Technical Specification
*"Truck with a hydraulic manipulator and Hooklift"*

## 1. PRODUCT PURPOSE:

The truck equipped with a hydraulic manipulator and hooklift is designed for transporting metal bins or containers that house special equipment used in exceptional and emergency interventions.
The truck must operate under intense conditions, allowing for immediate response during interventions, with frequent acceleration and deceleration, including on roads with very steep ramps and slopes.

## 2. GENERAL ORGANIZATION AND COMPOSITION:

The truck equipped with a hydraulic hook loading/unloading system and manipulator consists of the following components:

2.1. Chassis;
2.2. Hydraulic loading/unloading system with hook and manipulator;
2.3. Metal bin with tarpaulin;
2.4. Additional equipment.

## 3. TECHNICAL FEATURES:

### 3.1. Special truck, dimensional characteristics, mass and volume, performance:

3.1.1. Vehicle category: N3 according to the Registration Rules for Motor Vehicles and Trailers;
3.1.2. Overall dimensions (L x W x H) of the vehicle:
- Maximum length: 12,000 mm;
- Maximum width: 2,550 mm;
- Maximum height (the highest point measured from the ground): a maximum of 3,800 mm, with a container manufactured according to the DIN 30722 standard (which defines the hook height and the distances to the subframe anchoring elements on the transport platform), within an interior size range of 4,250 -7,000 mm (Annex nr. 2);

3.1.3. Payload of the vehicle, equipped with the manipulator and hooklift: a minimum of 12,000 kg;
3.1.4. The ground clearance and the angles of approach and departure of the fully loaded truck at the maximum authorized weight allow movement on unpaved roads;
3.1.5. Maximum speed: at least 110 km/h;
3.1.6. Maximum gradient: at least 30% or greater;
3.1.7. The fully operationalized truck, with all equipment and crew on board, must maintain stability for safe operation on terrain with inclines at least 25 degrees;
3.1.8. The approach, departure angles, and ground clearance of the fully operational vehicle:
3.1.8.1. Ground clearance: minimum 300 mm;
3.1.8.2. Approach angle: minimum 25 degrees;
3.1.8.3. Departure angle: minimum 25 degrees.
3.1.9. The vehicle, equipped with the manipulator and hooklift, features an adjustable underride guard.
3.1.10. The special vehicle will be delivered and operate without a tachograph.

### 3.2. Chassis:

#### 3.2.1. Cabin (left-hand drive):

3.2.1.1. Metal cabin, seating 1+2, with advanced equipment including 2 doors and electrically operated windows;

3.2.1.2. Equipped with hydraulic tilting system;
3.2.1.3. Soundproofed;
3.2.1.4. Fitted with suspension;
3.2.1.5. Cabin color: red (sticker not allowed);
3.2.1.6. The floor in the crew compartment will be covered with ribbed aluminum sheet with increased slip protection and easy to clean;
3.2.1.7. Windshield wiper system automatically controlled at time intervals (timer or equivalent);
3.2.1.8. Electric windshield defrosting system;
3.2.1.9. Interior windshield blinds;
3.2.1.10. Rear-view mirror system with defrosting and electric adjustment;
3.2.1.11. Air conditioning system (heating/cooling with A/C), and additional autonomous cabin heating system, using diesel as fuel, directly from the tank of the special vehicle. It can be used both while traveling to and from intervention missions and while stationary at the intervention site;
3.2.1.12. Cabin seats equipped with headrest and 3-point seat belts for all seats;
3.2.1.13. The driver's seat equipped with air suspension and adjustable in at least 2 directions;
3.2.1.14. Steering wheel adjustable in height and depth;
3.2.1.15. Audio system installation with CD, MP3 or USB, with a minimum of 2 speakers;
3.2.1.16. GPS navigation system with android auto / apple carplay, featuring updated maps of Europe;
3.2.1.17. Camera system automatically activated when reversing, with integrated rear parking sensors;
3.2.1.18. Dash camera system with SD or microSD card recording (the card will be delivered with the vehicle, compatible with the recording device, with a capacity of at least 64 GB, class 10+ with a transfer rate of at least 40 MB/s). The camera will record video in at least 1920 x 1080 resolution at 30 fps Full HD. It will allow recording of video, including speed and GPS data, to monitor the route and road conditions, whether or not acoustic and light signals are in operation. The recording function will automatically deactivate when the engine is off and reactivate when the engine starts. All necessary accessories for data download will be provided. Depending on the technical solution adopted for the camera (whether integrated into cabin interior elements or not), a suitable mounting system will also be delivered.;
3.2.1.19. LED lighting system for illuminating container loading/unloading operations, mounted behind the cabin.

## 3.3 Engine and ancillary installations

3.3.1. Emission standards: Compliant with current EU regulations at the time of delivery;
3.3.1.1. Fuel type: diesel;
3.3.1.2. Maximum power (DIN): starting from 300 kW;
3.3.1.3. Fuel tank with a capacity of at least 300 liters, AdBlue tank with a capacity of at least 30 liters, positioned to avoid affecting off-road capability and protected on the sides and underneath by a metal shield against damage when driving on or off-road;
3.3.1.4. Electric engine preheating system for stationary use, powered by an external source;
3.3.1.5. Oil sump for inclines over 30%;
3.3.1.6. Tow hooks rated for maximum truck load, positioned at the front and rear of the chassis;
3.3.1.7. Equipped with traction control system (ASR or equivalent).

### 3.4. Transmission

3.4.1. Traction configuration: 6x6 non-permanent with the following operating modes:
- 6x4 – rear axles for permanent traction;
- 6x6 – front axle engaged in traction.

3.4.2. Automatic transmission, designed specifically for the special vehicle based on its intended use, with adequate gear ratios to ensure travel under all driving conditions;

3.4.3. Power take-offs for operating the hydraulic pumps of the loading/unloading system and hook;

3.4.4. Two rear axles with twin wheels.

### 3.5. Suspension

The truck's suspension must allow for the safe loading and unloading of containers manufactured in accordance with DIN 30722.

### 3.6. Wheels

3.6.1. Number of wheels: min. 11 pcs. (including the spare wheel);

3.6.2. M+S tires, mounted on steel rims (including spare wheel);

3.6.3. Spare wheel of the same size as those mounted on the vehicle;

3.6.4. Device to facilitate the lifting/lowering of the spare wheel to/from the attachment position.

### 3.7. Steering system: power-assisted.

### 3.8. Braking system

3.8.1. Power-assisted;

3.8.2. Anti-lock braking system (ABS or equivalent);

3.8.3. Additional deceleration system (retarder or equivalent);

3.8.4. Hill Start Assist system.

### 3.9. Electrical installation equipped with sockets for connection to external consumers

3.9.1. Electrical system voltage: 24 V;

3.9.2. Two maintenance-free battery packs;

3.9.3. The battery packs and alternator must generate sufficient energy to power all the vehicle's electrical systems and additional specific equipment;

3.9.4. General circuit breaker to disconect all vehicle electrical consumers;

3.9.5. All electrical cables will be concealed and protected against shocks during movement;

3.9.6. The vehicle will be equipped with an external connector to enable battery charging and the charging of other equipment while stationary. The battery charging system will include an electronic charger with an automatic adapter for long-term charging and preservation;

3.9.7. The external 230 V connector will be male and mounted on the side of the truck, on the driver's side. Two female connectors will also be provided, each with a cable of at least 10 meters in length;

3.9.8. The 230 V circuit will be protected by grounding that ensures a leakage current of up to 30 mA or by a separation transformer. If protection is provided solely by grounding, a warning label will be placed next to the socket with the inscription: "ATENȚIE! A SE CONECTA DOAR LA O PRIZĂ AUTORIZATĂ" / ”ATTENTION! CONNECT ONLY TO AN AUTHORIZED OUTLET”;

3.9.9. The engine cannot be started while connected to an external 230 V power source, except through a self-disconnecting socket that disconnects when the engine is started.;

3.9.10. A universal 13-pin socket for coupling the trailer's electrical installation (24 V), and a cable adapter for a 7-pin socket for coupling the electrical installation (12 V).

## 3.10. Lighting-signalling installation

3.10.1. The lighting-signaling installation (chassis) must include front and rear fog lights. All headlights and lamps of the special vehicle will be protected against accidental impacts with a stainless steel metal grilles;

3.10.2. Audible warning for reversing.

## 3.11. Hydraulic manipulator and hooklift .

3.11.1. The hydraulic manipulator and hooklift of the vehicle will be mounted on the vehicle chassis;

3.11.2. The **manipulator and hookliftlift** must be manufactured according with DIN 30722 standards (defining the height of the hook and the distances to the anchoring elements of the subframe on the transport platform);

3.11.3. Allows for the loading/unloading of metal bins with tarpaulins as well as containers manufactured according to standard DIN 30722 (Annex nr.2), The system must enable the loading/unloading of containers manufactured according to DIN 30722 with the following dimensions:

- Maximum interior length $L_{max}$ = 7,000 mm;
- Minimum exterior height $h_{min}$ = 2,400 mm;
- Bin height between 500 – 800 mm;
- Maximum exterior width $l_{max}$ = 2,550 mm.

3.11.4. The system must handle a container with a total mass of **at least 12,000 kg** (including the container's own weight and its load);

3.11.5. The system must allow containers manufactured according to DIN 30722 to be securely fastened while moving, **even on unpaved roads;**

3.11.6. The control for the vehicle's manipulator and hooklift must be located at the driver's position;

3.11.7. **The manipulator will be mounted on the chassis;**

3.11.8. The maximum telescopic boom length must be 10 m;

3.11.9. The manipulator must be able to lift a minimum of 4450 kg at a distance of 2.5 m and a minimum of 1140 kg at a distance of 10 m.;

3.11.10. The manipulator must have a minimum lifting capacity of 128 kN;

3.11.11. The base:cast and stress-relieved to eliminate potential stress concentrators in welded constructions;

3.11.12. The lubrication of the rotation system is performed in a gear oil basin, completely separate from the hydraulic system;

3.11.13. The manipulator must be able to rotate at a minimum angle of 415°.

3.11.14. The column must be equipped with an internal channel for the passage of drive hoses, ensuring their protection;

3.11.15. The arms should consist of two segments articulated by bydraulic action, one of which is telescopic, with three hydraulic sections;

3.11.16. A minimum working radius of 10 meters, using a specially designed arm for medium ranges;

3.11.17. Additional skids on the left and right sides of the arm to ensure high precision;

3.11.18. An additional joint between the column and the main arm of the crane, as well as between the main arm and the telescopic arm, ensures constant maintenance of torque and speed in any working position;

3.11.19. The distribution system equipped with 4 functions: necessary specifications for the proper operation of the distribution system;
3.11.20. The stabilizing beam must have hydraulic extension on both sides for optimal opening;
3.11.21. The system must include a hydraulic telescoping system for ground adjustment;
3.11.22. Feet with spherical joints for adaptability and optimal stability in various terrain conditions;
3.11.23. The manipulator must be equipped with a main distributor capable of performing 2-3 movements simultaneously;
3.11.24. The crane must be operable manually from the base, only in emergency situations;
3.11.25. The crane must be equipped with a remote control system, allowing the operator to operate it efficiently and safely from a considerable distance;
3.11.26. Safety elements: The electronic system must include an overload detection functionality, capable of blocking commands that could increase the operating moment beyond the specified limits, thereby ensuring the protection of the manipulator and operator;
3.11.27. The manipulator must be equipped with a mushroom-type emergency stop button, located in an accessible and visible location, intended for immediate operation stoppage in critical situations;
3.11.28. The crane's slewing system must be equipped with safety valves for protection during slewing operations;
3.11.29. The main arm cylinder and secondary cylinders (double-acting) must be fitted with safety valves for protection against overloads and unexpected situations;
3.11.30. The telescoping cylinders must be equipped with safety valves to ensure safe and efficient expansion and retraction operations;
3.11.31. The manipulator must be equipped with safety valves in the hydraulic mounting system to prevent overloads and ensure safe and efficient operation under various conditions;
3.11.32. Electronic systems: A visual and audible warning system must be installed for the operator, with warning lamps mounted on the stalls to ensure safe and efficient operation of the manipulator;
3.11.33. Electronic systems: A capacity limitation system must be implemented, with continuous adjustment according to the extension and position of the stalls. This system must ensure the maximum possible lifting of the load under stable conditions for any position of the riding legs;
3.11.34. Electronic systems: A system must be installed to prevent collisions with bridges or passages during transport, ensuring the safety of the handler and preventing material damage;
3.11.35. Electronic systems: to implement a warning system that adequately signals if the riding system is not properly secured, in order to prevent potential situations of injury or damage;
3.11.36. An integrated electronic system must be installed to warn about revisions, diagnosis and issuance of error codes, ensuring optimal operation and reliability of the manipulator;
3.11.37. An automatic hydraulic oil diversion system should be implemented directly to the tank if the lever is not activated for 3 seconds, to ensure the safety and equipment protection;
3.11.38. An automatic shutdown system for the crane's electronic system must be implemented if the lever is not activated for 30 minutes, ensuring energy savings and operational safety.
3.11.39. The manipulator must be equipped with an LED reflector mounted on the telescopic boom to provide additional illumination for operations in low-light or dark conditions, ensuring safety and efficiency during night activities;

3.11.40. Hydraulic installation: The manipulator must be equipped with a high-pressure hydraulic pump, pre-installed from the factory, along with a fully equipped hydraulic oil tank that includes a return filter and wear indicator.

## 3.12. Metal bucket with tarpaulin

The body will be equipped with a support and loading/unloading system, manufactured according to the DIN 30722 standard, which defines the height of the hook and the distances to the anchoring elements of the subframe on the transport platform.

The dumpster has the following characteristics (Annex no. 2):

3.12.1. Inner length: maximum 7000 mm;
3.12.2. Shutter height: minimum 500 mm, maximum 800 mm.
3.12.3. External width: maximum 2550 mm.
3.12.4. Maximum height (with covers and tarpaulin mounted): maximum 2400 mm.
3.12.5. Side shutters with higes at the bottom;
3.12.6. Rear shutter with hinges at the bottom;
3.12.7. All shutters equipped with locking and securing systems during vehicle movement;
3.12.8. Metal floor, with non-slip grooves, impact-resistant, equipped with recessens or systems for anchoring;
3.12.9. Detachable cover;
3.12.10. Red heavy-duty waterproof tarpaulin that closes over the rear shutter, with two windows (skylights) on each side.

## 3.13. Additional facilities

3.13.1. Towing coupling corresponding to the truck's maximum towing capacity.
3.13.2. Coupling for the trailer's pneumatic braking system.
3.13.3. Acoustic and optical warning system:
3.13.3.1. Light ramp, minimum length of 1700 mm, maximum width as the cabin, arranged on the roof at the front of the upper part of the cabin, with modules of blue LED strobe lamps, protected against accidental impacts by a stainless steel grille, with the following characteristics;
3.13.3.2. Four blue side modules and two white modules, positioned symmetrically to the left and right of the centrally positioned acoustic module;
3.13.3.3. Each optical module will have a minimum of 24 LEDs, with a minimum power of 50 lumens/LED and a light frequency of at least 50 flashes/minute;
3.13.3.4. The length of each optical module will be at least 1/3 of the total length of the ramp (they will have the maximum size allowed after mounting the speaker);
3.13.3.5. Polycarbonate lenses and caps to ensure maximum visual effect and anti-matting;
3.13.3.6. The ramp will be protected against corrosion and water ingress.
3.13.4. Acoustic model, equipped with one or more loudspeakers:
3.13.4.1. Acoustic signal generator with minimum 3 tones, minimum power of 150 W;
3.13.4.2. Maximum amplification (peak): minimum 150 W;
3.13.4.3. External switchable audio input with the possibility of transmitting voice messages via microphone.
3.13.5. "Flash" type optical signaling system, based on LED technology, composed of 4 blue lamps, with a minimum of 8 LEDs/lamp, protected against accidental impacts with a stainless steel grille, arranged as follows:

- front of the cabin at the level of the radiator mask — 2 lamps;

- upper rear part of the vehicle, embedded in the container of the special vehicle — 2 lamps.

3.13.5.1. Sequence of blue LED modules/lamps, "flash" type, with a frequency of lights of at least 50 flashes/minute, incorporated into the container on its sides (covering a minimum of 50% of the total length of the container, symmetrically arranged), with a power of at least 50 lumens/LED and a minimum of 8 LEDs/module:

3.13.5.2. Control box for the acoustic-optical warning system, mounted on the dashboard.

3.13.6. Universal sockets or a socket and adapters (supplied for each truck) for coupling the trailer's electrical installation, for 24V, compatible with DIN ISO 12098, 1185 and 7638 standards;

3.13.7. The acoustic and visual warning systems that equip the truck will allow it to be highlighted both during travel and at the scene of intervention.

3.13.8 Mobile communication module for the special vehicle, in accordance with the technical specifications provided in (Annex no. 3).

### 3.14 Vehicle-specific features:

3.14.1. Medical kit approved according to the provisions of the Government Decision no. 1306 of 21.11.2008 on the establishment of the minimum content of the medical first aid kits in the equipment of motor vehicles;

3.14.2. Approved fire extinguisher, car type with a clamping bracket in the cab of the vehicle, sized for this category of vehicle: minimum 2 pcs.;

3.14.3. Set of spare bulbs and fuses;

3.14.4. Rubber mats for the interior cabin;

3.14.5. Reflective vest: 2 pcs.;

3.14.6. Reflective triangles: 2 pcs.;

3.14.7. Wheel wrench;

3.14.8. Hydraulic jack that allows the replacement of a wheel with the truck fully loaded;

3.14.9. Air coupling and hose with pressure gauge for inflating the vehicle's tires;

3.14.10. Wheel chocks: 2 pcs.

### 3.15. Painting and Engraving:

3.15.1. Truck color (including bed track): red RAL 3000.

3.15.2. No decals are allowed;

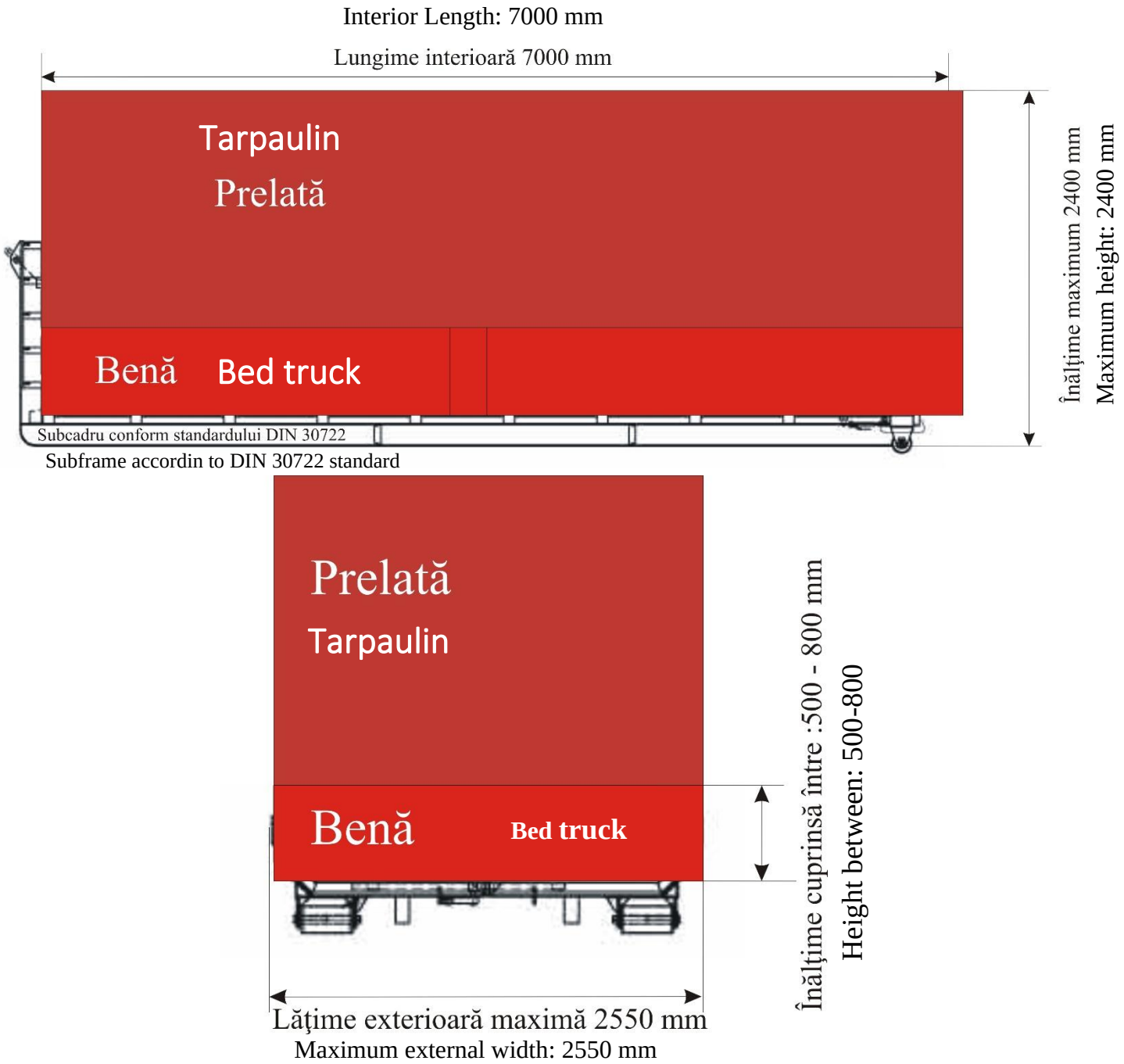
3.15.3. The truck will be inscribed as follows:

3.15.3.1. The inscriptions "SALVATORI ȘI POMPIERI" will be made in "Arial Narrow" font at the maximum dimensions allowed by the layout space. The inscription "SALVATORI ȘI POMPIERI" on the front of the vehicle will be written in the reverse;

3.15.3.2. The unique number for emergency calls "112" will be inscribed according to the icon presented in (Annex no. 1), at the maximum dimensions allowed by the layout space;

3.15.3.3. The logo of the General Inspectorate for Emergency Situations will be placed at the maximum dimensions allowed by the layout space;

Annex no. 1
The icon with no. 112


Interior Length: 7000 mm
Lungime interioară 7000 mm
Tarpaulin
Prelată
Benă
Bed truck
Înălţime maximum 2400 mm
Maximum height: 2400 mm
Subcadru conform standardului DIN 30722
Subframe accordin to DIN 30722 standard
Prelată
Tarpaulin
Benă
Bed truck
Înălţime cuprinsă între :500 - 800 mm
Height between: 500-800
Lăţime exterioară maximă 2550 mm
Maximum external width: 2550 mm

Annex no. 3

MOBILE RADIO COMMUNICATION MODULE FOR SPECIAL VEHICLES

## I. Technical Specification

*"TETRA standard communication terminals for installation in special vehicles"*

### 1. Interoperability

All the offered terminals will be compatible with the services available on the infrastructure of the TETRA system operational in the Republic of Moldova (Dimetra X). The compatibility with the mentioned infrastructure, for all types of services required by these technical specifications for each type of terminal, will be verified by the beneficiary's specialists, with the support of the Seller's authorized specialists.

In addition, the terminals offered:

a) must be **TCCA/ISCOM certified** for the version of TETRA infrastructure operational in the Republic of Moldova (with the presentation of the relevant information);
b) must support **multiple networks (MNC/MCC)** based on a list programmed in the terminal;
c) must support **AIM (Air Interface Migration signaling)**, according to ETSI 300 392-2.

### 2. Applicable technical requirements

#### 2.1. Standardisation

a) The TETRA terminals offered must comply with the ETSI TETRA standards, as follows:
- 300 392 TETRA V+D air interface;
- 300 394 TETRA V+D conformance testing;
- 300 395 TETRA Speech Codec;
- 300 396 TETRA DMO.

b) The TETRA terminals offered will be certified according to item 1.

#### 2.2. Environment

The TETRA terminals offered shall have the following environmental characteristics:

- Operating temperature: -30 … +60° C
  Storage temperature: -40 … +85° C
- Humidity: ETSI 300 019-1-5 CLASS 5.2
- Shocks and vibrations: ETSI 300 019-1-5 CLASS 5M3
- Dust and water protection: minimum IP 54

#### 2.3. Configuration

For easy installation, the mobile terminal will be in a "dash mount" or "remote mount" configuration depending on the vehicle model and the possibility of installation in the passenger compartment.

#### 2.4. RF

The TETRA terminals must meet the following RF characteristics:

a) RF Band (TMO&DMO): 380-400 MHz
b) Duplex spacing: 10 MHz
c) Adjacent channel spacing: 25 KHz
d) Static sensitivity (dBm): -114 minimum

e) Dynamic sensitivity (dBm): -105 minimum
f) Modulation: π/4 DQPSK
g) Receiver: Class A and B
h) Terminal Tx power: minimum 10 W

## 2.5. TETRA services and functionalities

### 2.5.1. *Voice services*

a) **Group call** (The group call service allows a terminal to establish one-to-many communication with a group of users called a working group, minimum 200 pre-programmed TMO groups);
b) **Individual half-duplex and full duplex call** (allows private communication between two terminals. The individual call can be either half-duplex - one subscriber talks, the other listens - or full-duplex, both subscribers can talk/listen simultaneously);
c) **Emergency call (**Each radio terminal is equipped with an emergency button, easy to identify and access. Pressing this button initiates a voice call with the highest priority on the network);
d) **Full duplex telephone call** (It is a full-duplex call (both subscribers can talk/listen simultaneously) between a radio terminal and a telephone subscriber on public or private networks. The call can be initiated both from the radio subscriber and from the telephone subscriber);
e) **DMO call** (Direct call allows subscribers to communicate directly, regardless of whether they are within the system's coverage area or not, minimum 100 pre-programmed DMO groups).

### 2.5.2. *Additional services*

a) TPI;
b) CLIP;
c) DGNA;
d) Late entry;
e) Priority call;
f) Group scanning (minimum of 10 groups);
g) Tx inxibit;
h) Operation as a "DMO repeater" (active license included in the price of the terminal);
i) Operation as a "TMO/DMO and DMO/TMO gateway" (active license included in the terminal price);

### 2.5.3. *Data services*

a) SDS/SDS-TL;
b) Status messages
c) IP PDS;

## 2.6. Mobility

a) **Cell selection/reselection**: type 3 or higher (according to ETSI TETRA 300 392-2 standard);
b) **Support for multiple networks (MNC)** based on a list programmed in the terminal.

## 2.7. Security

a) Authentication in the system. Authentication keys must be provided in a format as per TETRA MoU recommendations. Authentication keys must be provided in compliance with the security rules established by the TETRA MoU SFPG recommendations.
b) Air Interface Encryption;

c) Encryption on the radio interface – TEA1 (**Terminals must be supplied with the TEA1 algorithm).**
d) Security class: class 1 (Clear), class 2 (SCK) and class 3 (DCK and CCK);
e) Remote disable/enable.

### 2.8. Other functionalities

a) Emission inhibition in special environments (Emission prohibition function in radio frequency sensitive areas).

## 3. Specific technical requirements for the TETRA mobile terminal

### 3.1. Nominal power supply conditions: 12 Vcc

### 3.2. User Interface (MMI)

a) Display
- minnimum diagonal 2.8 inches;
- color display resolution: minimum 640x480 pixels;
- number of display colors: minimum 65K;
- Standard & Zoom Character Mode;
- indicators displayed on the display for working modes (e.g. TMO, DMO, Tx inhibit, etc.);
- Operation through intuitive menus.

b) Keyboard
- alphanumeric keyboard;
- menu navigation keys;
- button/key for initiating an emergency call;
- button/key for group selection;
- volume button/key.

c) Phonebook
- telephone book (nr.tel + private no., minimum capacity 1000 entries);
- easy dialing (e.g. by searching the phonebook, last dialed numbers, etc.)

d) Inerfacts:
- for connecting audio accessories;
- multifunctional interface for programming/data transmission/AT controls.

### 3.3. Integrated GPS Receiver

a) The TETRA mobile terminal must be equipped with an integrated GPS receiver with the following specifications:
- satellites received simultaneously: minimum 10;
- sensitivity: min. – 152 dBm;
- Precision/accuracy: max 5 m.

b) The TETRA mobile terminal **must support the ETSI LIP protocol** (ETSI standard message format through which location information is transmitted from the radio terminal via the TETRA infrastructure to an AVL server).

c) The TETRA mobile terminal must support the transmission of location information simultaneously (from the user's point of view) with the use of the TETRA Packet Data service.

## 4. Accessories & Installation Kit

For each terminal the Seller must provide accessories and installation kit. These must include:
- standard microphone with PTT and mounting bracket;
- speaker with connection cable and fixing bracket;

- power cable provided with safety and suitable connectors (min. 5m, adapted to practical situations);
- bracket for fixing in the vehicle;
- omnidirectional car antenna, band 380...400 MHz, VSWR<1.5 in the band of interest, impedance 50 ohms, fixing type on the body, provided with installation kit (fixing, RF cable, connectors, etc.);
- converter from 24Vdc to 12Vdc (if the voltage available on the special vehicle requires it);
- active GPS antenna integrated on the same support as the UHF antenna, band 1.5... 1.6GHz, VSWR<1.5 in the band of interest, impedance 50 ohms, fixing type on the body, provided with installation kit (fixing, RF cable, connectors, etc.).

5. Installation of terminals:

- The contractor must carry out the installations of the mobile TETRA terminals;
- The installation of the equipment (radio terminal and accessories), the DC power solution, the RF and DC cable routes, and power solution must be carried out based on coordinated solutions with the Beneficiary and the vehicle manufacturer (official representative) to avoid affecting the vehicle's warranty;
- All installations must allow easy access to the terminal's radio unit so that the Beneficiary can program the terminal without removing it from the vehicle.

6. Terminal programming

6.1. The programming of the TETRA terminals must be possible by the Beneficiary using a PC/laptop provided with a USB port.

6.2. A programming kit must be provided for the full quantity of TETRA mobile terminals. It must include all the elements necessary for programming the supplied TETRA mobile terminals, namely:

- USB cable for programming;
- programming application (including radio software versions);
- the license/hardware key for the programming application (if applicable);
- User Guide for the programming application, including installation and operation instructions, in English or Romanian;

6.3. For TETRA terminals, an instance of the software application and/or hardware device will be provided for uploading the authentication/encryption keys (only if the TETRA radiocommunication system administrator does not have such software/hardware products), so that the authentication/encryption keys can be loaded by the Beneficiary on any of the types of terminals provided. If the authentication/encryption keys are loaded with a software application, it will work on any PC/laptop with the Windows 10/11 64-bit operating system.

7. General requirements

7.1. The Bidder must demonstrate the compatibility of the terminals with the system in which they are to be integrated.

7.2. The terminals will be programmed by the Beneficiary with the support of the Seller, in collaboration with the administrator of the TETRA radiocommunication system, in which they are to be integrated.

7.3. The Bidder agrees to provide technical assistance free of charge, at the Beneficiary's request during the entire programming period of the terminals, including in the phase of entering the authentication/encryption keys and enrolling the terminals in the TETRA infrastructure.

7.4. The delivered products must be new and unused. Equipment declared by the manufacturer as EoS (End of Sale) or EoL (End of Life), or expected to be declared as EoS or EoL in the year of purchase, will not be accepted.

7.5. If the terminals fail during the warranty period and the defect prevents the Beneficiary from deleting programmed information (SCK keys, groups, etc.), the Bidder must supply and install a new module/assembly in which the information programmed by the Beneficiary is stored, the defective module/assembly remaining with the Beneficiary.

7.6. Any software/firmware license required for the operation of the equipment according to the technical specifications within this specification must be provided and included in the equipment's price.

7.7. Any material or accessory, device or subassembly necessary for correct installation and operation as specified will be considered implicitly requested and must be delivered.

7.8. A user manual in Romanian must be provided for each handheld terminal.

## 8. Warranty

The warranty for the supplied equipment, including its accessories, is minimum of 24 months from the date of final receipt.

## 9. Quantities, equipment and services.

| Milestone ID | Landmark name | |
|---|---|---|
| 1. | TETRA mobile terminal with TEA1 encryption algorithm.<br>This milestone includes the following sub-milestones: | 1pc. |
| 2. | Installation TETRA set, according to item 5 | 1 set/terminal |
| 3. | Software/hardware assembly and documentation for programming the mobile terminal, according to item 6. | 1 set |

| SERVICES | | |
|---|---|---|
| 4. | Support for terminal programming. | For each piece of equipment delivered |
| 5. | Installation of terminals (manufacturer solution).<br>*Note:* The installation will be done based on a prototype installation agreed between the Contractor and the Beneficiary. | For each piece of equipment delivered |

## II. Technical Specification

*"Portable TETRA Standard Communication Terminals"*

### 1. Interoperability

All the offered terminals will be compatible with the services available on the infrastructure of the TETRA system operational in the Republic of Moldova (Dimetra X). The compatibility with the mentioned infrastructure, for all types of services required by these technical specifications for each type of terminal, will be verified by the beneficiary's specialists, with the support of the Seller's authorized specialists.

Additional terminals offered:

a. they must be TCCA/ISCOM certified for the version of TETRA infrastructure operational in the Republic of Moldova (with the presentation of the relevant information);
b. must support multiple networks (MNC/MCC) based on a list programmed in the terminal;
c. must support AIM (*Air Interface Migration signaling*), according to ETSI 300 392-2.

### 2. Applicable technical requirements

#### 2.1. Standardisation

a) The TETRA terminals offered must comply with the ETSI TETRA standards, as follows:
   - 300 392 TETRA V+D air interface;
   - 300 394 TETRA V+D *conformance testing;*
   - 300 395 TETRA *Speech Codec;*
   - 300 396 TETRA *DMO.*

b) The TETRA terminals offered will be certified according to item 1.

#### 2.2. Environment

The TETRA terminals offered shall have the following environmental characteristics:

- Operating temperature: -30° C …..+70° C
- Storage temperature: -40° C .....+85° C
- Humidity: ETSI 300 019-1-7 Class 7.3A
- Shocks and vibrations: ETSI 300 019-1-7 CLASS 5M3
- Dust and water protection: IP 65/66/67/68

#### 2.3. RF

The TETRA terminals offered must have the following RF characteristics:

a) RF Band (TMO&DMO): 380 - 400 MHz
b) Duplex gap: 10 MHz
c) Adjacent channel gap: 25 KHz
d) Static sensitivity (dBm): -114 minimum
e) Dynamic sensitivity (dBm): -105 minimum
f) Modulation: π/4 DQPSK
g) Receiver: Class A and B
h) Tx terminal power: adjustable in steps up to **2.8W (Class 3)**;

#### 2.4. TETRA services and functionalities

##### 2.4.1. *Voice services*

a) Group call (The group call service allows a terminal to establish a one-to-many communication with a group of users called a working group, minimum 200 pre-programmed TMO groups);

b) Individual half-duplex and full duplex call (Allows private communication between two terminals. The individual call can be of the semi-duplex type - one subscriber talks, the other listens - or full-duplex, both subscribers can talk/listen simultaneously);
c) Emergency call (Each radio terminal is equipped with an emergency button, easy to identify and access. Pressing this button initiates a voice call with the highest priority on the network);
d) Full duplex telephone call (It is a full-duplex call (both subscribers can talk/listen simultaneously) between a radio terminal and a telephone subscriber in public private networks. The call can be initiated both from the radio subscriber and from the telephone subscriber);
e) DMO call (Direct call allows subscribers to communicate directly, regardless of whether they are in the system's coverage area or not, minimum 100 pre-programmed DMO groups).

2.4.2 *Additional services*

a) TPI;
b) CLIP;
c) DGNA;
d) Late entry*;*
e) Priority call;
f) Scanning groups (minimum 10 groups in scanning);
g) Operation in "repeater" mode (*the portable TETRA terminal must have the ability to register the repeater mode when receiving the signal transmitted by a repeater equipment, in which case group communications are made only through the repeater terminal and only within the radio coverage range provided by it*);
h) Operation in the "gateway interface" mode (*the portable TETRA terminal must have the capability to enter the gateway work mode when receiving the signal transmitted by a gateway equipment, in which case group communications are carried out between a terminal in gateway mode within the range of the gateway equipment and a terminal registered on a radio cell within the system infrastructure*);

2.4.3. Data services

a) SDS/SDS-TL;
b) Status messages
c) IP PDS;
d) AT Commands.

2.5. Mobility

a) Cell reselection: type 3 or higher;
b) Support for multiple networks (MNC) based on a list programmed in the terminal.

2.6. Security

a) Authentication in the system. Authentication keys must be provided in a format as per TETRA MoU recommendations. Authentication keys must be provided in compliance with the security rules established by the TETRA MoU SFPG recommendations;
b) Air Interface Encryption
c) Encryption on the radio interface – TEA1 (**Terminals must be supplied with the TEA1 encryption algorithm).**
d) Security class: class 1 (Clear), class 2 (SCK) and class 3 (DCK and CCK);
e) *Remote disable/enable.*

### 2.7. Other functionalities

Emission inhibition in special environments (Emission prohibition function in radio frequency sensitive areas).

## 3. Connectivity

### 3.1. Wi-Fi

- IEEE Standards Supported 802.11 a, b, g, n, ac;
- Wi-Fi bands: 2.4GHz and 5GHz;
- authentication and encryption;
- TLS 1.2 security.

### 3.2. Bluetooth

- Supported versions: Bluetooth 5.0, 4.2, 4.1, 4.0, and 2.1;
- Security: Supports encryption.

## 4. User Interface (MMI)

a) Display

- color screen with the possibility of rotating the image and enlarging the displayed text;
- color display resolution: minimum 2.4 inches, 65K;
- indicators displayed on the display for working modes (e.g. TMO, DMO, etc.);
- Operation through intuitive menus.

b) Keyboard

- alphanumeric keyboard;
- menu navigation keys;
- button/key for initiating an emergency call;
- button/key for group and volume selection;
- programmable buttons;
- Keyboard lock.

c) Phonebook

- telephone book (nr.tel + private number with a capacity of min.1000 entries);
- easy dialing (e.g. by searching the phonebook, last dialed numbers, etc.)

d) Audio & programming interface/data transmission

- audio amplifier and speaker (the power of the amplifier and speaker must be adequate so that the terminal can be used in noisy environments);
- Audio mode: loud/discrete selectable from MMI. The audio volume must be controllable from the MMI;
- possibility of using audio accessories;
- multifunctional interface for programming/data transmission;
- supports Over-The-Air Programming.

## 5. Integrated GPS receiver

a) The TETRA handheld terminal must be equipped with an integrated GPS receiver with the following specifications:

- satellites received simultaneously: minimum 8;
- sensitivity: min. – 163 dBm;
- precision/accuracy: max 5 m (probability 50%);

b) Active GPS antenna, integrated in the TETRA antenna or in the terminal;
c) The TETRA handheld terminal must support ETSI LIP.

6. Accumulator
   a. Battery Type: Lithium-Ion or Lithium Polymer;
   b. Capacity: minim 1950 mAh;
   c. Autonomy for 5/5/90 mode (Tx/Rx/Standby): ≥ 18 hours.

7. Accessories

The following accessories shall be provided for each terminal:
- small RF antenna;
- *hands-free accessory* with built-in microphone, speaker and PTT button, provided with a rotating clip for lapel attachment;
- clip for fixing the portable terminal to the belt;
- dual charger for simultaneous charging of terminal and battery (EU socket);
- vehicle charger;
- spare battery with specifications according to item 6.

8. Terminal programming

8.1. The programming of the TETRA terminals must be able to be carried out by the Beneficiary through a PC/laptop provided with a USB port.

8.2. A programming kit shall be provided for the entire quantity of TETRA mobile terminals. It must contain all the elements necessary for programming the supplied TETRA mobile terminals, namely:
- USB cable for programming;
- programming application (including radio software versions);
- the license/hardware key for the programming application (if applicable);
- for the programming application, the User Guide will be delivered, which will include the description of how to install and operate the application, in Romanian/English;

8.3. For TETRA terminals, an instance of the software application and/or hardware device will be provided for loading the authentication/encryption keys (only if the TETRA radiocommunication system administrator does not have such software/hardware products), so that the authentication/encryption keys can be loaded by the Beneficiary on any of the types of terminals provided. If the authentication/encryption keys are loaded with a software application, it will work on any PC/laptop with the Windows 10/11 64-bit operating system.

9. General Requirements:

9.1. The Bidder shall demonstrate the compatibility of the terminals with the system in which they are to be integrated.

9.2. The terminals will be programmed by the Beneficiary with the support of the Seller, in collaboration with the administrator of the TETRA radiocommunication system, in which they are to be integrated. The Bidder undertakes that, at the request of the Beneficiary, it will provide technical assistance free of charge, whenever necessary, during the entire programming period of the terminals, including in the phase of entering the authentication/encryption keys, respectively of enrolling the terminals in the TETRA infrastructure.

9.3. The delivered products must be new and unused. Equipment declared by the manufacturer as EoS (End of Sale) or EoL (End of Life), or to be declared as EoS or EoL in the year of purchase, will not be accepted.

9.4. In the event that the terminals fail during the warranty period and the defect does not allow the Beneficiary to delete the information programmed by the Beneficiary (SCK keys, groups, etc.), the Bidder undertakes to supply and install a new module/assembly in which the information programmed by the Beneficiary is stored, the defective module/assembly remaining in the possession of the Beneficiary.

9.5. Any software/firmware license required to operate the equipment in accordance with the technical specifications herein will be provided and included in the price of the equipment.

9.6. Any material or accessory, device or subassembly and any other materials like them, which are necessary for the correct installation and operation at the parameters specified in this specification shall be considered a priori requested, and the equipment shall nevertheless be delivered.

9.7. For each handheld terminal, a user manual must be provided in Romanian.

## 10. Warranty

The warranty provided for the equipment supplied, including its accessories, is at least 24 months from the date of final receipt.

## 11. Quantities, equipment and services.

| Milestone ID | Landmark name | Quantity |
|---|---|---|
| 1. | TETRA handheld terminal with TEA1 encryption algorithm, accessories according to item 7. | 3 pcs. |
| 2. | Software/hardware assembly and documentation for programming the handheld terminal, according to item 8. | 1 set |
| SERVICES | | |
| 3. | Support for terminal programming. | For every piece of equipment delivered |

## Abbreviations

| | |
|---|---|
| AL - | Ambience Listening |
| ARL - | Automatic Resource Location |
| AVL - | Automatic Vehicle Location |
| CLIP - | Calling Line Identification Presentation |
| DGNA - | Dynamic Group Number Assignment |
| DMO - | Direct Mode Operation |
| DTE - | Data Terminal Equipment |
| ETSI - | European Telecommunications Standards Institute |
| GC - | Group Call |
| GPS - | Global Positioning System |
| IC - | Individual Call |
| IP - | Internet Protocol |
| ISCOM - | Higher Institute of Communications and Information Technologies (laboratory of the Italian Ministry of Communications) |
| LIP - | Location Information Protocol |
| MCC - | Mobile Country Code |
| MNC - | Mobile Network Code |
| MoU - | Memorandum of Understanding |
| PC - | Personal Computer |
| PDS - | Packet Data Services |
| PEI - | Peripheral Equipment Interface |
| PIN - | Personal Identification Number |
| PTT - | Push To Talk |
| PSU - | Power Supply Unit |
| RF - | Radio Frequency |
| Rx - | Receive |
| SDS - | Short Data Services |
| SFPG - | Security and Fraud Prevention Group |
| SwMI - | Switching and Management Infrastructure |
| ST - | Specification Technica |
| TEA - | Tetra Encryption Algorithm |
| TETRA - | Terrestrial Trunked Radio |
| TL - | Transport Layer |
| TMO - | Trunk Mode Operation |
| TPI - | Talking Party Identification |
| Tx - | Transmit |
| URL - | Uniform Resource Locator |
| V+D - | Voice and Data |
| VSWR - | Voltage Standing Wave Ratio |
| WAP - | Wireless Application Protocol |