




“APPROVE”
Deputy general director
for Information Technology
and Social Affairs

 **F. Kuvatov**
" 18 " 03 2022

TECHNICAL ASSIGNMENT

for modernization of the existing automated control system of process of
Demineralized Water Unit PA-6300
of "Shurtan Gas Chemical Complex", LLC

1. GENERAL INFORMATION

1.1. Name.

Modernization of the existing automated control system of process of Demineralized Water Unit PA-6300 (Demin. Water unit).

1.2. Reason and purpose of purchasing the product.

Basis: Protocol No: 14 dated November 29, 2019 of the Scientific and Technical Council approved by the General Director of "Shurtan Gas Chemical Complex", LLC.

"Activities plan for 2022 aimed at ensuring the implementation of the identified priorities and indexes of "Shurtan Gas Chemical Complex", LLC approved by the Chairman of the Board of "Uzbekneftegaz", JSC dated 10.01.2022.

Protocol of the Scientific and Technical Council of the Shurtan Gas Chemical Complex (No: 06 dated September 30, 2021.)

Due to the fact that the existing Automatic Control System "Aquatech International LLC" (USA, 2000) Demin. water of the PA-6300 unit in the Utility shop of "Shurtan Gas Chemical Complex", LLC is morally and physically obsolete, and potential failures in the operation of this system will lead to large material losses. The management of "Shurtan Gas Chemical Complex", LLC decided to replace the standard automation system of the Demin. water unit PA-6300 to ensure economical, reliable and safe operation.

This Technical assignment has been developed to receive proposals from potential participants for work to replace the existing automated control system (ACS), including the supply of equipment, installation and commissioning.

Modernization of the existing ACS of the Demin. Water unit PA-6300 with the implementation of additional functions, both in the software and hardware.

Centralized control of the technological process, continuous measurement, display and registration of technological parameters, as well as presentation of information about the state of technological equipment in a form convenient for operational personnel.

Detection, prompt display and registration of limit deviations of technological parameters, and comparison with permissible (regulatory) values.

Displaying in the form of graphs (trends) the history of the process and the state of the equipment for any period of time.

Registration and presentation to the customer of the results of work on the creation of ACS of the Demin. Water unit PA-6300, on manufacture and adjustment of individual means (hardware, software, information) and software and hardware (software and methodological) system complexes is carried out in accordance with the terms of the Agreements.

Place of operation - "Shurtan Gas Chemical Complex", LLC.

1.3. Information about novelty (manufacture / production year of the product)

The supplied equipment for replacement of ACS shall be new, produced not earlier than 2022, was not in service, not restored, not in storage, and also not preserved (which was not in use, not previously used, including, its consumer properties were not restored).

1.4 Stages of development / manufacture of ACS

- Perform the replacement of aggregate automation in one stage during the planned shutdown of the plant (10-15 days of a complete shutdown of the plant, including days for start-up), which includes the followings:

- algorithms of ACS start-stop;
- control of actuators and transmitters of ACS;
- provision of information and operating modes of the ACS in graphical and digital form, automatic presentation of information about preventive and emergency situations, memorization of controlled parameters for a certain period before and after an emergency shutdown;
- maintaining of a given output steam pressure, steam temperature or volumetric productivity of the plant;
- data transmission to the upper level of Shurtan Gas Chemical Complex's control system.
- Composition and content of works;
- Inspection of the operating facility and collection of the necessary information to carry out work to replace the existing control system;
- Development of design solutions for ACS and its parts;
- Development, execution, coordination and approval of documentation in the amount required to perform work on creation of development or adaptation of ACS;
- Training of the Customer's personnel;
- Manufacturing, factory testing and supply of equipment;
- Pre-commissioning works;
- Preliminary tests, pilot operation and acceptance tests;

2. SCOPE OF USE

Purpose of ACS Demin. water unit PA-6300 is an automated control and regulation of demineralized water production for the needs of "Shurtan Gas Chemical Complex", LLC.

3. TERMS OF USE

3.1 General terms of use.

Requirements for General system.

• ACS shall be developed as a hierarchical distributed system using standard inter-layer exchange protocols. ACS components shall meet the following basic requirements:

- software modularity;
- hardware modularity;
- openness of software and hardware standards;

The main functions of the system:

• ACS is designed to perform the functions of automatic control, regulation, control and protection, ensuring trouble-free long-term operation of steam production. The system shall perform the following functions:

- management functions;
- adjustment functions;
- information functions;
- storage of history within a certain time.

3.2 Additional/special requirements for operation:

- the work performed shall be of proper quality, in accordance with the requirements of this Technical assignment (TA), acting laws, firefighting and sanitary and epidemiological requirements;
- the contractor is responsible for damage to property and equipment during the unit set-up;
- the contractor shall provide copies of documents confirming the qualifications of specialists (certificates, certificates, certificates for electrical safety, fire safety, labor protection, safety, industrial safety, etc.);
- current work shall be performed by qualified specialists who have previously performed such work and shall have the appropriate certificates;
- in the process of work execution, the Customer draws up the required order - permission for work, organizes the safe storage of the supplied equipment, tools and other property of the Supplier necessary for the work;
- spare parts required for elimination of all the defects, required for the installation and commissioning of equipment supplied by the contractor shall be carried out by the contractor;
- the contractor shall provide a reference list for updating of the similar types of Demin. water unit PA-6300;
- Basic technical, economic and operational indexes.

ACS shall ensure reliable, efficient and trouble-free operation of the Demineralized water unit with a capacity of 70 m³/h, intended for production of Demineralized water, by treating the process water sent to the unit from the internal water supply, followed by its sending for boiler feed water preparation and ensuring the technology needs for Demineralized water.

a. The plant was put into operation in 2001.

b. Working time fund is 8000 hours per year.

- In case after modernization the technological indexes do not return to the previous indexes, the contractor will carry out the appropriate adjustment work (tuning of the ACS control logic program) at his own expense.

3.3 Requirements for equipment operating cost

The high energy efficiency and reliability of the units shall ensure low operating costs.

4. TECHNICAL AND QUANTITATIVE DATA OF EXISTING DEMINERALIZED WATER UNIT PA-6300.

4.1 Basic technical information about the existing control system:

No:	Type, brand	Name	Quantity
1.	1785-L30B	PLC 5/30 processor	1 pc.
2.	1771-A4B	16 slot chassis	1 pc.
3.	1771-A3B	12 slot chassis	2 pcs.
6.	1771-P7	Power supply module	3 pcs.
8.	1771-ASB	Remote I/O adaptor module	2 pcs.

9.	1771-IFE	Analog input module 16 point	4 pcs.
10.	1771-OFE2	Analog output module 4 point	9 pcs.
11.	1771-IMD	Digital input module 16 point	5 pcs.
12.	1771-OMD	Digital output module 16 point	12 pcs.
13.	1771-OW16/B	Contact output module 16 point	5 pcs.
14.	CM125-PS-230AC/24DC U/5	24VDC power supply	1 pc.
16.	1771-CP1	Power cable	3 pcs.
17.	1770-CD	Chassis interconnecting cable	25 pcs.
18.	1784-CP10	Programmer communication cable	1 pc.

4.2 Information of software and control and monitoring system of the existing Demin. water unit PA-6300.

- Rockwell Automation RSLogix5 Rev.5.20.20
- CITECT ver.6.1 SCADA
- RSLinx 5

4.3 Technical requirements

No:	Name	Characteristic
1	Engineering (operator) workstation (1 piece)	<p>High-performance industrial PC for the unit in 19" racks (2HU) with excellent industrial properties.</p> <ul style="list-style-type: none"> • High compactness. • High reliability of work in industrial conditions. • Intel technology. <p>Basic design.</p> <ul style="list-style-type: none"> • 19" metal housing (2 HU) to ensure electromagnetic compatibility and high resistance to mechanical influences • Lockable door on the front panel to prevent access to disk drives, controls (Reset, Power), USB interface, fan and air filter • PCI card holder for reliable operation of PC modules in the event of vibration and shock. • Replacement of front fan and dust filter without tools. • Dust protection by high pressure generation inside of the case by means of fan with the dust filter. • Graphics controller with PCI-Express bus integrated into the processor of Intel GMA HD, graphics controller, resolution up to 2048 x 1536 pixels, 60 Hz, 16-bit color. <p>• Interfaces:</p> <ul style="list-style-type: none"> • 2 x LAN 10/100/1000 Mbit/s Ethernet interface (RJ45, with team support function).

		<ul style="list-style-type: none"> • “4 x USB” 2x3.1 and 2x3.0 rear, 2 x USB 3.0 front (one of which is only accessible when the door is open), 1 x internal, for example for media with software licenses. • 2 x PS/2, COM1, COM2, LPT1, DVI-I, 1 x ProfiBus MPI • Sound: Line Out, Micro. • 3 free expansion slots (all long): • 1 x PCI. • 1 x PCI Express x16. • 1x PCI-Express x8 (4-lane). <p>Power Supply:</p> <ul style="list-style-type: none"> • 100 ... 240 V AC, 50 ... 60 Hz redundant. <p>Processors:</p> <ul style="list-style-type: none"> • Intel® Core™ i7-12650H (up to 2 cores/4 threads, up to 4.70 GHz, 24 MB cache, Turbo Boost, VT-d, iAMT, EM64T) • SATA 3.5" HDD with NCQ technology or SATA 2.5" SSD: • 1 X 250 GB. • 1 x or 2 x 500 GB. • RAID1, 500 GB (2 x 500 GB, disk redundancy), built-in RAID controller. <p>Preinstalled operating systems:</p> <ul style="list-style-type: none"> • Microsoft Windows OS multi-language (64-bit) (latest versions); • Windows 10 LTSB 2019, multi-language (64-bit) • The station includes a keyboard, mouse and monitor with a diagonal of 24 inches.
2	CPU controller	<p>A programmable controller designed for building of the automation systems of medium and high complexity. Modular design, natural cooling operation, local and distributed I/O structures, wide communication capabilities, many functions supported at the operating system level, ease of operation and maintenance provide cost-effective solutions for building automatic control systems in various areas of industrial production. The efficient use of controllers is facilitated by the possibility of using several types of central processors of different performance, the presence of a wide range of input-output modules for discrete and analog signals, functional modules and communication processors.</p> <p>PLC (Programmable Logic Controllers) and its components according to GOST R IEC 61131-7-2017 (IEC 61131-7), IEC 61511-1:2003.</p> <p>Standard protocols and information exchange channels are used for information exchange within software and hardware complex (SHC) of automatic control system of technological process (ACST P) and with external systems:</p>

		<p>-Industrial Ethernet (with using of fiber-optic communication lines) for communication of servers, SHC of medium level ACS and local ACS;</p> <p>-Industrial Ethernet for communication of operator stations and servers;</p> <p>- Profibus-DP for communication of industrial controllers with I/O subsystems.</p> <p>-Modbus RTU, Modbus TCP/IP.</p> <p>Also, as part of the middle level of the SHC of ACS means of communication are provided for communication with local ACS and field equipment.</p>
3	I/O modules	<p>A computer-process interface (CPI) is a set of input-output modules that provides interfacing with a variety of equipment (sensors, actuators and other devices) and allow you to receive, process, issue signals of various types in a wide range of voltage, current, power, duration impulses while performing at the same time other features.</p> <p>The periphery provides reception of the following signals: (shall receive the following signals).</p> <p>Analog</p> <ul style="list-style-type: none"> - from transducers with a unified electrical output DC signal 4...20 mA; - resistance thermometers - thermocouple <p>Discrete:</p> <ul style="list-style-type: none"> - type "dry contact"; - voltage +24V; - DC and AC voltage 220V <p>Typical polling time of input signals to the medium level SHC (frequency of survey cycle) of signal conversion channels:</p> <ul style="list-style-type: none"> - from pressure sensors (pressure drop) - no more than 0.1s, - temperature sensors, etc. - no more than 0.5 s, - from sensors with a discrete output signal - no more than 0.25 s. <p>ACS provides commutation of electrical circuits and generation of output (control) signals:</p> <ul style="list-style-type: none"> - Analog signals of DC 4...20 mA HART. - Discrete signals of "dry contact" type with commutation of the following voltages (on ohmic load): - DC with voltage 24 V at current up to 5A; - DC with voltage 220 V at current up to 0.2 A;
4	Power Supply	<p>The uninterruptible power supply unit provides workability of the system of the redundant operator station during the period of power outage for a sufficient time to shut down the stations automatically, in order to preserve the integrity of the installed software and files of the project. 24V power supply units are provided in a redundant version for both internal and external power supply units.</p>

4.4. REQUIREMENTS FOR OPERATOR'S AUTOMATED WORKSTATION (AWS).

The operator's AWS shall meet the following requirements:

- the manufactured system block with the possibility of installation of filters of the form factor housing shall have fixing to be fixed to the rack 19";
- Two monitors of at least 24 inches, arranged in one row horizontally (complete with fixing).

The workstation shall be equipped with:

- functional operator keyboard;
- system of emitting sound signals;
- mouse manipulator with ergonomic mat.

The functional keyboard shall provide quick switching between mnemonic circuits, acknowledgement of sound alarm, actuation/deactivation of safety loops, call of Proportional/Integral/Derivative (PID) regulators.

One monochrome laser printer shall be provided in the operator's room for printing reports, logs, trends and mnemonic diagrams.

Operator's workplace shall be equipped with specialized furniture.

Furniture shall have a modular principle of building of workplaces, with the possibility of expanding the workplace, both horizontally and vertically. The working surface shall have high wear resistance for use in 24/7 mode (antivandal coating). Cable connections shall be able to be wired in a system of horizontal and vertical cable channels with limited access.

4.5 REQUIREMENTS FOR AUTOMATION CABINETS

Under the automation cabinets shall be provided cabinets other than cross-connect cabinets and power distribution cabinets.

Placement of medium-level equipment in cabinets of 800(w)x800(d)x2000(h), entry of cables provide from the bottom.

Layout solutions of cabinets shall meet the following requirements:

- degree of protection is not less than IP42 for cabinets;
- material is steel;
- mounting rack is 40 U;
- the cabinet shall be locked with a key without a protruding handle;
- the cabinet is supplied in a standard color of the manufacturer;
- the cabinet shall be provided with lifting rings and devices for loading and unloading operations;
- one 220V AC 16A socket shall be installed in the electronic data processing cabinet;
- each cabinet shall be provided with a lamp and a pocket for documents, in cabinets with active equipment shall be provided with a fan;
- in the design of the cabinets, it is necessary to provide the possibility of fixation them to each other and the possibility of adjusting the horizontal position during installation;

- in each cabinet, provide with two inputs for powering duplicated sources.
- any part that is energized above 48V shall be protected from direct contact and be appropriately marked;
- place the control system controllers on the panels, and the terminal blocks in the intermediate distributing frame and in the barriers;
- the number of intercabinet cable connections shall be minimal;
- laying of connecting cables shall be performed in such a way that access to electronic means does not require disconnection of connections;
- power supply terminals shall be placed separately from other terminals;
- connections between the distributing frame and the controller shall be made with a cable with marked cores as JZ500 18x0.5 or similar;
- mains cables coming from technological facilities, and cables connecting cabinets in the control room, are inserted into the cabinets from the bottom;
- cable screens are connected to the grounding system inside the cabinet;
- the ends of the incoming multicore cables are connected to the input terminals, the layout of which is divided according to the types of signals and circuits;
- "non-intrinsically safe" circuits and 220 VAC circuits shall be laid separately;
- to connect "non-intrinsically safe" signals and signals "220 VAC" coming from the field level, terminal blocks with fuses shall be provided;
- each wire or cable inside the cabinet is laid with a closed cover in the perforated box;
- all cables, terminal blocks and clamps shall be marked;
- terminal blocks shall be spring-loaded. Preferred Phoenix Contact ST 2.5 or equivalent;
- terminals intended for input/output signals with protection type of "intrinsically safe electric circuit ia", shall be blue (light blue).

The rest of the terminals shall be gray.

- clamps of grounding circuits shall be yellow-green;
- the cable between the system and the distributing frame is included in the delivery of ACSTP;
- redundant channels for each of the system modules are connected to the terminals; jumper cabinets are not connected in a row with enabled cabinets from the side of the "field". Reserve cores of mains cables from the "field" are connected to separate terminals of the jumper cabinet and are not connected from the system side; distribution of input/output channels among jumper cabinets shall be performed according to the type of signal (analogue inputs, analog outputs, discrete inputs, discrete outputs); installation of all equipment shall be carried out only on the mounting panel; installation of equipment on the side walls of cabinets is not allowed.

4.6 Requirements for stability and parameters when exposed to environmental factors.

All technical means located at the level of a technological object shall operate in an environment with the following parameters:

- ambient air temperature from -27 to +55 °C;
- relative humidity of the ambient air from 40 to 95% at a temperature of +35 °C;

4.7 Power / energy supply requirements.

The power supply of ACSTP in the control building is carried out from two redundant power sources (PS) of the operating ACSTP system. If necessary (to optimize an uninterruptible power systems), provide replacement of existing PS with analogues of the required power.

If it is necessary to replace the PS, the following requirements shall be met:

- PS shall have "On-line" technology with double conversion (3-phase - input - 380V / 1-phase - output ~ 220V) and a transformer of galvanic isolation from the network.

Uninterruptible Power Supply (UPS) is included in the complete delivery;

PS capacity is determined by the nominal total power consumption of equipment and secondary power sources connected to the PS with a margin of 50 %;

- UPS batteries shall be sealed, maintenance-free with a service life of at least 10 years; UPS shall be equipped with WEB/SNMP cards. The supplied PS shall be similar to those used in ACSTP of the Demin. water unit (to be specified with the Customer). The complete delivery shall include the SNMP/OPC software of server with a portable hardware license (Hardware License Key).

The proposed PS models shall have a regional service center in Uzbekistan.

To prevent disruption of the equipment due to a power failure, to eliminate the consequences of its shutdown, it is necessary to provide for the possibility of backup power supply for servers and other critical equipment of the second level of ACSTP and field instrumentation from uninterruptible power supply (UPS) designed for a period of operation of at least 1 hour.

The UPS shall be powered by:

- system cabinets;
- field instrumentation;
- power supply cabinet (ACSTP) $U \sim 220V$; $P = 10.5 \text{ kVA}$.

Power supply for field instrumentation equipment (sensors, transducers, electro-pneumatic positioners, solenoids, etc.) shall be run from redundant 24 VDC power supplies included in the system complete set.

24V Power supply units of "dry contact" discrete inputs, solenoids and controllers shall be redundant and separate from each other.

All the ACSTP cabinets shall have two 220V AC power supply inputs, connected to different PS.

The supply shall include power distribution cabinets with protection elements (automatic) according to the quantity of equipment + reserve (50%). In the power distribution cabinet, load distribution by phases shall be performed.

Provide 16A circuit breakers for the power cabinet in power distribution cabinets.

4.8 Requirements for instrumentation and automation:

- checking of the protection channels of the Demin. Water unit;
- checking of starting readiness;
- normal automatic stop;
- automatic emergency stop;

- automatic control of the actuators and means of measuring the Demin. Water unit;
- automatic protection for technological parameters;
- remote manual control of actuators on the operating and non-operating Demin. Water unit;
- emergency stop of the Demin. Water unit in case of ACS failure;
- interaction with distributed control system (DCS);
- control or interaction, SP (set point) settings, tasks with DCS;
- autonomous operation in the absence of communication with the DCS;
- debugging modes (cold scrolling, hot scrolling, step by step start-up);

4.9 Requirements for the control and monitoring system

- The supplier shall supply an operator station that includes the functionality of an engineering station. ACS users (operator (dispatcher), ACS engineer, service engineer) shall have only those rights that they need to perform their job duties. The process of granting and changing rights shall be controlled, including the procedure for registering users using a personal identifier and password.
- The operator's station shall be implemented on the basis of modern computer technology designed for continuous industrial operation.
- storage of historical data for at least 30 days.
- Increasing of the reliability of the devices by increasing the efficiency of their maintenance.
- constant collection, processing and storage of information received by controlled objects (intelligent field equipment connected to SCADA);
- display of information about the state of technological objects, including in the real time;
- detection of discrepancies between the set of values of the project and actually installed devices;
- characterization of the defect in the probability parameters;
- automatic switching on of indicators informing about the need to perform preventive maintenance of devices;
- graphic representation of curves, curve graphs, diagnostic results, etc.
- save the instrument configurations to a centralized database;
- provide calibration of measuring instruments;
- provide the possibility of control and emergency recovery of control programs of controllers, operator panels;
- registration of changes in settings and modes of operation.
- data graph, visualization of results as a trend curve;
- allocation of subgroups of more than eight variables.

Equipment operation parameters shall be displayed in real time in the following form:

- mnemonic diagrams;
- histograms;

- operational and archival charts (trends);
- operational reports;
- tables.

The following colors shall be used when displaying the status of the control object and control and the operating parameters of the equipment on the mnemonic diagrams:

- green - the unit is on, the damper is open, the parameter value is normal;
- yellow – the unit is off, the damper is closed, warning signal;
- orange – in hot standby;
- brown – under repair (masked parameter);
- blue – ready to work;
- red – out of order, disabled due to an accident, emergency signaling;
- pink – parameter imitation;
- gray - intermediate position.

In addition, the design of the interface shall take decisions similar to those of the existing ACSTP.

- The workplace shall be equipped with specially designed engineering furniture that ensures the convenience of work.

4.10 Software requirements:

The supplied software for remote control and monitoring of equipment shall meet the following requirements:

- software, system and application shall be licensed;
- Programming shall support all functions and types of variables to ensure security and comply with the IEC 61131-3 standard.
- the delivery shall include appropriate installation distribution kits on removable media (USB, CD/DVD disks);
- it shall be possible to replace the software with subsequent versions, provided they are compatible;
- ease of installation, configuration, maintenance.

Visualization of the followings:

In the visualization system of the current control system change the communication between the controller and the computer only.

- operational (current) information: values of technological process (TP) parameters, violations of regulatory boundaries (algorithms) by parameters;
- archival data: parameter values; text messages about violations of TP conducting, user actions to control TP, as well as system messages from all SCADA subsystems;
- The engineering station and the operator station shall be on the same network, i.e. in case one of them is disabled due to maintenance, the remaining one shall be able to control the monitoring of the unit.

- control of technological equipment and parameters of TP conducting: changing the settings and operating modes of control loops, changing the settings of Emergency Shutdown System (ESS), entering of numerical data.
- The subsystem shall work in two modes - development (Development), execution (Runtime).
- The contractor organizes a FAT test.

4.11 Requirements for ergonomics and technical aesthetics:

Analog signals of the sensors shall come to the analog input modules through galvanic isolation barriers to provide additional protection of the controllers. Discrete input and output signals shall be connected to the controller input and output modules through isolating relay devices (relays) to prevent high voltage from electrical equipment.

Programmable logic controllers (PLC) shall be placed in control cabinets together with automation and power supply elements that implement the functions of the automatic control system.

The PLC architecture shall provide a wide choice of input and output modules to cover many applications, from high speed discrete control upto continuous process control.

Cabinets shall be finished products with internal wiring, ready for connection of external cables.

Normalizing transducers and sensor power supplies shall be placed in similar cabinets to meet ergonomic requirements.

Technology representing a separate structural unit in the form of a cabinet, rack, casing, container or console section shall have devices for connecting to a ground loop.

System diagnostics shall be carried out at all levels.

At the level of control and management of the technological process (controller level), data about the state of measuring channels, input/output modules, and power supplies shall be formed.

At the level of the human-machine interface, data about the state of PLC and network automation tools shall be formed.

The state of the ACS components shall be displayed on the screens of the operator's workstation. Based on the diagnostic data about the state of the system components, signs of the reliability of analog and discrete signals shall be formed, which shall also be displayed on the screens of the operator's workstation.

At the level of the backbone network, self-diagnostics of channels shall be carried out.

4.12 Requirements for components, initial and operational equipment and materials.

- the equipment must be free from defects in design, materials or workmanship, occurred as a result of an act or omission of the contractor, under normal use of the supplied equipment under conditions usual for Uzbekistan;
- the supplied equipment shall be new, produced not earlier than 2021;
- the supplier must make all the proposed equipment operational and include in his offer all the components (including fasteners) necessary to fulfill this requirement;
- each equipment supplied shall be operational and provide the functionality provided by the manufacturer as a separate component;
- operating conditions of the equipment are determined by its technical characteristics;

- all equipment offered for delivery shall be provided with a supplier's or manufacturer's warranty for a period of 2 (two) years;
- the supplier shall guarantee that the delivered goods are new, previously unused, not discontinued by the manufacturer at the time of delivery;
- The supplier shall ensure that the quality of the equipment complies with these technical requirements.

4.13 Requirements for the safety of information in case of accidents

The system shall ensure the safety of technological information at emergency technological situations, saving of the the system configuration, application software, trends and event logs in case of failure of system components, abnormal power outage or incorrect actions of technological personnel.

The software and hardware complex of the ACSTP shall provide for hardware and software to ensure high reliability and security.

Functional reliability shall be ensured by failure diagnostics, ease of maintenance, selection and training of maintenance personnel.

The non-volatile memory of the controllers shall ensure the preservation of the full configuration, operating constants (setpoints, regulator coefficients, alarm limits (alarms), etc.) and all operating parameters without time limit. Non-volatile memory controllers shall not use removable batteries (batteries).

Disk drives of workstations and engineering stations, servers shall be organized in RAID1 or RAID5 level with a capacity of at least 500 GB. All active network equipment shall be redundant.

Information about emergencies and malfunctions of ACSTP components recorded on magnetic disks, shall be preserved during a power interruption of any duration. Provide for information loss resulting from a malfunction of disk devices, its partial or complete recovery using system maintenance programs.

4.14 Requirements for functional safety. Safety instrumented systems for industrial processes.

General design requirements and development of an automated safety system (ASS) that meets the requirements of: IEC 61511-1: 2003, PLC (Programmable Logic Controllers) and its components according to GOST R IEC 61131-7-2017 (IEC 61131-7 IEC 61511-1:2003, NFPA85). The software is created using technology level languages, conforming to the international standard ISO 61131-3 (IEC-1131).

4.15 Dimensions and packaging requirements

The goods shall be shipped in the manufacturer's export standard packaging (closed, serviceable), ensuring tightness and its complete safety from mechanical damage during long-term storage and transportation of products, taking into account several transmissions on the way. Packing shall ensure the safety of the goods during transportation, loading and unloading operations in all weather conditions and the movement of the goods to the place of its installation.

4.16 Hardware requirements

ACS shall operate in automatic mode, fully controlled by the PLC, which manages and controls according to the established algorithms.

The automatic mode of operation of the system is the main operating mode of performance, in which the system operates around the clock and continuously and implements the functions of controlling and management (at the choice of the operator) of technological equipment, and also solves the main tasks of archiving and documenting of process parameters in real time.

The ACS shall ensure the fulfillment of the tasks of control and management in full, by implementing the following functions:

- Automatic regulation of the most important technological parameters.
- Automatic blocking - protection of the main equipment in case of deviation of parameters from the norms of technological regulations.
- Automatic start-up of reserve equipment in case of emergency shutdown of working equipment, as well as additional equipment to ensure the requirements of the technological mode.
- Emergency and technological signaling of the process, condition of equipment.
- Centralized control of the technological process, continuous measurement, displaying and recording of technological parameters, as well as presentation of information about the condition of technological equipment in a form convenient for operational personnel.
- Detection, operational displaying and registration of limit deviations of technological parameters, and comparison with permissible (regulatory) values.
- Displaying in the form of graphs (trends) the history of the process and the condition of the equipment for any period of time.
- Formation of operational accounting and reporting and archival documentation.
- Control of the actions of operational personnel and self-diagnostics of the main technical means and equipment failures.

The functions of the operator station shall include displaying of the readings of process parameters in absolute units, displaying of the condition of the main process equipment and emergency failures, managing of process parameters and equipment, and presenting of information about the controller's health diagnostics.

Controllers with functions of automatic control of technological processes shall be provided with 100% redundancy of intra-system mains, network devices and data transmission lines of distributed control system (DCS) and ESS, 100% redundancy of archives and databases.

The transition to the reserve shall be carried out automatically, shock-free and without process shut down. Replacement of a faulty object (element) shall be carried out without process shut down.

All controllers of the control system shall provide continuous self-diagnostics with determination of internal malfunction of controllers, input/output modules and failures of connection of input/output circuits of instrumentation and control equipment with signaling and registration of malfunctions in the system.

The input/output of discrete signals shall be connected via intermediate relays. Input/output to the system of intrinsically safe signals shall be made through intrinsically safe barriers. Each intrinsically safe I/O channel shall be individually galvanically isolated from other channels, system buses, interfaces, and power circuits.

Spark protection barriers used in the ESS system shall be single channel and shall have a TÜV (SIL) certificate not lower than SIL3. Intrinsically safe barriers for solenoid valves and limit switches shall provide line control and serviceability devices according to the NAMUR standard.

For non-intrinsically safe analog input/output signals, provide protection against short circuits and over voltages using single-channel compact isolation amplifier (Phoenix Contact or similar).

For analog I/O modules, function for detecting of line breaks, line shorts and parameters out-of-range shall be provided.

Replacement of input/output modules shall be carried out on the operating equipment without cutting off the power and reducing the reliability of the system.

There shall be a 20% reserve of input-output channels and 20% free space for possible future installation of additional devices (concerning all the equipment: processor stations, input/output modules, distribution and relay cabinets, power cabinets, network equipment). SCADA shall provide connection of DCS control systems supplied with process equipment via TCP IP and RS-485 interface (redundant data bus) with various exchange protocols (for example, MODBUS-RTU, MODBUS-TCP, Foundation Fieldbus, Profibus). Data received via digital channels shall be processed by the system in the same way as data from I/O modules.

Where necessary, signals shall be transmitted from the PLC system to the DCS system by physical contacts and over a redundant network of data transmission.

Data exchange between controllers, servers, operator stations and by engineering stations shall be performed via a high-speed redundant communication line with a transmission rate of at least 100 Mbps.

The data network between the I/O baskets and the CPU shall be fast, deterministic, scalable, with guaranteed packet delivery time and I/O module polling time no more than 100 milliseconds, shall provide the ability to change the configuration of input/output baskets, adding of new input/output baskets without resetting of the central processors.

The supplier shall provide protection against chatter and electrical noise on the input circuits.

The ACSTP shall be supplied complete with hardware and software tools for diagnostics, testing and network settings.

If the System contains equipment that requires special settings for putting it into operation, then the tools for setting up such equipment shall be supplied complete with it.

The data transmission network shall have redundant network equipment for connection to redundant fiber optic communication lines, including an optical distribution frame.

The construction of redundant data transmission channels shall exclude violation of the normal operation of the control system in the event of a single failure of any network equipment or a break in one communication cable.

All active network equipment shall be of industrial design (with improved cooling).

The system shall constantly perform diagnostics of network equipment and, if a malfunction is detected, form a message to the operator and engineer of control system.

The system shall include dedicated historical data servers, with disk array of at least 1TB.

4.17 Requirements for spare parts, tools and accessories (SPTA) and wear parts

The delivery set shall include spare parts for a two-year period of operation, specific tools and devices for repair and maintenance, according to the manufacturer's passport.

The set of spare parts, tools and accessories shall ensure operation for two years, taking into account consumption rates and the availability of wear parts in the design (c indicating of the name and quantity in the technical proposal).

SPTA for a two-year period of operation

Table 1

No:	Name	Quantity
1	Operator automated workstation	1 pc.
2	Monitors 24"	1 pc.
3	Central Processing Unit (CPU)	1 pc.
4	Power supply for CPU	1 pc.
5	Communications processor	1 pc.
6	Buffer battery for CPU	2 pcs.
7	Analog signals input module	1 pc.
8	Analog signals output module	1 pc.
9	Discrete signals input module	1 pc.
10	Discrete signals output module	1 pc.
11	Discrete signals output module: galvanic separation of external and internal circuits	1 pc.
12	Discrete signal input module: optoelectronic separation of external and internal circuits	1 pc.
13	Power source	1 pc.
14	Optical communication module with 1 RS485 port and 1 glass FOC interface (Media converter)	1 pc.
15	Ethernet switch	1 pc.
16	Synchronization module	1 pc.
17	Relay	10%
18	Terminals for Fuse installation	10%
19	Terminal module for connecting sensors and actuators	5 pcs.
20	Plug-in fuse holder	5 pcs.
21	DIODE for redundant power supply module	2 pcs.
The list of SPTA may be amended by contractors and additional SPTA may be added.		

4.18 Additional Requirements.

The user shall include in the proposal:

- guaranteed supply of spare parts to the ACSTP at the user's request for at least 10 years after the end of the warranty period;
- information about the assembly and testing center of the supplied ACSTP equipment, terms of acceptance of the equipment;
- Certificate of conformity with the technical regulations of the customs union - TR CU 012/2011, 004/2011, 020/2011.
- the list of SPTA for the two-year period of the system operation (Table 1);

- the list (scope) of engineering, installation, pre-commissioning, and training of the ACSTP engineering personnel (an advanced course of the System configuration); in the proposal shall be indicated the dependence of the cost on the number of trainees;
- a table of the required and proposed, taking into account the multiplicity of the number of inputs/outputs of the ACSTP, relays. The volume of signals of the System shall be calculated on the basis of 10% reserve for inputs/outputs;
- terminal equipment (screw terminals, wire lugs, DIN-rails, perforated cable-duct) in accordance with the volume of signals + 50% reserve and cable products for intra-system connections;
- the equipment offered must have verification methods approved by the body of the State Standard;
- information about the terms of manufacture and delivery of goods, as well as the services rendered.

All technical documentation for ACSTP and its components must be in Russian and English.

5. REQUIREMENTS AS PER THE DELIVERY AND ACCEPTANCE PROCEDURE

5.1 Delivery and acceptance procedure

Goods are accepted after incoming inspection by the Acceptance commission of "SGCC", LLC at the Customer's warehouse in accordance with the Technical assignment (TA) and the concluded contract. The Acceptance Commission shall perform the acceptance of goods in terms of quantity, quality, completeness and external signs of preservation of goods (presence of mechanical damage, visible deformation of individual assemblies and parts of goods and other similar obvious signs of damage) in accordance with the shipping and accompanying documents, quality certificates of the manufacturer. The conclusion of the acceptance commission shall be reflected in the act of acceptance, which shall be signed by all persons involved in the acceptance of goods. In case the acceptance of goods reveals discrepancies in quality, quantity and completeness, the Customer shall apply measures to ensure the safety of goods and prevent mixing with other similar goods and notify the Seller about it in writing form within 3 (three) working days from the detection of defects.

In case of detection of shortages and non-compliance of equipment, the Parties in the presence of authorized Representatives of each Party shall draw up a Certificate of acceptance of equipment by quantity and quality.

The followings shall be presented for acceptance:

- a set of technical means of ACS, and connected in accordance with the operating mounting drawings of ACS technical means, prepared for operation;
- operational documentation in 2 copies (including electronic version on USB or CD), containing all data about the system, necessary for mastering and operation in Russian and in English;
- software in a form of programs on USB or CD-discs in two copies and accompanying documentation of the user and software engineer in Russian and English languages;
- SPTA, instruments and devices for operability, adjustment of technical means and control of metrological characteristics of measuring channels of automatic control systems.

The following types of tests are set for the automatic control system:

- Factory tests;
- Preliminary tests;

This image shows a single sheet of white paper with horizontal blue or grey ruling lines. The lines are evenly spaced and run across the width of the page. There is no handwriting or other markings on the paper.

- Operational test;
- Acceptance tests.

Programs of all stages of tests are made by the Supplier on the basis of the document "Program and Method of Testing", included in the project operation documentation (RD 50-34.698-90, item 2.14), and are approved by the Customer.

Test programs shall contain the lists of specific checks of functions of ACS of Demin. water unit, which shall be carried out during tests to confirm the fulfillment of requirements of the TA, with references to the appropriate methods (sections of methods) of tests.

According to the results of the testing stages in accordance with Appendix 2 of RD 50-34.698-90 organizational and administrative documents are prepared, which include Acts, Protocols and Reports about the test results. Organization-administrative documents are signed by commission members and approved by the chairman of the commission.

Tests of ACS can be carried out in one or more stages. A "Test Report" is drawn up based on the test results.

5.2 Requirements for handing-over the technical and other documents to the customer during delivery of the equipment.

Passport and operation manual in Russian and in English, manufacturer's certificate, wiring diagrams, certificates of conformity.

The Supplier shall provide the following documents confirming the compliance of products with the established requirements:

- certificates (declarations) of conformity to GOST (GOST or Technical specification (TS)) and safety requirements;
- specification of the main equipment components with indication of manufacturers and their certificates of compliance;
- documentation for mounting, pre-commissioning and operation in Russian and in English;
- design documentation (layout, process, mechanical, electrical, Instrumentation & automation drawings; diagrams of the installation of devices on the measuring table during the test; wiring diagrams and cable connection list; diagrams of external wiring; specifications and equipment schedule and materials with dimensional drawings, indicating of weight and other technical characteristics; engineering documentation of cabinets; equipment layout diagrams: general equipment layout; power supply and protective grounding diagrams; drawings of screen interfaces (displays) of operator stations; description of unit control algorithms; program code of the controller);
- descriptions of the software and the Programmer engineer's manual for the maintenance of the software complex in terms of the controller and operator station;
- recommendations for the minimum level of spare parts, tools and accessories for maintenance and repair of technical facilities.

The goods must be accompanied with the following documentation:

- certificate of conformity of the goods;
- invoice (invoice) of the Seller with a description of the goods, specifying the quantity, price per unit of goods and the total amount;

- consignment note issued in the name of the consignee with indication of the station of departure and destination, the name of the Customer, the number and date of signing of a valid contract;
- Certificate of origin, indicating the number and date of the invoice;
- packing list;
- Certificate of quality of the goods, issued by the manufacturer;
- Safety data sheet;
- mounting manual;
- Operating instructions and maintenance practices;
- Description of faults, indicating the causes and methods of elimination;
- general technical documentation, the supplier's information about the equipment with indication of parameters and energy requirements;
- Technical specifications and description of the equipment units;
- design documentation (layout, process, mechanical, electrical, Instrumentation & automation drawings; diagrams of the installation of devices on the measuring table during the test; wiring diagrams and cable connection list; diagrams of external wiring; specifications and equipment schedule and materials with dimensional drawings, indicating of weight and other technical characteristics; engineering documentation of cabinets; equipment layout diagrams)
- general equipment layout; power supply and protective grounding diagrams; drawings of screen interfaces (displays) of operator stations; description of unit control algorithms; program code of the controller);
- descriptions of the software and the Programmer engineer's manual for the maintenance of the software complex in terms of the controller and operator station;
- recommendations for the minimum level of spare parts, tools and accessories for maintenance and repair of technical facilities.
- other technical information.

Operational documentation shall contain the necessary amount of technical data and information about mounting and operation, indicating of the scope and recommended frequency of maintenance.

5.3 Requirements for equipment insurance.

The insurance of the goods shall be at the Contractor's expense.

The equipment must be insured according to the CIP Incoterms 2010.

6. TRANSPORT REQUIREMENTS

Goods of the manufacturer must be shipped in standard packing (closed, sealed package, intact), ensuring its complete safety from all kinds of damage during long-term storage and transportation, taking into account several transmissions on the way. Other variants and sizes of packing are subject to additional agreement with the Customer provided they are acceptable.

Delivery of equipment shall be made at the Supplier's expense by shipment of products by road and/or rail to the consignee, other methods of shipment may be made only upon written approval of the Customer. In case of erroneous shipment of equipment to a different address, the Supplier shall, at his own expense, re-address the products to the destination specified in the

contract. Destination: Customer - "Shurtan GCC" LLC, Republic of Uzbekistan, Kashkadarya region, Guzar district, Shurtan settlement, 180300, www.sgcc.uz, sgcc@sgcc.uz.

The equipment must be insured in accordance with CIP - the terms of delivery.

Supplied equipment and materials must have the manufacturer's original packing, which must ensure the safety of the equipment during transportation. Transportation of the equipment and its safety during transportation to the site and loading operations shall be ensured by the Supplier.

7. STORAGE REQUIREMENTS

Storage of goods shall be in accordance with the manufacturer's "Instructions for acceptance, inspection and storage of equipment".

8. REQUIREMENTS FOR THE SCOPE AND/OR PERIOD OF WARRANTY

- The warranty period for the supplied equipment shall start from the date of its operation;
- the warranty period of equipment operation shall be 24 months from the date of commissioning of the equipment;
- period of free warranty service - 2 (two) years, from the date of warranty expiry. During the warranty period the Contractor is obliged to repair or replace the failed device, all costs will be covered by the Contractor. Free service is understood as an additional obligation to eliminate defects (defects) in the product and replace the equipment without charging the Customer (spare parts from the Customer);
- the equipment must be of good quality. The Contractor undertakes to replace faulty goods free of charge during the warranty period and shall eliminate the identified fault or replace the faulty goods within 10 days from the date of notification;
- the supplier shall, at its own expense and within the period agreed with the customer, eliminate any defects in the supplied equipment, materials, detected during the warranty period;
- in case of equipment failure, the Supplier shall send his representative to participate in drawing up a report fixing the defects, agreeing the procedure and terms of their elimination not later than 5 days from the date of receipt of the Customer's written notice. The warranty period in this case shall be extended accordingly for the period of elimination of defects.

9. REQUIREMENTS FOR REPAIRABILITY

- all devices and equipment of the unit must be repairable under operating conditions with the indication of the frequency, scope and schedule of repair and maintenance;
- equipment must not have defects (hidden defects) related to the design, used materials or defects in manufacturing;
- the system design must be repairable, safe and easy to maintain.

10. MAINTENANCE REQUIREMENTS

10.1 Maintenance requirements

Warranty period is not less than 24 months. During the warranty period the Supplier undertakes, at his own expense, to replace or repair defective parts of the equipment, provided that the defect is due to faulty design, poor material or faulty workmanship and is not the result of force majeure, negligence, mishandling, alteration or damage caused by the Customer's personnel or third parties. If any part of the equipment is replaced or repaired by Supplier during the warranty period, such replaced or repaired part shall be warranted by Supplier. The warranty period shall

be established in accordance with applicable law. Service during the warranty period once a year, but before 6 months of operation, at the expense and effort of the Supplier.

10.2 Service requirements

Operation in case of accidents and emergencies shall include a procedure for switching services to available standby components, notifying of the management and users about switching to available standby systems, carrying out the necessary set of emergency recovery jobs.

Recovery after a failure or accident shall include:

- regulated restoration of operability in case of malfunctions and failures of technical means;
- restoration of data transmission channels;
- analysis of failures and causes of failures or accidents;
- documentation in written and electronic form.

The scope and procedure of technical and software maintenance shall be determined by the operational documentation. In the event of equipment malfunctions, the Contractor shall be obliged to eliminate them at its own expense and by its own efforts within a short period of time.

Technical support must be provided by the service provider, or its Technical support in Uzbekistan.

11. SAFETY REQUIREMENTS

The goods must be safe to use, store and disposal.

The product must be fully compliant with the requirements of the ISO-45001 safety standard.

12. REQUIREMENTS FOR QUALITY AND CLASSIFICATION

The quality of the Goods shall comply with the established standards and technical conditions of the manufacturing plant and shall be confirmed by a certificate of factory tests issued by the manufacturing plant and the requirements specified in this TA.

The goods shall fully comply with the requirements of ISO-9001 quality standard.

13. ADDITIONAL (OTHER) REQUIREMENTS

Customer's personnel must be fully trained to operate and maintain the equipment.

14. REQUIREMENTS FOR QUANTITY, COMPLETENESS, PLACE AND TERM (PERIODICITY) OF DELIVERY

The cost of packing and delivery must be included in the price of the goods. Supplier is obliged to notify Customer about date and time of Goods delivery no later than 3 (three) working days before Goods delivery date.

Goods delivery period is 2 months (60 calendar days), until the plant is completely shut down.

In case of erroneous shipment of equipment to the wrong address, the Supplier at his own expense makes re-direction of products to the destination specified in the contract.

Consignee: Customer - "Shurtan GCC", LLC, the Republic of Uzbekistan, Kashkadarya region, Guzar district, Shurtan settlement, 180300, www.sgcc.uz, sgcc@sgcc.uz.

15. REQUIREMENT FOR ACCOMPANYING SERVICES DURING SUPPLYING OF EQUIPMENT

15.1 Requirement for design documentation.

Operational documentation according to GOST 2.601 has to be attached to the goods.

Operational documentation must contain the required amount of technical maintenance data.

All design documentation must comply with the requirements of this Technical Assignment, current SanPiN, fire safety, sanitary and epidemiological norms, Electrical Installation Regulations (EIR).

Technical documentation for each set of equipment shall be submitted by the supplier in paper and electronic form in English and Russian languages in two copies.

The technical documentation shall include:

- technical description of the Programmable Logic Controller (PLC) (purpose, construction and principle of operation);
- Operating instructions with a detailed description of the checks and adjustments;
- technical requirements for installation, connection and operation of the supplied controller;
- troubleshooting instructions;
- certificates of quality (conformity) for the PLC.

15.2 Requirements for the contractor:

- Availability of certified technicians with experience of installing and commissioning of PLC cabinets;
- Provision of reference list of successfully completed similar projects (reference list) for upgrading of the control system of the Demin. Water unit;
- Documentation according to the following list shall be provided in Russian and English in 2 copies in paper and electronic form for each item of equipment:
 - Installation Manual;
 - Operation manual and maintenance procedures;
 - Description of failures, with an indication of the causes and methods of elimination;
 - General technical documentation, supplier information about equipment with the parameters and demand in energy resources;
 - Technical characteristics and description of the equipment units, other technical information;
 - Certificates of quality, certificates of conformity, installation diagram and passports of the equipment.

15.3 Requirements for manufacturing and inspections.

All manufacturing works shall be carried out in accordance with fire safety rules, EIR, occupational safety rules, SanPiN, industrial safety, the requirements of internal administrative documents of the Customer.

15.4 Installation requirements.

Carrying out of installation works by the Supplier's specialists.

The Supplier shall provide installation and pre-commissioning of the equipment at the site:

- The performer of installation and pre-commissioning works shall be recommended by the manufacturer of the equipment, and shall have officially trained personnel with supporting documents (certificate, diploma, authorization document, etc.);
- the specialists who were instructed on labor protection, fire safety, industrial safety, ecological safety and other requirements, established by the current legislation of the Republic of Uzbekistan shall be allowed to work;
- Power supply cables and signal cables shall be selected according to the technical requirements of the manufacturer of the equipment and shall be installed in polyvinylchloride (PVC) ducts;
- The testing procedure for the PLCs supplied as well as the requirements for their operation shall be determined on the basis of the manufacturer's technical documentation for installation and operation. During the installation and pre-commissioning of the equipment, the contractor shall be guided by the applicable health and safety regulations and the requirements of O'z DSt 2875:2014.
- Spare parts required for compatibility and connection to existing devices must be provided by the supplier.

15.5 Requirements for pre-commissioning

The supplier shall perform the followings:

- pre-commissioning of the equipment at the Customer's site.
- equipment testing and trial run with guaranteed production capacity for all parameters;
- subsequent service and support during operation.

Supplier shall provide warranty for the equipment with indication of hours or days of operation. Testing within 72 hours after installation.

Pre-commissioning means that the Supplier shall provide, among other things, all necessary materials, tools, consumables, auxiliary equipment necessary for the installation, adjustment and commissioning of the unit and its normal operation, including those not listed in the terms of reference.

During the installation and pre-commissioning works, the contractor is responsible for the safety of the supplied equipment.

15.6 Requirements for the Customer's personnel training:

Hardware and software training shall include the following:

- design and composition, principle of operation;
- operating principles, configuration and programming of the hardware and software of the controller and operator's station;
- maintenance and operation of the equipment.

Training of customer's personnel for control and maintenance of the installed PLC systems. It is necessary to provide training of personnel in the system, the rules of the testing unit operation, the principles of maintenance and operation. At the end of training on the basis of tests, practical exercises and interviews, trainees shall receive certificates confirming the passage of training and the ability to operate and run the unit.

Based on the training program developed by the Supplier, the training of 6 process operator and 6 instrumentation and automation specialists shall be carried out at the site of “SGCC”, LLC.

Supplier provides training of specialists in the Supplier's special training center for 4 specialists of system engineering on programmable logic controllers and SCADA system on the following subjects:

System architecture	OS and graphic design
Software system	Operator station
Software package installation	Graphic editor
Project and objects view modes	OS and graphic design
Multiprojects	Dynamization wizard
Project language	Reporting, printing
PC stations and communication	Basics
Utilities for configuring of PC stations	Configuring of a sequence report message - Конфигурирование отчета последовательности сообщений на клиенте
Configuration of PC Stations	Configuring of trend reports
Communication	“Client/Server” Architecture
Creating of Projects	Configuring of Standby Server and Stations
Introduction	Adjustment of unit icons and front panel
Creating of a new project	Designing of a front panel using the front panel designer
Automation station	Archiving system
Hardware Configuration	Tag Registration
Automation Systems	Messages
CPU Reliability Drivers	CPU Reliability Drivers
Configuration changes in Run Mode	Configuration changes in Run Mode
Library functions	

15.7 Other related services


Not required.

16. LIST OF ACCEPTED ABBREVIATIONS

ACS - automatic control system
SHC - software and hardware complex
ACSTP - automatic control system of technological process
SHC of ACS - software and hardware complex of automatic control system

CPI - computer-process interface
AWS - Automated Workstation
PID - Proportional/Integral/Derivative
ESS - Emergency Shutdown System
DCS - distributed control system
TCP/IP - Transmission Control Protocol/Internet Protocol
CPU - central processing unit
SPTA - spare parts, tools and accessories
EIR - Electrical Installation Regulations
PLC - Programmable Logic Controller
PVC - PolyVinylChloride
CIP Incoterms 2020 - «Carriage and Insurance Paid to»

Developed by:

Senior foreman of the Instrumentation & automation shop:  S. Karimov

Agreed with:


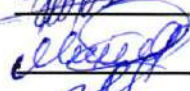

Chief metrologist of "SGCC", LLC:

Head of Instrumentation & automation shop:

Head of the ACSTP area:

Lead engineer of The Material and

technical resource management service:

 H. Mahmudov
 Z. Jalilov
 U. Abdullayev

 M. Hobiev

Перевод: Мустаховой Наманг 