40 .. +50)°C

Cab-3 (IP54)
ambient temperature
(-50 .. +50)°C

Multiparameter Fluid Analyzers

ER-12
Main block

ALM-2.01
Analyzer of liquids
multiparameters
two channels



Structure diagramm

Sample Preparation Device **SPD**

The sample preparation device is designed to adapt the measured medium for analysis, namely:

- cooling by changing the flow rate of the refrigerant;
- pressure reduction;
- mechanical cleaning;
- stabilization of the flow rate;
- indications of flow rate, temperature, pressure.

Conductometric fluid analyzers, pH meters, and other fluid analyzers are installed on the SPD.

SPD characteristics

Inlet temperature	
- 200 °C / 1 heat exchanger (HE)	
- 380 °C / 2 HE	
- 565 °C / 3 HE	
Inlet pressure, max	40MPa
Sample flow measurement range	(10..70) l/h
Sample temperature at outlet, max	45 °C
Sample pressure at outlet, max	0,02 MPa
Number of heat exchangers	1 or 2 or 3
Refrigerant temperature, max	40 ° C
Refrigerant pressure, max	4 MPa
Number of analyzers	up to 4

Thermometers, temperature controllers

Inputs: thermometers Cu, Ni, Pt
thermocouples: A-1, A-2, A-3, B,E,J,K,L,M,N,S,R,T
Measurement range: (-50..+1200) °C
Accuracy, %: 0.5, 1.0

Temperature converters
Output signal: (4..20) mA
Programmable

Temperature transmitters
Current output: (4..20) mA, **HART**
Interface: RS-485 (Modbus)
Probe length up to 2m

Temperature controllers
Current output: (0..5), (0..20), (4..20) mA
Interface: RS-485 (Modbus),
Discrete output: 2 dry contacts
Inputs: thermometers Cu, Ni, Pt
Thermocouples: A-1, A-2, A-3, B,E,J,K,L,M,N,S,R,T

Pressure gauges, vacuum gauges

Measurement range:
Middle: (-60..0..4000) kPa
Small: (-125..0..+125) Pa
Accuracy,%: 0.25; 0.5; 1

Pressure transmitters:
Output signal: (4..20) mA

ECM
Electrocontact manometers (vibration-resistant)
Current output: (4..20) mA
Discret output: 2 dry contacts
Indication: 7segm LED
Interface: RS-485 ModBus

Inlet pressure

Controllers
Input: overpressure / rarefaction of non-aggressive and aggressive gases and liquids
Current output: (0..5), (0..20), (4..20) mA
Interface: RS-485 (Modbus),
Discrete output: 2 dry contacts

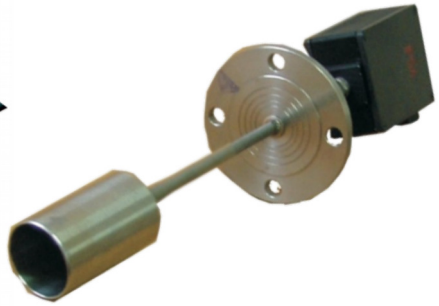
Pressure transmitters with indication
Current output: (4..20) mA, HART
Indication: 7segm LED
Interface: RS-485 ModBus

Level meters of liquids

Measurement range: (0..0.1) m
(0..0.5) m
(0..5.0) m
(0..10) m
(0..20) m
(0..40) m
(0..60) m
- on request

Accuracy, %: 0.5; 1.0

Level controllers
Current output:
(0..5), (0..20), (4..20) (mA)
Interface: RS-485 (Modbus),
Discrete output: 2 dry contacts



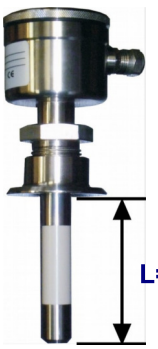
Liquid level alarm

Measuring principle: conductometric

Limit of switching by Conductivity (resistance) of fluid (jumper selectable)

1: 8 µS / cm (25 kOhm)
2: 80 µS / cm (2.5 kOhm)
3: 800 µS / cm (250 Ohm)
4: 8000 µS / cm (25 Ohms)

Output signal: relay
standard: ~ 220V, 7A; = 30V, 7A
reinforced: ~ 250V, 16A; = 24V, 16A
= 50V, 1A; = 300V, 0.3A



Supply of analyzers to various enterprises of ROSATOM State Corporation

Safety class **3H, 4H**
Total: **530** analyzers.
Including 2018 - **120** analyzers

Customers:

1. Leningrad NPP-2.
2. Belarusian NPP.
3. Kursk NPP.
4. Novovoronezh NPP.
5. Balakovo NPP.
6. Rostov NPP.
7. Bushehr NPP (Iran).
8. “Mayak” (Chelyabinsk).
9. Kudankulam NPP (India).
10. Mining and Chemical Combine (Zheleznogorsk).

References for analyzers by NPP Automatica, JSC (Russia)