**Technical Specification**

**for the manufacture and supply of mining equipment intended for charging development blast holes and boreholes for the needs of the Underground Mining Operations of “Kumtor Gold Company” CJSC**

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| **Item No.** | **List of Key Data and Requirements** | **Key Data and Requirements** |
| 1 | Place of Delivery | Kumtor Gold Company CJSC, Kyrgyz Republic, Balykchy city, Narynskoye Highway, 9. |
| 2 | Customer | Kumtor Gold Company CJSC, Underground Mining Division. |
| 3 | General Provisions | The subject of this Technical Specification is the manufacture and supply of one (1) unit of underground mining equipment — a charging machine intended for charging development blast holes with emulsion explosives (EE) during underground drifting operations.The equipment must be:  • New, never used, not refurbished, not previously dismantled;  • Fully ready for operation after assembly and commissioning;  • Adapted for continuous 24/7 operation in high-altitude underground mine conditions. |
| 4 | Geometrical Parameters of Workings | Maximum height:  • Main workings – 5200 mm  • Operational workings – 4500 mm  Maximum width:  • Main workings – 5500 mm  • Operational workings – 4500 mm  Minimum outer turning radius – 7400 mm  Minimum inner turning radius – 4200 mm  Maximum ramp gradient – 15%Road surface – rock. |
| 5 | Environmental Conditions | 1. Elevation above sea level – up to 4000 m  2. Ambient temperature: –35°C to +40°C  3. Mine air temperature: +2°C to +5°C  4. Humidity – approx. 70%  5. Ventilation airflow: 20 m³/s  6. Water supply – technical water  7. Harmful gases – none  8. Dust conditions – none. |
| 6 | Mining Equipment Requirements |  |
| 6.1 | Technical Specifications | 1. Model, brand, and manufacturer — subject to selection results.  2. Tank capacity — to be determined.  3. Year of manufacture — not earlier than 2025.  Engine:  2.1 Preferred brand: Mercedes-Benz or Deutz  2.2 Fuel: Diesel  2.3 Engine displacement — to be determined  2.4 Engine power — to be determined  2.5 Turbocharger — required  2.6 Turbo-timer (engine and turbo cooling delay system) — required  2.7 Liquid cooling system — required  2.8 Exhaust system: catalytic converter and muffler  *The engine must be approved for underground mining operation.*  *High-altitude adaptation and arctic climate package required.*  *Designed for continuous 24/7 operation, shift duration – 11 hours, year-round.* |
| 6.2 | Electrical System Requirements | 1. Network voltage – 24 V;  2. Battery capacity – more than 2 units;  3. Yellow flashing beacon – 1 unit;  4. LED parking lights, brake lights, turn indicators, and signal indicators;  5. Front and rear lighting – LED;  6. All electrical wiring must be in non-combustible and waterproof insulation. |
| 6.3 | Load Capacity | 1. Load capacity – to be determined by the Supplier based on equipment configuration (subject to approval by the Customer). |
| 6.4 | Brake System | 1. Service brake: sealed dual-circuit hydraulic brake system; multi-disc wet brakes on both axles;  2. Parking / emergency brake: spring-applied, hydraulically released. |
| 6.5 | Tires | 1. Single, pneumatic, tubeless tires, size 12.00–20 PR 20 (final size to be confirmed upon equipment selection);  2. Spare wheel assembly – at least 1 unit. |
| 6.6 | Steering System | 1. Hydraulic steering of articulated frame, orbitrol type;  2. Frame articulation steering angle: ±40° (subject to approval). |
| 6.7 | Transmission | 1. Hydromechanical transmission with hydraulic pump drive;  2. Full-time all-wheel drive. |
| 6.8 | Hydraulic System | 1. Variable displacement pumps (for steering and boom) – model and brand to be determined;  2. Pump capacity – to be determined;  3. Oil tank volume – as provided by the manufacturer;  4. Oil filtration on return line;  5. Indicators for oil level, filtration, and temperature. |
| 6.9 | Hydraulic Lifting Platform (Operator Basket) | Hydraulic lifting platform (basket) intended for safe placement of operators when charging blast holes located in the roof or upper sidewalls of the working area.  • Installed on the front or rear side of the chassis (as agreed with the Customer);  • The design must provide maximum visibility of the charging area and stability during elevated work;  • Lift height must comply with the cross-section parameters specified in Section 4;  • Drive: hydraulic, equipped with rupture protection valves;  • Load capacity: up to 500 kg;  • Dual control: from operator cabin and from basket;  • Protective canopy above the basket to shield operators from small rock fragments and liquid drips (must be removable if necessary);  • Safety railing, handrails, toe-boards, anti-slip platform surface;• Emergency descent function in case of pressure loss;  • All components must be explosion-proof and permitted for underground mining use. |
| 6.10 | Fire Protection System | 1. Automatic fire suppression system – required;  2. Portable fire extinguishers – required. |
| 6.11 | Operator Cabin | 1. Enclosed cabin; protection against falling objects and rollover (ISO 3449 / ISO 3471), ROPS and FOPS compliant;  2. Driver’s seat with T-shaped backrest, pneumatic suspension, and 3-point safety belt;  3. Heating and air conditioning – required;  4. Multifunctional display showing: speed, RPM, operating hours, fluid levels, temperature, pressure, alarms, fault codes, etc.;  5. Two rear-view mirrors;  6. Rear-view camera;  Control markings and labels in Russian language. |
| 6.12 | Lubrication System | Centralized lubrication system. |
| 7 | **Requirements for the Mixing and Charging Unit (MCU)** |  |
| 7.1 | General Requirements | The mixing and charging unit with hypercharging drive is intended for preparation, dosing, and charging of development blast holes and explosive boreholes with emulsion explosives (EE) during underground mining operations.The equipment must ensure high-precision component feeding, real-time control of explosive density, and automated dosing. |
| 7.2 | Main Performance Characteristics | • Output rate of finished explosive: adjustable 40–120 kg/min;  • Stable dosing at 40–60 kg/min is mandatory;  • Accuracy: emulsion ±2%, reagents ±1%, final explosive density ±0.03 g/cm³;  • Pump module: screw/plunger type, wetted components AISI 316, seals PTFE/FKM/EPDM as chemically compatible;  • Sensitization type: gas-generation using sodium nitrite and acid activator;  • Adjustable density range of the finished explosive: 0.8–1.25 g/cm³;  • Delivery pressure: not less than 4.0 MPa;  • Delivery hose: length 40 m, optional 60/80 m, coil or drum configuration;  • Blast hole diameter: from 43 mm to 64 mm;  • Borehole diameter: up to 102 mm;  • Length of charged holes and boreholes: from 1 to 30 m;  • Operating cycle and modes: explosive feeding module, dosage system adjustable by mass/volume along hole depth, ability to set pauses and programmable charging modes. |
| 7.3 | Design Configuration | Storage tank for emulsion matrix — 1000–2000 L;  Storage tanks for sensitizers (gas reagents) — 2 tanks up to 40 L each;  Water tank for system flushing — 100 L;  All wetted components — stainless steel (AISI 304/316);Charging hose drum;  Charging hose length up to 40 m;  Quick-release fittings for flushing and maintenance;  Electrical equipment protection — IP65;All cables and connectors — moisture-resistant and vibration-protected;  Replacement of pumps and filters permitted without disassembly of the entire unit;  Seals and hoses must be resistant to nitrites, emulsifiers, and acid activators.  Installation of the mixing and charging module may be:  • centered on chassis — for optimal load distribution and stability on inclines;  • rear-mounted — if required by equipment layout and to ensure optimal charging radius.  Configuration (center or rear) must be approved by the Customer. |
| 7.4 | Control System | Main control unit for charging drive;  Russian-language interface displaying parameters: pressure, volume, density, flow rate, system status;  Operating modes: automatic, semi-automatic, and manual;  Control panel located in the operator basket (hydraulic lifting platform);Wireless remote control for explosive charging operations;  Reporting and data transfer system;  Data and telemetry: PLC with recipe storage, log retention ≥12 months, export via USB/SD in CSV/JSON, CAN-bus interface, Wi-Fi/4G option, shift-based reporting. |
| 7.5 | Charging Drive System | Hydraulic drive (option for low-voltage / explosion-proof electric drive per Customer agreement);High-precision hydraulic dosing drive with independent pump control;  Intelligent automatic calibration system for dosing modules;  Density control of finished explosive via integrated flow and pressure sensors;  Automatic and manual feed adjustment depending on hole depth and hose resistance;  Self-cleaning mode and flushing system after each operating shift. |
| 7.6 | Safety Requirements for the MCU | Built-in protective functions: electronic and mechanical interlocks when access to the working area is open; protection against accidental start; emergency stop buttons.  Protection against static electricity; compliance with explosion-protection requirements (Ex).The equipment must comply with applicable industrial and explosion/fire safety regulations of the EAEU, as well as international standards: ISO, IEC, EN, ATEX/IECEx. |
| 8 | Spare Parts and Tools | 1. Supplier must provide a spare parts kit for 2000 operating hours.  2. Special tools required for maintenance.  3. Wheel chocks with mounting brackets. |
| 9 | Technical Documentation | 1. Supplier must provide technical documentation together with the equipment (certificates of conformity, technical passports, operation manuals, spare parts catalog, and other required documents for safe operation, customs clearance, and registration in state authorities of the Kyrgyz Republic).  2. Operation and Maintenance Manuals — 2 copies.  3. Spare Parts Catalog with part numbers — 2 copies.  4. Documentation, dimensional and kinematic drawings, hydraulic and electrical diagrams in PDF (or DXW) format on USB — 2 pcs.  5. Material compatibility protocols with Customer’s emulsion matrix.  6. Certificate of quality and origin.  All documents must be provided both in electronic and printed form in Russian language. |
| 10 | Warranty Period | 1. Supplier must provide a warranty period of not less than 12–24 months from the commissioning date.  2. Availability of a service center and spare parts warehouse in the Kyrgyz Republic.  3. If no service center/warehouse exists in the Customer’s country, the Supplier must establish necessary arrangements for service support and technical assistance. Equipment shall be operated continuously (24/7).  4. Supplier must conduct training of Customer personnel at Kumtor mine site. |
| 11 | Equipment Acceptance | Acceptance by quality and quantity shall be performed at the Kumtor mine site with participation of the Supplier’s representative. |
| 12 | Commissioning | 1. All costs for additional work identified during equipment inspection shall be borne by the Supplier. |
| 13 | Quality Assessment Criteria | 1. During the warranty period, equipment performance will be evaluated; performance characteristics must correspond to factory specifications.  2. In case of non-conformities, Supplier shall bear all associated correction costs. |
| 14 | Payment Terms and Delivery Schedule | 1. Payment terms: as per Contract.  2. Delivery shall be carried out at the Supplier’s expense and responsibility.  3. Delivery terms: for non-residents of the Kyrgyz Republic — DAP; for residents — DDP.  4. Delivery location: Kyrgyz Republic, Balykchy city, Narynskoe highway, 9.  5. Delivery period: up to 120 calendar days from Contract signing.  6. Assembly and commissioning shall be performed within the timeframes established by the Customer. |
| 15 | Technical Regulations and Standards | The equipment must comply with the requirements established by the current Technical Regulations of the Customs Union (TR CU 010/2011) "On Safety of Machinery and Equipment" and other applicable EAEU requirements (if necessary). |
| 16 | Safety | Brake interlock and overload protection systems, fire protection equipment and lighting must comply with the technical passports.Moving parts of the equipment that present a hazard to personnel must be guarded, except for parts where guarding is not possible due to their functional purpose. Guards must be supplied complete with the technical devices required for their installation. |
| 17 | Note | The requirements specified in this Technical Specification are indicative and may be adjusted during discussions with potential suppliers. |