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Supply requirements

Procurement of 105 low floor, Euro 6 - C class - Diesel engine, new city-buses (30 midi buses - 10 m, 40 standard buses - 12 m, 35 articulated buses - 18 m)

for urban public transport in Brasov City - Romania

- A.List of goods and related services**
- B. Delivery and Completion Schedule**
- C.Technical specifications**

A. List of goods and related services

1.1 List of goods

No.	The Items	Short description	The Quantity
1.	Buses	Midi city buses (10 m) - Diesel Euro 6 Standard city buses (12 m) - Diesel Euro 6 Articulated city buses (18 m) - Diesel Euro 6	30 units 40 units 35 units
2.	Ticket validation equipment	Please consult Chapter 15.2	105 pcs.
3.	On-board ITS computer	Please consult Chapter 15.3	105 pcs.
4.	Passenger information system	Please consult Chapter 15.4	105 sets
5.	Video surveillance system	Please consult Chapter 15.5	105 sets
6.	Passengers counting system	Please consult Chapter 15.6	45 sets
7.	Voice communication system with dispatch centres	Please consult Chapter 15.7	105 sets
8.	Embedded electronic management and diagnosing system (EEMDS) through CAN	Please consult Chapter 15.8	105 sets
9.	Back-office software and hardware for ITS	Please consult Chapter 15.9	1 set
10.	Tools, devices and test equipment, specific equipment and software for maintenance operations and repairs, diagnosis and parameters setting	Please consult Chapter 18.1	See Annex 1.1
11.	Initial supplying of spare parts and materials	Please consult Chapter 18.2	See Annex 1.2
12.	Initial supplying of main components and electronic command units	Please consult Chapter 18.3	See Annex 1.3

1.2 List of related services

No.	The name of the related services	Short description	The Quantity
1.	Training services	Please consult Chapter 19.2	The Flat amount
2.	Setting up the workshop/service centre	Please consult Chapter 19.1	The Flat amount
3.	Preventative/Planned maintenance for 36 months	Please consult Chapter 22.2	36 months

B. Delivery and completion schedule

The time limit for the first delivery of goods to Purchaser location is no later than 24 weeks after the date when the contract was signed by both parties. The time limit for completion of delivery to Purchaser location is no later than 40 weeks after the date when the contract was signed by both parties

Name of goods or related service	Delivery Schedule
GOODS	
Buses	<ul style="list-style-type: none"> - The first delivery of minimum 15 buses will be carried out within 26 weeks from the date when the contract was signed by both parties - The second delivery of minimum 20 buses will be carried out within 30 weeks from the date when the contract was signed by both parties The last delivery of buses will be complete within 40 weeks from the date when the contract was signed by both parties <p>All deliveries made prior to their respective deadline are encouraged and accepted provided that:</p> <ul style="list-style-type: none"> - The first set of minimum 15 buses will be delivered within 26 weeks from the moment when the contract entered into force; - At least 35 buses must be delivered within 30 weeks from the moment when the contract entered into force; and - The final set of buses will be delivered no later than within 40 weeks from the moment when the contract entered into force.
Ticket validation equipment	Shall be delivered as already installed and functioning one on each and all delivered buses
On-board ITS computer	Shall be delivered as already installed and functioning one on each and all delivered buses
Passenger information system	Shall be delivered as already installed and functioning one on each and all delivered buses
Video surveillance system	Shall be delivered as already installed and functioning one on each and all delivered buses
Passengers counting system	45 of the buses (15 buses of 10m, 15 buses of 12m and 15 buses of 18m) must be equipped with passenger counting system
Voice communication system with dispatch centres	Shall be delivered as already installed and functioning one on each and all delivered buses
Embedded electronic management and diagnosing system (EEMDS) through CAN	Shall be delivered as already installed and functioning one on each and all delivered buses
Back-office software and hardware for ITS	Shall be delivered and installed together with the first delivery of buses

Tools, devices and test equipment, specific equipment and software for maintenance operations and repairs, diagnosis and parameters setting	Shall be delivered and installed together with the first delivery of buses
Initial supplying of spare parts and materials	Shall be delivered in tranches within 40 weeks from the date when the contract was signed by both parties
Initial supplying of main components and electronic command units	Shall be delivered in tranches within 40 weeks from the date when the contract was signed by both parties
RELATED SERVICES	
The training services	two weeks prior to the delivery of the first buses
The creation of the service unit	within a month from the arrival of the first buses
The preventive / scheduled maintenance activity for the next 36 months	in accordance with the preventive / periodic maintenance plan included in the provisions of the contract or amended by the parties that signed the contract

C. The technical provisions

- a. **Midi bus 10 m – EURO 6**
- b. **Standard bus 12 m – EURO 6**
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 - 7.2.1. Windshield
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- 25.2. Verification of characteristics, quality of parts and materials
- 25.3. Verification before delivery
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- 26. SYSTEMATIC FAULTS AND HIDDEN FAULTS**
- 27. MARKING, PRESERVATION, PACKAGING, TRANSPORTATION**
- 27.1. Marking
- 27.2. Preservation and packaging

1. GENERAL REQUIREMENTS

- The total cost of the procurement procedure includes the costs of the buses delivered together with the requested equipment and the related services;
- The procurement procedure for the new urban buses destined for the city of Brasov has to comply with the Romanian legislation and the buses must be of low floor for the entire length of the bus, without any high surfaces, meeting the Euro 6 (Stage C) pollution requirements;
- For the purpose of increasing the fleet homogeneity **all the three types of delivered buses must be produced by the same manufacturer**. A homogeneous fleet gives important technical, economic, and operational advantages to the Purchaser given the actual condition of the Purchaser workshops and of the related personnel.

Supplying the buses from a single manufacturer gives real advantages to the Purchaser regarding the workshop authorisation and the necessary improvements for workshop location, the workshop equipment with necessary tools and devices for repairs and maintenance operations, the simplification of maintenance operations and cost reduction for this requested service, training of workshop staff, training of drivers, integrated management of the intelligent transportation systems that will equipped the new buses, the purchasing of spare parts and consumables for the new buses, the image of public transport perceived by passenger (fleet standardisation) and easing the use of ticket validation system for passengers.

- The procurement procedure for equipment, special tools, spare parts and consumables;
- The service activities inside the warranty period, the post warranty period, the training of the Purchaser's staff, as these are stipulated in the contract.
- Whenever applicable, the Supplier shall provide the latest generation (version) of the components and systems which equip the buses.
- **The tenderers, may propose, as a priced option, alternative body styling on the 18m articulated vehicles. In the tenderer decided to present such option then it should clearly indicate which elements of the vehicle are different to the standard vehicle proposed, using diagrams, plans or specifications as required, and how these changes affect the following elements (both positive and negative):**
 - **Capital Cost;**
 - **Operational Cost (e.g. fuel savings from aerodynamic benefits);**
 - **Maintenance Cost (e.g. special order parts, or additional equipment fitted); and**

Passenger Perception (e.g. increased ridership generated from a more positive image – this must be evidence based).The purchaser will make a decision based on the information supplied whether to exercise this option on any or all of the 18m vehicles. This will be agreed with the supplier as part of the final contract clarification discussions.

- The tenderers may propose as an alternative technical option for on board computer for ITS (Supply Requirements – paragraph 15.3) the upgrading of the on board computer for AVL (Supply Requirements – paragraph 15.1). In they opt for such alternative proposal, then the tender shall include all information necessary for a complete evaluation of the alternative by the Purchaser, including, as appropriate, drawings, design calculations, Technical Specifications, breakdown of prices, and other relevant details which shall demonstrate that the the alternative solution meets all the Purchaser technical requirements.

1.1. Laws and Directives

1.1.1. *The buses must comply with the EU and the Romanian legislation and also with the Regulation regarding the homologation, the certificate of authenticity and the registering of the vehicles (RNTR 7), modified by the Order of the ministry of Transportation no 1049/20.08.2013.*

1.1.2. The buses must comply with the Euro 6 C class pollution regulations

1.1.3. The buses must comply with all the rules, regulations and standards issued by the EU for the engine equipped vehicles

1.1.4 The tenderer has to submit, no later than the day when the first set of buses will be delivered, the homologation certificate issued by the rightful Romanian Authority (Registrul Auto Român), in order to be able to obtain the registration for the buses.

1.1.5. The buses must be built in compliance with all the standards, rules and regulations that are into force regarding the technical requirements for road vehicles and according with the stipulations of Directive

85/2001/EC - *Special provisions for vehicles used for the carriage of passengers comprising more than eight seats in addition to the driver's seat* and also with Directive 46/2007.EC amended by Directive 395/2009/EC.

1.1.6 The compliance with the with the provisions of the Directive 30/2003/EC and the related Romanian regulations has to apply also to the engine of the bus, engine that must be compatible both with diesel and with biodiesel fuel.

1.2. Hazardous materials

All the materials and substances used for the bus must not endanger the health of the passengers, the maintenance staff or of the drivers. The presence or the use of asbestos is forbidden. The list of hazardous substances specified in the tender documents must contain the following details:

- the name of the substance
- the supplier
- the place where it can be found in the bus
- the type of health risk
- measures meant to diminish the effects of the health hazard
- the quantity of the substance

1.3. Transporting provisions

When defining the technical parameters of the vehicle, the tenderer must take under consideration the topographic features and the traffic particularities of the public transportation of passenger road network where the Purchaser operates (Brasov). The tenderer must pay close attention to the capacity, the suspension, the brake system, the traction characteristics, the life expectancy of the bus (until the moment when the necessity for the extended reparations, the scrapping or the dismantle arises), therefore considering:

- the configuration of the route and the terrain level differences with slopes with a degree of inclination of at least 14% and curves with an exterior angle of at least 12.5 m
- the specifics of the buses namely the fact that they will be generally filled with passengers

1.4. Operating meteorological conditions

The buses must comply with the SR HD 478.2.1 S1: 2002 Regulation, the second part that speaks about the environmental specifics or other equivalent standard.

The buses are meant to operate in temperate type N climate conditions and must provide all the safety requirements while being used in the city of Brasov.

- the environmental temperature between 35 degrees below 0 Celsius and plus 40 degrees Celsius
- relative humidity of 98% with a temperature of ≤ 25 degrees
 - the altitude of maximum 1200 meters
- external factors like: dust , rain, fog, mud, snow, hoar-frost, ice, salt water, oil products, non-skid fluids;

1.5. Route suitability

The geometric parameters of the bus must comply with the route specifics where the Purchaser operates.

The front and the back access angle and also the distance between the floor of the bus and the road must be designed so that no damage should occur during the usage of the bus on all the routes where the buses will operate.

1.6. Admissible noise

The noise level limit must be in accordance with the CEE-UNO no. 51 or 70/157 / CE regulation.

1.7. Quality and anti-corrosive protection

The design solutions along with the quality of the product and materials used at buses manufacturing have to offer the warranty that there will be no need for major interventions and no major repair jobs due to corrosion during the entire life of these buses (12 years) considering that salt is used on the roads when the snow and the ice occurs during the winter season.

The Tenderer must advise on the best conduct for the prevention of corrosion.

The corrosive protection has to comply with the provision of the ISO 9223 prescriptions.

1.8. Periodicity of the maintenance operations

The maintenance works has to be scheduled at no less than 40000 km or 2300-2500 operating hours.

These details have to be included in the warranty terms.

The tender documents must include all the specification about the maintenance works, the necessary technology and the time frame for them.

2. DIMENSIONS

The requested type of vehicle is the new urban bus type, Euro 6, phase C compliant, with completely lowered floor, at the same level, without other stairs or increased heights throughout the entire length of the vehicle and surface intended for the passengers.

The Description	The Specification
a. The 10 meters long bus	The total length between 9.400 mm and 10.900 mm
b. The 12 meters long bus	The total length 12.000 mm +/-350 mm
c. The 18 meters long bus	The total length 18.000 (mm) +/-400 mm
The width	2.500 mm +/- 50 mm (without the outside mirrors)
height (with the air conditioning system included)	Max. 3.150 mm (the height of the car shed)
minimum turning radius	≤ 12,5 m
front overhang	Min. 2.600 mm
rear overhang	Min. 3.200 mm
The number of access doors	The specification of the double doors from the right side of the bus a. - the 10 m in length type with minimum 2 double doors b. - the 12 m in length type with 3 double doors c. - the 18 m in length type with 4 double doors All doors must have door handles
The width of the access doors	The minimum width would be 1200 mm for all the access doors. The second access door has to be equipped with a mechanical platform for wheelchairs or baby carts.
The tyres	275/70 R 22.5 „M+S” CITY-URBAN, load index 150/145
The capacity (no of passengers)	a. The 10 m in length type – min. 70 persons b. The 12 m in length type – min. 96 persons c. The 18 m in length type – min. 135 persons
Total mass specifics	The tender documents will include detailed mass specifications and the mass distribution on the axles, and will highlight the following: - Calculated effective load (kg); - The net weight in compliance with the Directive CE / 27/1997 (kg); - The maximum admissible weight of the bus in kg must be in compliance with the <i>legal provisions regarding the distribution of the vehicle weight for the vehicles present in traffic</i>

floor height	Design – completely low floor (No stairs must exist on the way and platform of the passenger compartment throughout the entire length of the bus). The height of the stair for all the doors must not exceed 340 mm, measured when the bus is empty and when stationary (without using the tilting device) – in accordance with EC 2001/85/EC.
The frontal access angle	Max. 7°
The back access angle	Max. 7°

3. PROPULSION SYSTEM

3.1. Engine

The buses included in the tender must be equipped with engines that are compliant with the Euro 6 phase C pollution emissions regulations according with (EC) Regulation no. 595/2009, (EU) Regulation no. 582/2011 for implementation and modification of (EC) Regulation no. 595/2009, amended by (EU) Regulation no. 64/2012.

The Purchaser's requirements regarding the engine

The compression ignition engine will use diesel and biodiesel fuel and will have a minimum of 5 cylinders. The engine will be supercharged with intercooler and will be in compliance with the EURO VI, phase C prescriptions regarding the emissions and the proof of all these will be proved by presenting the type approval certificate issued by RAR or through a EU approval certificate, along with the certificate of conformity (CoC) issued by the manufacturer.

- the engine power - **a.** The 10 meters long bus - min. **190 kw.**
- **b.** The 12 meters long bus - min. **200 kw;**
- **c.** The 18 meters long bus - min. **220 kw.**

- the maximum torque of the engine must be reached at a relatively reduced number of rotations: range of 1.100 – 1.500 rpm or 1.200 – 1.600 rpm, and it must provide a range of rpm where the maximum torque will be maintained at a constant level towards superior levels of rpm.

The command and the control over the functioning of the engine will be achieved via an electronic command unit , integrated in the ISEMD (chapter 15.8) of the bus and communicating via the CAN network.

The electronic unit will provide information about the functioning parameters of the engine and all the maintenance works required, the electronic diagnosis process together with the actions needed in order to restore the performances of the engine if needed.

The control system will provide, in real time, visual and audio warning information to the driver when technical issues occur (lack of lubrication, overheating, fires, etc.)

In accordance with the provisions of the R85 EEC-UNO Regulations the tenderer will present documents issued by the rightful laboratories about the main performance indices of the engine:

- the maximum power
- the rotation speed at maximum power
- the maximum torque
- the minimum rotation speed for maximum torque
- the rotation speed range for maximum torque
- cylinder capacity
- the average fuel consumption (l/km) test SORT 1
- the specific fuel consumption (g/kWh)
- the energy consumption for 1 km in [MJ/l] for operation cost determination for the entire lifetime period of the bus (CE Directive no. 33/2009 transpose in Romanian legislation by OUG 40/2011);
- the quantity of emissions: CO₂ (g/km); NO_x (g/kWh) PM (particles) (g/kWh);
- NMHC (g/kWh); opacity (m-1);

- the specifics of the engine : number of cylinders and the positioning of the cylinders
- other technical specifications: stroke/bore, compression ratio, type of fuel injection, the fuel injection pressure, the injection flow (debit), the advance of the injection.

The engine must be able to start at -32 degrees C environmental temperature (this temperature was recorded in the last years at the Purchaser location), without any other helping device and with frost prevention system for the AdBlue tank. .

The engine must comply with the pollution level values imposed by the law for the homologation of diesel engines.

The tenderer must supply a legal certificate proving that the engine comply with the EURO VI, phase-C regulation .

The engine oil must be replaced no sooner than after 40000 km or 2300-2500 working hours

The noise level, inside the passenger compartment and outside the vehicle must be as low as possible in accordance with the CEE-UNO no. 51 or 70/157 / CE regulation, due to adequate soundproofing solution of the engine.

The engine compartment should be design in order to provide enough space for dismantling the engine components, the gearbox and the other subsystems.

3.1.1 Inlet plug

The minimum height of the inlet plug has to be at least 1,4 m above the ground . As a proof, it is necessary to present a technical drawing indicating the distance between the air plug and the ground, for the tender vehicles.

3.1.2. Air filter

The air filter must be the dry type and the driver's dashboard must indicate the level of contamination of the filter. The tender document must include information about the authorised filter suppliers. The minimum life expectancy of the air filter must be 40000 km

3.1.3 Engine cooling system

The cooling of the engine will be done with a mix of water and antifreeze liquid.

The antifreeze liquid will be based on organic inhibitors- minimum G12.

The technical specification:

- closed type installation, under pressure, with a recycling pump and a thermostat for adjusting the temperature for the functioning of the engine. The installation will include manual and automatic taps for opening and closing the heating and cooling circuits
- the vent must be automatic, preferably hydraulic, so that the rotation of the vent will vary based on the cooling necessity
- the tubes of the cooling system will be made out of highly anticorrosive material (e.g. stainless steel and brass) thermic isolated so that it would last for the total life expectancy of the bus
- flexible connections with a minimum life expectancy of 9 years
- on the driver's dashboard there has to be a liquid minimum level indicator
- the temperature of the cooling circuit must be shown on the driver's dashboard

The access to the radiator must be very easy so that cleaning and replacing works could be done. The cooling radiator should be placed so that it could be access without having to dismantle other parts. The cooling liquid addition should not be done through the passenger's compartment.

If there is not enough cooling liquid in the cooling installation an optic and sound signal will be launched on the driver's dashboard.

There also must be an exterior transparent device that would permit the drive to see the liquid level.

The engine compartment must be protected, in the lower part, with a protective cover.

3.2. Transmission

The gearbox will be electronically controlled, with a retarder system included, with no less than 6 gears for forward movement and 1 for reverse.

The technical requirements

- the hydrodynamic automatic transmission powershift type with 6 forward plus 1 reverse gears with a multiplication of the engine rotations (overdrive) for at least the 6th gear. Acoustic and light signals will be installed for reverse movement.
- the retarder must be directly controlled by the brake pedal and have a brake efficiency close to vehicle stop without using the service brake.
- temperature sensors (electronical command unit, the retarder, the oil bath)
- electronically controlled functioning, the existence of a primary retarder, providing a maximum torque which ensure the changing of the gears with a reduced number of rotations per minute, the changing of the gears will be done in accordance with the topography of the road.

The cooling system of the gearbox oil and of the retarder oil will ensure a low temperature of all the components of the gearbox, a safe brake system so that it could reduce speed until very low values close to halt (hydrodynamic brake, retarder, low wear of brake pads and brake disks), silent functioning due to the shock absorbers and the hypoid gear, a low fuel consumption and oil changes at no less than 90 000 km.

This will ensure the functioning for no less than 500.000 km without any overhaul.

If the diagnosis process it is not integrated with the Electronic management and diagnosis system of the bus and it is done using a different interface and software, the tenderer must specify this situation in the tender documents and will provide the Purchaser with the diagnosis kit. Also the winning tenderer will provide two diagnosis sets per each bus type including laptops, software, modems, all usable for the entire duration of time in which the buses are used.

The buses will be equipped with a speed limitation system (with DLV adjustable) for no more than 70km/h.

3.3. Drive shaft

If the drive shaft needs to be greased the tenderer must specify the time frame for this operation and how exactly this must be done. The life expectancy of the Drive shaft will not be less than for 200.000 km.

4. SUSPENSION

The bus must have integral pneumatic suspension, electronically controlled with ECU programmable electronic command, with kneeling function and automatic position adjustment depending on bus load (ECAS).

The electronic management and diagnosis system of the bus must include the control, diagnosis and parameter monitoring functions of the suspension system.

There must be the possibility to adjust the distance between the floor of the bus and the road so that the bus could kneel to the side of the doors in order to facilitate the passenger access. This function must be active only when the bus is halted and it will be monitored by the bus computerised system.

Only after the bus floor is levelled again and the access doors are closed the bus would start running again on the road.

The driver will have the possibility to uplift the bus on all axes with at least 40mm when the bus is moving with a speed less than 20 km/h, in case it encounters an obstacle or the road. When the speed exceeds 20km/h the suspension level will turn back to normal.

Any change affecting the suspension will be signalled on the driver's dashboard and an optic and sound signal will be launched and it will be recorded in the on board computer memory. The air cushions and the sensitive components of the suspension must be protected against physical damaging and pollutants (mud, oil products).

5. STEERING, WHEELS, AXLE

5.1. Steering system

The steering system must be servo type which provide a better manoeuvrability of the bus. Testing connections will be provided for measuring the oil hydraulic pressure. The steering wheel will be adjustable both vertically and horizontally depending on the needs of the driver. The adjustable option will be inactive as long as the bus is running. The steering system will have a dumping system and the possibility of diagnosis.

The steering box and the power steering as well the spherical joints of the steering mechanism must be operational „without maintenance“ with a minimum life expectancy of 300.000 km.

In compliance with the provisions of CEE Regulations the steering box must provide the adequate steering angle also must create the right turn radius for the external part of the bus.

The steering system must provide a maximum compatibility with the front axle.

5.2. The pneumatic installation (the compressed air generating system)

The pneumatic system must be homologated in compliance with EEC-UNO Reg. 54 or 92/23/EC.

The equipment for preparing, storing and distributing the compressed air must include: the compressor, the separator filter, the drying filter (which must be double for the 18m long buses), the compressed air tanks, the interconnecting tubes, the coupling connectors.

It is mandatory that the pneumatic installation will work properly even in very low temperature up to minus 32 degrees Celsius, without any condensations or ice caps. The tender must include a written description of how the delivered buses will be able fulfil this mandatory requirement.

Other requirements of the pneumatic system:

1. The pneumatic system must have no less than the following elements for air preparation:

- the oil separator
- the air dryer and the automatic condensation separator

2. The design of the cylinder capacity the compressor must take under consideration the opening and closing of the doors, time and time again, and also a large number of braking actions .

- The lifetime of operation must be as high as possible
- The compressed air tanks must be built out of stainless steel or other corrosive resistant materials.
- The transporting tubes and the connexions must be built of highly anticorrosive materials and must be positioned so that no friction between them could occur or between them and other components of the bus and also so that there would always be at a safe distance from the heat discharging components.
- The pneumatic hose and tubes must be entirely manufactured out of anti-corrosive materials.
- The pneumatic plastic hoses and tubes are not allowed
- In order to allow the general inspection and the diagnosis of the pneumatic system more connections must be provided for the repair process and the maintenance

A quick coupling at each of the following location : front and back side of the bus, on the chassis, next to the towing device will be provide for charging the installation with compressed air. The quick couplings will have a unidirectional valve and a protection cap.

5.3. Tyres

Technical specification:

- The tyre size must be 275/70 R 22.5.
- Tubeless radial, CITY-URBAN (in the homologation documents there has to be specified that the tyres are CITY-URBAN or the equivalent)
- Armed lateral profile
- The tenderer must provide information about the necessary pressure of the tyres
- The tyres will have the "M+S" inscription and must have the right adhesion on road covered with glazed frost, ice, snow
- Metallic protection disks of the stud bolts will be assembled on the front wheels
- Mud flap located behind the wheels, both on the front axle and on the driving axle
- The spare tyre must be delivered with the bus, but separately packed
- On the rear axle, where on each side the number of tyres is doubled, the air pressure of the tyres must be measurable and adjustable without any dismantling action being necessary

The air pressure shall be permanently monitored through a Tyre Pressure Monitoring System (TPMS) and the results will be shown on the driver's dashboard therefore he will be warned if the tyre pressure becomes too low. In visible places on the tyres the recommended values of the inside air pressure will be inscribed.

5.4. Axle

5.4.1. Rear axle

It will be compact, carter type, with axle drive bevel pinion with hypoid gearing, with Anti-lock Braking System/Anti Slip Regulation endowment. The axle with planetary reductor in the wheel hub is not accepted. The crankcase of the axle will be provided with places marked for the suspension of the vehicle.

Portal axles with two-stage reduction are also accepted.

The tenderer will present in its tender the type of the driving axle, detailing its technical characteristics.

The tenderer has to provide data about the quantity, type and quality of the engine used in the differential driving gear.

The minimum replacement period of the oil has to be of at least 120.000 km covered.

The rear axle should have maximum compatibility with automatic transmission.

The offer shall include maintenance instructions for periodical replacing the oil in the differential driving gear, as well as requirements regarding the quality and type of the oil used.

5.4.2. Front axle

The front axle must be rigid, forged in I profile or the independent semi-axle type, ABS included

The front axle must have a lifetime expectancy, without major interventions, of no less than 500.000 km

The semi-axle must include marked places for the elevation of the tires

The semi-axle with two swinging arms solution is not acceptable.

The front axle must be designed so that it could deal with an increasing number of passengers.

The type of axle chosen both for the front part of the bus and for the rear part of the bus will be adequate for a low floor without stairs for the standing passengers.

The pneumatic suspension will be separated from the telescoping dumper suspension.

5.4.3. The 2nd axle for the 18 m long buses

It must be rigid and it must include the EBS.

6. BRAKING SYSTEM

The braking system must be homologated in compliance with the EEC - UNO no. 13 or 71/230/EC.

The braking system on all axle of the bus must be disk based braking system with automatic adjustment which will require no adjustment during the operation. The braking system has to be exclusively designed as a system with compressed air.

6.1. Service braking system

The service brake must contain two independent pneumatic circuits on each axle that will act on the brake disks. The intensity of the action will be visible on the dashboard (ABS and ASR and the air pressure of the brakes according to the bus load and to the other incorporated function).

The manufacturing solution will allow the diagnosis, control and reestablishment of the parameters through the network CAN Multiplex.

The service brake will be integrated with the retarder of the gearbox and the retarder will be controlled by the brake pad.

6.2. Brake pads

All the brake pads used on the buses must be the same type, manufactured by the same producer and approved in accordance with the EEC - UNO no. 13 or 71/230/EC Regulations.

The driver's dashboard display must include a pad brake usage indicator.

The life expectancy of the brake pads must be no less than 50.000 km for all axes of the bus.

The brake disks must have a life expectancy of no less than 250 000 km.

6.3. Hand (parking) brake and the auxiliary brake system

The parking brake will act on the rear axle, with pneumatic command, it will work through cylinders with spring activation, being able to easily mechanically unblock or being able to pneumatically unblock through the air outlet panel, if the necessity arises.

If the parking brake is not activated after the bus and engine stop an acoustic signal will be heard to warn the

driver. The acoustic warning will be heard every time the bus will be used and the parking brake is not activated when the ignition key is not in the socket. The acoustic warning will be heard even when the right level of air pressure is not reached.

6.4. Parking brake

The parking brake used for bus-stops brake will be pneumatic, automatically activated and it will act on the brake disks in the bus stops, once the doors are opened or when activated by the driver.

The brake pads must be ecological (asbestos free), on their surface the maximum level of usage will be inscribed, they must not generate vibrations or annoying noise regardless of the speed, the braking force used or the wear degree .

In the tender price the tenderer must include the methodology and the tools needed for changing the brake pads and the brake disks.

If accidentally both the brake pedal and the gas pedal are touched the brake pedal will have the first effect.

The pneumatic control components such as valves, distributors and so on must be protected from the cold air flow and the anti-slip materials (e.g. salt) thrown on icy roads during winter season.

6.5. Electronic brake system(EBS)

The buses must be equipped with an electronically controlled braking system connected to the on board computer and the CAN system.

7. GENERAL TECHNICAL FEATURES AND THE FUNCTIONAL REQUIREMENTS OF THE AGGREGATES, THE SUBSYSTEMS AND THE COMPONENTS

7.1. Chassis, vehicle body, exterior coating, paint

The process for manufacturing the body of the vehicle will comply with the EEC - UNO prescriptions.

The vehicle body must be self-supporting and will have a low floor for the entire length of passenger compartment. No stairs are allowed at the access doors or on the floor.

The vehicle body must be resistant to cracking, tears, distortions for the entire life expectancy of the bus. It must also be anticorrosive protected (inward and outward).

The sub-frame must be anticorrosive resistant for at least 12 years without needing to conduct any supplemental anti-corrosive treatment.

The safety structure of the vehicle body can be built out of:

- pipe profiles for heavy loads
- rectangular pipes and/or carbon steel profiles for metal structures, protected against corrosive effects through cathaphoresis or hot galvanizing;
- rectangular pipes and/or stainless steel profiles
- rectangular pipes and/or aluminium profiles

The entire vehicle body will be put together by using protective gas welding and the side parts will have an extra armour with longitudinal bars meant to protect the passenger in case of lateral collision.

The anticorrosive protection, existing under the body of the bus will ensure the resistance against contact with stones, sand, ice and so on.

The tenderer must provide a detailed description of the way the anticorrosive protection was ensured, the number of layers of protection, their thickness and a document containing the technical details of the materials used for the bus.

The structure of the body of the bus will include double suspension points, distinctly marked in the front areas and the rear areas of the tyres existing on both axle, the first for assembling the jack and the other one for securing the bus through fixed devices.

The structure of the body of the bus and the technical solution for the windows must not allow the movements and vibrations which would lead to the cracking of the windshield or of the windows.

The exterior lateral coating of the vehicle body can be made with glass fibre panels, stainless steel, aluminium, galvanized steel sheet glued/soldered to the vehicle body of the bus, inward and outward isolated

with phono absorptive and isothermal coating that is easy to dismantle.

The warranty for the lateral protective layer must be for no less than 10 years.

The vehicle body will be made out of various elements joined together, easily dismountable for simple mending actions or for the replacement.

Both the front and rear coating will be done with glass panels armed with plastic fibres, stainless steel, aluminium, galvanized steel sheet and other corrosive resistant materials that are all easily replaceable. A metal structure must be included for the positioning of the radio antenna for the non-metal ceiling.

The ceiling, the floor and the lateral walls will be thermally insulated.

The bonnet of the engine will be made out of galvanized sheet, protected against corrosion through cathaphoresis or heat galvanizing or out of stainless steel or aluminium sheet .

The body of the car must not have sharp or cutting edges both inward and outward

Following a collision the replacement works for the parts of the bus must be done with components that have degrees of corrosive resistance as the initial replaced components. The tenderer must detail the repair technology so that the same degree of resistance could be obtained as before the collision.

The internal coating will be out of synthetic anti-vandalism material, vibration resistance, shocks and temperature variations, fireproof, easy washable, anti-graffiti proprieties and its colour must match the interior colours of the bus.

The inward and outward coating solutions and the assembling solutions of the bus body parts must ensure an adequate accessibility degree so that the all the interventions to the bus parts could be rightly done.

The outside access to the lateral components of the bus and of the engine must be possible only after passing by easily removable or pliable covers. All the written mentions from the inside and on the outside of the bus will be in the Romanian language and positioned in compliance with the EEC-UNO regulations and to the provisions of the Romanian Register of Road Vehicles All the access covers will have a lock.

The axes and the rubber components situated near the pneumatic suspension system will be protected from water and mud staining by flaps.

The buses will be equipped with two towing hooks, one for the front side and one for the rear side.

The rear crook must be able to ensure the towing of a light trailer (of maximum 750 kg)

The requirements regarding the anticorrosive protection

They must be in compliance with the Directive 2004/42 / CE.

The tenderer will detail, in the tender documents, the painting and the anticorrosive protection system meant to last for the entire life expectancy of the bus.

The painting materials must in compliance with the Directive VOC 1999/13 /CE in order to limit the emission of organic volatile components due to the usage of the organic solvents

If closed profiles are used the tender documents will include the details of their internal protection.

The paint layer and the anticorrosive protection system must allow the cleaning procedures for the bus, based on revolving brushes and water jet or cleaning substances, resistant to the sun ray, the UV, the ozone, the pollutant agents and the environmental specifics above mentioned.

The outward surface of the bus must allow its coverage with self-adhesive foil containing advertising materials and the surface must resist to repetitive placing and replacing actions.

The tenderer will include in the tender documents detailed instructions about the process of re-establishing the anticorrosive protection and for the repainting process in cases of traffic accidents, specifying the materials to be used and their technical characteristics.

Any and all coverings, namely the anticorrosive protection solutions or the decorative elements will be mentioned in the manufacturer's documents and in the technical documents of the bus.

The tenderer must offer no less than a 6 years warranty for the body of the bus, including for the paint layer without any maintenance actions being needed.

The colour of the exterior of the bus will be decided by the Purchaser and it will be conveyed to the tenderer no less than in 4 weeks from the moment when the contract was signed by both parties.

7.2 Windshield and windows

7.2.1. Windshield

The glass of the windshield must be dark (for sunray protection) and approved in compliance with the CEE - ONU no. 43 or 92/22 / CE.

The windshield and the rear window and the side windows will be met into place by gluing. The gluing system must be resistant to: temperature variations ,UV, light pollutants and the tenderer must offer a no less than 12 years warranty for it (the entire life expectancy of the bus).The windshield must be out of a single piece, out of duplex glass and it must ensure the driver's visibility from his chair at 180 degrees with no less than 75% transparency.

7.2.2. Side windows

The side windows must have a transparency index of no less than 70% on a certain colour in order to ensure the protection of the passengers against sun rays and it also must contribute to the maintaining of a low temperature inside be bus.

The side windows must be made of secured glass.

The side windows must partially open through flipping (hopper windows) in order to allow the ventilation if the air conditioning system stops working.

The tenderer will specify in the tender documents the total number of windows supplying the necessary technical drawings.

The left side window, near the driver's seat , must be the sliding type, electrically heated and must include an adjustable sun visor solution (for no less than 2/3 of its surface) meant to ensure protection against the rays of the sun without impairing the driver's visibility to the rear view mirror.

A plastic deflector must be placed near the window but this will not have an impact on the size of the bus.

There must be emergencies exists, in compliance with the legal provisions, exits clearly marked and the way that these doors open must be specified in Romanian. The necessary emergency equipment (hammer, cable, etc.) also needs to be provided near all the emergency exits.

7.2.3. Door windows

The glass of the doors must have the same transparency index as the lateral windows of the bus in order to ensure protection against the sun rays. The glass of the doors must be the secured type glass and it will be attached in its place by gluing. On the door frame, in order to shield the glass inside the bus balustrades will be placed.

7.3. Access doors

The body of the bus must be in compliance with the regulations EEC-UNO in force, the position of the access doors, the configuration for the passenger's space and the access to that space inside the bus must provide the right loading on the axes and it must ensure the fluent mobility of the passengers.

All the written notices inside the bus must be in the Romanian language and they will be positioned in compliance with the CEE-UNO regulations and the Romanian rightful authority prescriptions.

The inside painting, the logo of the Purchaser, the inventory number and other inscriptions that will decided by the Purchaser will be notified to the tenderer in 4 weeks since the contract entered into force. The cost will be included in the tender price.

The frame of the doors will be manufactured from high resistance anti-corrosive materials (aluminium, stainless steel)

- The access doors will be positioned on the right side of the bus
- The number of doors:
 - **a.** The 10 meters bus - **minimum 2** double doors
 - **b.** The 12 meters bus - **3** double doors
 - **c.** The 18 meters bus - **4** double doors .
- The minimum width 1.200 mm
- The minimum height of the doors 1.900 mm
- The doors will be electronically and pneumatic controlled. The electronic system of the doors will be integrated in the entire control system of the bus.

Requirements to be met:

- all doors must open independently
- When closed, the door has to be tight, to stop the passage of air, snow or water.
- they will be no less than 80% glazed
- the two sides of the door must open and close simultaneously and must include a passenger protection system (the closing force of the doors will be diminished in order to prevent the crushing of a passenger and also system must prevent the opening of the doors while the bus is still running).
- the doors will be controlled in compliance with Reg. no. 107 CEE-ONU.
- the glass part of the door will be protected from the passengers that accidentally lean against the door by a diagonally placed balustrade, in the centre of the door. This balustrade must fulfil double function: protecting the glass of the door and helping the passenger maintain their foothold.
- in the emergency after the bus is halted, the must be openable both from the inside and from the outside, even is the bus has no power or air supply. The opening system of the doors will be marked „ use in case of emergency”.

„ ACȚIONARE ÎN CAZ DE URGENȚĂ ”

- the buses must include a system meant to prevent the buses from running with the doors opened. The bus may run with the doors opened only in case of emergency, without passengers, after the emergency function was activated but with limited speed for running. The emergency button must be sealed and its usage will be recorded in the memory of the on board computer.
- the opening and the closing of the doors will be signaled on the driver's dashboard with a flashing light signal and also by a sound
- all the bus doors must be able to be locked with a key so that unauthorised access could be prevented after the working hours
- the driver must be able to close and secure the front access door from the outside of the bus (by pressing a concealed button) and the two sides of the door will have separate mechanisms
- in the passenger's sitting space, near the access doors, a series of buttons will be placed so that the passengers could ask for the bus to halt in the bus stops and for the doors to open (after the bus is halted). The intention of the passengers will be visible on the driver's dashboard and it will determine the driver's action.

The above mentioned buttons must be placed also on the outward body of the bus, near each access doors or on each door, depending on the decision of the manufacturer with IP67 protection and led light illuminated.

On the drivers dashboard the signal for “ bus station or please open the door” will be visible.

For the middle door , where the disabled persons or carriage elevator is , both on the inside and on the outside of the bus buttons will be placed for opening the doors or activating the elevator. Their action will be visible on the driver's dashboard.

The opening and closing the doors system that includes solenoids, cylinders , valves, must be solid as construction and must not be affected by condensation.

The access doors must be built so that the number of passengers could be counted. Selected vehicles are to be fitted with automatic passenger counting devices.

7.4. Auxiliary platform for wheelchair and baby stroller

The buses must comply with the provisions of the Law no 448/2006 and the European Directive 2001/85/CE that state the right of the disabled persons to have access to the public transportation of passengers.

At the second access door, there must be the disabled persons or the carriage elevator must be operated both manually or mechanically.

The elevator platform will have a hidden handle and must be able to slide in or out.

The elevator platform must have an interlocking system connected to the driver's dashboard so that the bus could not rum with the platform activated. Any unauthorised attempt to operate the system will be signaled on the driver's dashboard. The structure must be made out of stainless steel.

The platform must be covered with a usage resistant layer and must prevent sliding from both ends.

On the visible part of the opened platform reflective paint will be use to draw the attention.

The maximum weight to be carried will not exceed 350 kg.

The bus must be able to lean on the right side so that disabled person in wheel chairs would have easy access on the bus.

7.5. Lighting system and exterior lights

The lighting system and the external lights must be in compliance with CEE-UNO no. 48 or 76/756/CE and national and international standards.

The side lights and the position lights must be the led type lights in order to provide more safety and trigger energy savings.

Fog lights must be included as well.

The diagram of the lighting system must be included in the technical documents of the bus.

7.6. Windshield wiper and the washing system

The bus must include a windshield wiper and cleaning system. This system must include a speed control option for the continuous and for the intermittent function with adjustable timing.

When the cleaning and wiping functions are activated this will also allow the right and left side visibility, with the help of a combined mechanism.

7.7. The supply and distribution electrical plant

The electrical distribution panels containing (the light fuse, the relays, the connexions) must be easily accessible for maintenance purposes.

The battery compartment and the distribution panel must be easily accessible from the outside but they also must be protected against environmental impacts and it will include a ventilation system for the vapours generated inside.

The distribution panel will include a solution to protect against the electrical power surges (with the help of the fuses). Any voltage drop will be signalled with both audio and visual warnings.

All the electrical panels will have a sticker in Romanian with diagram information about the fuses and the connections.

The electrical plant will function at 24V. The batteries will be the Super Heavy Duty type with low maintenance requirements. The battery compartment must be ventilated.

The main parameters of the battery should be the normal tension 12v , the minimum capacity minim (215-225Ah).

The batteries will be connected to the electrical plant will be done through a chain series.

The direct electrical charging from a 12 V battery is not acceptable.

For the consumers above or under 24V-28V converters and inverters will be furnished.

The functioning of the electrical plant will be coordinated through a general switch.

The alternator will be with built-in electronic voltage regulator relay. The electrical power would be generated so that there would also be a spare quantity for the validators, monitoring the number of passengers, video surveillance, the system that ensure the passenger's information and so on.

The bus will have an intelligent electricity usage and battery charging optimiser device. Once the general switch will be touched the power will be cut off.

The components of the electrical plant will ensure that the buses are functioning the correct way and will be in compliance with the following requirements:

- Their positioning must ensure the easy access in order to be able to complete maintenance works
- There will be multiple inter-connexions between the electrical circuits, all from the distribution panel
- All the cables must be placed in a protected space, in the upper side of the interior of the bus, they must be easily accessible for any intervention
- The buses must include an electrical system for charging the bus for recharging and starting the engine.
- On all the components, cables (each and every cable), the connectors, the electrical and electrical control mechanisms, the respective codes will be inscribed on their surface in such way that it will be always visible.

- All the cables must include a number of spare connections so that the broken circuits could be easily replaced, the number of spare connections on each cable would be decided by the manufacturer in accordance with the complexity of the circuit;
- All the electrical connections must be corrosive resistant and the connections that could be exposed to humidity must be sealed;

The external connectors of the electrical plant must be protected also with neutral grease. The traffic lights and the external lights will be sealed and if sweat may occur there must also be condensation release points

7.8. Centralised greasing system

The bus must be equipped with an automatic lubrication device monitored by the on board computer. For the other elements that need lubricating (the network, the assisted steering, the air pump, the connecting equipment and so on), the tenderer must include in the tender documents a document specifying the quantities, the type and the technical specification of the elements used, the name of the manufacturers , the lubricating time frame, the necessary filters and so on. If possible, several options shall be indicated.

8. INTERNAL REQUIREMENTS

8.1.Mechanical requirements

The noise level must be in compliance with the UN EEC R 51 prescriptions

8.2. The passenger's compartment

Inside the bus, near the second door there must be a marked safety space, for wheelchairs.

The wheelchairs must be secured through safety belts inside the bus. Apart from the already mentioned requirements the tenderer must comply also with the specifications from the 1.1 Paragraph in Section in 2 and all the legal provisions presently into force.

A visual indicator will be placed on the driver's dashboard so that he could be notified about the impaired person's intention to descend from the bus, activated by the stop button adjacent to the wheelchair space.

The front area between driver's cabin and the front door must be marked and inscribed on the floor for passengers warning about the fact that standing in this area is banned while the vehicle is moving.

8.3. Passenger seats

The passenger seats must be made out of plastic that was priority antistatic treated and that is also resistant to the act of vandalism - tough structure plastic (the expanded plastic solution is not allowed), anatomically individual chairs, locked on a framework.

The safety framework of the seats will be made out of galvanised steel or a similar resistant material.

The back of the seat will have a handle for the use of the standing passengers.

The positioning of the seats, the technical solution for the attachment of the last row of chairs to the floor, the floor boards and the engine access covers will not impair maintenance works.

In the tender documents all these details will be distinctly specified.

The number of seats must not be less than:

- for 10 m buses: 17 seats;
- for 12 m buses: 20 seats;
- for 18m buses: 32 seats.

The seats will be the independent type, assembled through the side console (in order to facilitate the cleaning of the bus floor) and they will be secured on a supportive bar. The seats need to be arranged so that there would be seats for the impaired persons, the elderly persons and for parents with babies. No less than 4 seats will be placed between the first and the second door or between the second and the third door. The special seat will be marked with pictures on the wall of the bus.

The seats for parents accompanied by children and for the impaired persons must be of the different colour from the rest of the seats. The minimum width of these seats would be 440 mm.

The Purchaser will decide the colour of the seats, in a maximum of 4 weeks' time from the day when the contract is signed by both parties.

8.4. Support bars, support handles for the passengers and other internal structures

The passenger compartment has to have supportive horizontal bars.

In order to ensure a better visibility degree inside the bus all the bars and handles must be in a different colour than the main colour of the bus.

Unless the bars are made of stainless steel they have to be covered with a layer of paint that is resistant to usage, to peeling or that is coated in plastic material. The supportive bars, the flexible handles and of the handles from the back of the seat are positioned so that they could provide support for the standing passengers. The conditions provided in the regulations EEC-UNO R 36 will be observed.

The diameter of the supportive bars must not be less than 20 mm or more than 45 mm. The external surface of the bars has to be coated with anti-sliding material. The materials used must be easy to clean and resistant to acts of vandalism.

There must be no uncovered sharp edges that could cause accidents. All the name and symbol labels have to comply with the purchaser's requirements. The purchaser will finalize the requirements together with the successful bidder and will determine the number, type and location of the labels and symbols, depending on the space in the bus.

The inside covers that provide access to the roof must be easy to open in order to allow the access to the equipment placed in the roof area without the use of special tools.

8.5.Foor

The floor of the bus will be made of waterproof and anti-slide sandwich plywood (WBP or EN 314 class 3), compressed, sound-absorbing and connected through special couplings. The sound insulation of the floor will include the rear area of the bus and the passages.

The entire vehicle must have no obstacles which may prevent the passage of the passengers.

The anti-slide rubber carpet must have the following technical specifications:

- The thickness, no less than 2 mm
- The specific density no less than 2 kg/ sq.m.
- The inflammability of the covering paint must be in compliance with UN CEE 118 or 95/28/CE
- ***The anti-sliding feature of the floor must be in compliance with EN 13845 Esf, DIN 51130 R10 and ISO 9352 standards***

The covering layer of the floor must be resistant to the action of acids and diluted bases.

It must be easy to clean whether it is wet or dry. If not in a single piece, the covering should be welded on the reverse so that the joining points prevent water penetration (the method of jointing must be specified in the response).

All the areas of the floor must be in a different colour than black or white. The step edges will need to be protected with aluminium bands.

8.6. Air conditioning system

In order to ensure the summer microclimate inside both the passenger's compartment and the driver's compartment there should be a single air conditioning system inside the bus.

This system must have an adequate capacity in order to satisfy both the heating and the cooling process for the entire interior of the bus. The system must allow the adjustment of the temperature and the air flow, in two areas, both for the driver's compartment and for the passenger's compartment. The driver's cabin and the passenger's compartment must be able to be ventilated and adjusted separately.

In order to supply the natural ventilation the bus an adequate design solution must be used so that no less than 5 windows would allow the air to enter inside the bus and 2 roof hatches will be placed and they will be operated manually .

The provision of the air conditioning must be monitored and controlled also remotely, from the drivers central dispatch (for passenger compartment) .

8.7. Heating system

The bus must be equipped with a preheating system for the thermal agent, system that will be common with the heating circuit for the engine (minimum power of 30kW).These must be in compliance with UNO ECE 122 or 2001/56/CE The preheating device will be electronically programmed and it will be integrated in the general air conditioning system , both for summer and for winter temperatures.

The preheating system must be integrated in the general system of the bus in terms of management and diagnostics. A diagnosis and measurement device for the fuel consumption level of the preheating system will be installed along with the necessary accessories.

The heating installation must provide no less than 15 degrees Celsius when the temperature outside descends to - 15 Celsius or less. The driver's cabin and the defrosting of the windshield must be done by the common heating and cooling system. The air, whether cold or hot will be uniformly distributed inside the driver's cabin but the distribution must also be controlled (especially for the hot air).

The heating system for the windshield will ensure the normal visibility at 35 degrees Celsius below zero.

Convection air heaters from both the driver's cab and the passenger compartment will have brushless and without collector electric motors.

The heating of bus must be the radiator type or the heater type.

The thermostats must be positioned so that they would allow the control of the temperature in the driver's cabin and in the passenger compartment. The heating components inside the compartment will be placed so that they could easily be cleaned without dismantling them. The design and the positioning of the heating devices under the seats would be done so that any action that could cause the intentional or accidental damaging could be prevented.

The tender documents must include drawings for the positioning of the heating devices inside the bus.

8.8. The lighting system in the inside of the bus

The lighting system for the driver's dashboard will preferably done with led lights so that it could have a greater reliability. The lights must be protected against the acts of vandalism. The lighting within the dash panel of the driver will have separate command for operation, at his requirement. The lighting in the passenger's compartment will be on two levels on intensity and the intensity level will be controlled by the driver.

The positioning of the lamps will ensure an optimal lighting of the passenger saloon.

The part of the lighting system that provides the light must not electromagnetically affect the other systems.

9. SAFETY AND SECURITY

9.1. The safety mechanism of the access doors

In case of emergency, after the bus is stopped, the doors must be able to be opened both from the outside and from the inside even if there is no electricity or air supply. The mechanism for opening the doors in case of emergency must be easily detectable and it will be done by red colour inscriptions „**ACȚIONARE ÎN CAZ DE URGENȚĂ**” in Romanian and „**POWER IN CASE OF EMERGENCY**” In English. The devices for opening the doors in case of emergency must be protected against unauthorized action by transparent plastic coverings easily breakable in case of emergency. Other methods of protection against unauthorized access are accepted. The opening of the doors must be allowed only when the bus is halted, and the bus will be equipped with a device that will not allow its running with the opened doors.

9.2. Emergency exits

The bus will be equipped with no less than 5 emergency exits. The size and the positioning and the marking of these will be done in compliance with the with the EU regulations. The bus will be equipped with hammers for breaking the windows that are the emergency exits. The hammers will be protected against theft and will be visibly placed. The emergency exits will be indicated with signs both in Romanian and in English.

9.3.Engine compartment

The trap doors for access to the engine compartment located in the saloon will eliminate, through manufacturing, the possibility of passenger accidents. The trap doors will be protected both against opening by unauthorized individuals and against vandalism.

The hatches that will allow the access from the exterior to the engine compartment and the side components of the engine will have sensors indicating when the hatch is opened (these will block the accidental starting of the engine through the control panel).The opening of the hatches will the engine is running will be visible on the dashboard. The thermal and phonic isolation of the passenger's compartment will be done with the use of fireproof materials in compliance with the international regulations. The engine compartment will have a warning system and an automatically fire extinguisher.

10. MIRRORS

The mirrors must be in compliance with CEE-UNO 46 or 2003/97/CE. The bus must be equipped with two rectangular exterior mirrors that must be adjustable and must be heated. The exterior mirror from the right side must be able to allow visual access to the areas around the doors and around the wheels. The minimum height of the lowest part of the mirror must be in compliance with the Regulation EEC-UNO 46 or 2003/97/CE.

Also in the passenger's compartment there must be mirrors:

- One in front of the driver in the middle
- One mirror in the right corner in order to ensure the visibility to the main door and to the surface of the other access doors

11. DRIVERS CABIN

11.1.The driver's seat

The driver's seat must be adjustable in 3 directions: front, back, vertical and lumbar with pneumatic or hydraulic control system and must be independently adjustable. It must be equipped with headrest, armrest and safety belt.

11.2. Driver's cabin

The driver's space will be partially separated from the passenger area (complete separation in the rear side which continue with the right side towards windscreen in order to provide protection for driver against the cold air that enter in the bus at front door opening, during the winter season).

The driver cabin must have a modern design, with a glass panel in the upper part with a good visibility, made of anti-vandalism materials and closing the driver's space.

The glass surface of the separator panel must be manufactured out of transparent smoky materials to prevent the reflection of the light from the passenger's compartment in the windshield. The glass with an applied foil is not allowed.

The requirements for the driver's cabin:

- The panel of the driver's cabin must be closed from the floor to the ceiling
- A door for allowing the driver to enter his cabin from the passenger's compartment (opening toward passengers compartment)
- The door of the driver's cabin must have 2 parts, the lower part and the upper part, which can be opened separately and it must be designed for offering the possibility of selling transport tickets by the driver (by opening and securing the upper part of the door); for this purpose the door design will include installation of a specific removable shelf for ticket selling);
- There must be an adjustable light source in ceiling;
- The cabin will be both heated or cooled;
- It will have 2 first aid kits, a hammer for breaking the glass, 2 warning triangles a fire extinguisher of no less than 6 kg, a key chest for personal belongings

The driver's cabin colour will be decided by the Purchaser and the supplier will be notified about this in 4 weeks from the moment when the contract was signed.

The driver's cabin must have a FM radio adapted for the public channels and meant only for the driver's use.

11.3. Driver's dashboard

The driver's dashboard must include the On board computer and a multifunctional digital screen including OBD function.

The dashboard will include all control buttons of bus components and devices needed for bus control and operation.

The On board computer with digital screen will be fitted with data storage, processing and display capabilities for vehicle operation, functions, monitoring and diagnosis (OBD).

The On board computer will be integrated with the electronic management and diagnosis system (ISEMD).

The dashboard will have the following indicators:

- speedometer
- odometer
- diesel fuel level indicator
- braking air pressure system indicator
- engine temperature indicator
- oil pressure indicator
- lighting devices indicator
- opened doors indicator
- battery charging status indicator
- EBS Indicator
- parking brake indicator
- headlight low beam indicator
- brake pads wear indicator
- electronic unit indicator
- fire indicator in the engine compartment
- indicator for the presence of water in the diesel fuel

The dashboard must include a red warning **STOP** sign that will be activated together with no less than the following red indicators:

- low pressure in the braking system
- the temperature of the cooling liquid is too high
- low level of the anti-freeze liquid inside the cooling system
- low level of motor oil
- low level of the oil pressure inside the engine
- fire risk inside the engine compartment

Warning acoustic signals

These will be activated simultaneously with the light signals in no less than the following cases

- insufficient pressure in the pneumatic circuit
- low oil pressure
- high antifreeze liquid temperature
- missing antifreeze liquid in the expansion vessel
- fire risk in the engine compartment

The dashboard control panel

The values of the independent computerized system for the monitoring of the electronic control units will be included in the driver's dashboard. On the screen the following parameters will be visible:

- data from the engine control unit
- data from the gear box control unit
- data from the EBS control unit
- data from the ECAS control unit
- data from the doors control unit
- data from the ventilation, heating and AC control unit
- maintenance operations periodicity
- error codes

The information will be presented in the Romanian language and the screen will have daylight adjusting option.

The on board self-diagnosis function – OBD will be provided through the electronic management system of the vehicle. The On board computer will display on screen the faults which occurs during the vehicle operation for all the monitored systems. The faults which affect the traffic safety will be mandatory displayed on the dashboard screen. The faults will be displayed as text message, in Romanian language, or pictograms and not as error codes. The Supplier will provide the faults/errors catalogue. The warnings on board the vehicle will be distinctive and suggestive for critical faults (the bus is not allowed to move) and separately for ordinary faults (the bus can be driven).

The on board computer software must provide access restrictions for drivers to parameters configuration and resetting (deleting) the memorised faults.

Stored data must be available also for other systems through a standard interface.

The complete external equipment and software for on board diagnosis will also be provided by the Supplier (laptop, specific software and operating system, licenses, interfaces), according with chapter 18.1 specifications.

11.4. Sun protection

The driver's cabin must be equipped with fixed sun visor(foil) and mobile roll type as follows:

- the foil attached to the upper part of the windshield and on parts of the lateral window
- 2 mobile roll type ones on the windshield able to cover the entire surface but that can be separately operated
- one roll type able to cover the entire section of the right side window including the mobile part of the window

12. OTHER EQUIPMENT OF THE VEHICLE

Each vehicle has to be fitted and delivered with the following equipment:

- 2 set of first aid kits in compliance with the EU and Romanian regulations
- Hammers for breaking the glass in case of emergency, in the driver's cabin and in the passengers space
- 2 warning triangles
- two wedges (gauges) for securing the wheels
- 2 fire extinguishers of at least 6 kg (one in the driver's cabin and one for the other part of the vehicle)
- reflective vests
- breakdown flashlight with intermittent light signal
- spare wheel identical with the wheel of the bus
- 2 hydraulic jacks
- 3 sets of identical keys (for: starting the engine, safety, special use, etc.)
- in compliance with the prescriptions of the Purchaser all the written signs inside the buses will be in both English and Romanian

13. FUELLING SYSTEM

The fuelling system must be equipped with both water and impurities filter.

13.1. Fuel tank

The capacity of the diesel fuel tank has to be at least of 250 litres. Other requirements for the fuel tank:

- The tank must be manufactured from synthetic plastic material or stainless steel;
- The fuel tank material must permanently resistant to the fuel used;
- The fuel level indicator must be provided.

The fuel tank must be equipped with fuel level sensor with high accuracy, which will send information about fuel consumption (fuel level data aggregated with GPS and time stamp) through to the CAN system.

The fuel tank must be equipped with detection and alarm system for unauthorized opening and rapid emptying of the fuel. The alarms must be transmitted on-line in the Dispatch Centre through CAN system and the On Board Computer for ITS.

13.2. AdBlue tank

The capacity of the AdBlue tank has to be at least 30 litres and the tank includes a heating system for temperatures below - 11 C.

13.3. Oil tank for power-steering system

The oil tank for power-assisted steering mechanism has to be positioned in an accessible place allowing the possibility of an easy liquid level check from the exterior.

13.4. Windshield washing system

The windshield cleaning system must have tanks with a capacity of at least 4 litres. The tanks must be easily filled in from the exterior.

14. VEHICLE DRIVABILITY

- Downhill stability : minimum 12% at maximum load
- The Performances at the turning points: will be in compliance with the Directive 97/27/EC and The Directive 2001/85/EC or R107 (the drivability will be proved based on the documentation from the tender). The bus must have a 12.5 m turning radius and none of its extreme points should exceed the circle perimeter.
- The Access angle: minimum 7 degrees.
- The departure angle : minimum 7 degrees.
- The Speed limitation: 70 km/h

15. The Intelligent Transportation Systems

The buses must be equipped with Intelligent Transportation Systems which are specific to urban public transport.

Technical specifications overview:

All electric and electronic equipment below mentioned must meet the following minimum operating conditions in urban environment:

- climate zone: N;
- the maximum relative humidity (at $\leq 25^{\circ}\text{C}$) of 98%
- the Protection category: minimum IP 20
- the Protection against vibrations, shocks, dust, water, UV
- the functional vibrations : 5 ... 100 Hz, 3 axle
- the operating shocks: 10g, 6ms, sinusoidal wave
- supply voltage: minimum range 15-30 VDC
- overvoltage protection (voltage spikes) up to 50 Vcc for a limited time
- the reverse-polarity protection
- life expectancy: no less than 10 years

All electronic equipment which are managed through a software will be delivered along with the basic software applications and the related licenses on CD, DVD, or by online access, etc., and will be upgraded, without additional costs for the purchaser, for the entire warranty period of the buses.

All electronic equipment with EPROM memory will be delivered together with the necessary writing device, the software and licenses.

All devices must comply with UNECE Regulation 10 on Electromagnetic Compatibility or Directive 72/245/EEC relating to the radio interference (electromagnetic compatibility) of vehicles and amending Directive no 19/2009.

15.1. Existing equipment and the necessary preparations for existing equipment relocation on new buses

The Supplier must allow and facilitate integration of the existing ticketing and AVL (automatic vehicle location) systems onto the delivered buses.

The existing ticketing and AVL systems were implemented in 2016 on the entire RATBV fleet as a result of the project „Intelligent management of the public transport system in Brasov city” – SMIS code: 40134. The project has a 5 year monitoring period of investments.

The AVL System is responsible for planning, monitoring and dispatching of the public transport fleet and with passenger information inside the vehicles and at bus stops. The AVL system includes the following equipment installed on each RATBV vehicle: On board computer for AVL system (OBC-AVL) with GPS and communication modules and driver interface (multifunctional touchscreen), interior passenger information LED panel.

The Ticketing system is responsible for ticket selling, validating and control. Each RATBV vehicle include 2 or 3 dual validators (for contactless Mifare cards and paper tickets). The communication between validators and the ticketing system back-office is conducted via OBC-AVL.

The tenderers will consider that some ITS equipment that will be installed on the requested buses will be transferred from existing RATBV vehicles, which will be taken out of service or scrapped this year. The number of buses which will be scrapped in 2018 is equal with the number of the new buses that will be delivered in this contract, so the following existing equipment will be installed on each new bus after delivery:

- 1 On board computer with driver touchscreen (CB-AVL)
- 1 interior LED panel for passenger information
- 1, 2 or 3 existing validators, depending on the doors number of delivered buses (1 validator for two doors bus, 2 validators for 3 doors buses or 3 validators for 4 doors buses)
- 1 Switch with 8 ports for LAN communication

The Purchaser is responsible with the installation and putting into operation on the delivered buses the above mentioned ITS equipment which is coming from the existing RATBV vehicles.

The Supplier is responsible with wiring and fitting preparation for installation of the above mentioned equipment, as these installations should be conducted in an easy manner for the Purchaser (plug & play). The Supplier will design the final scheme for ITS equipment installation with the Supplier approval.

The ITS equipment management, control and data communication installed on the vehicles will be conducted as follow:

- 1) **The equipment which is transferred** from old RATBV vehicles will be managed by OBC-AVL: validators, interior LED panel.
- 2) **The new requested ITS equipment**, except ticket validators, will be managed by an On board computer for ITS (OBC-ITS) which must be delivered by the Supplier according with chapter 15.3. specifications. As an alternative solution, the Tenderers can choose to use the existing On board AVL computer (OBC-AVL) for the management of the new ITS equipment provided by Supplier. In this case the Supplier will have to upgrade the OBC-AVL software and hardware (see below the technical specification of the existing OBC-AVL). The tenderer must ensure that the solution is possible and viable and it will not affect the good operation of ITS equipment.
- 3) The new validators will be managed by OBC-AVL as for their full integration into the existing ticketing system. The Purchaser is responsible with the validators integration into the existing ticketing system.

All buses must be prepared with the necessary wiring for the existing equipment at RATBV, which will be installed by the Purchaser, after delivery of the buses.

- 1) **On Board AVL Computer (OBC-AVL)** and driver touchscreen display
 - a. OBC-AVL will be installed in one of the compartment from the driver cabin and the positioning of the touch-screen display will ensure a good visibility and accessibility for the driver
- 2) LED Panel for the interior passenger information
 - a. The LED panel will be installed in the front part of the passenger area, attached from ceiling.
- 3) The Validators will be installed on the vertical support bars or body pillars, as follows:
 - a. for 10m buses: 1 validator will be transferred from the old fleet and it will be installed near the 2nd door
 - b. for 12m buses: 2 validators will be transferred from the old fleet and they will be installed near the 2nd and 3rd door
 - c. for 18m buses: 3 validators will be transferred from the old fleet and they will be installed near the 2nd, 3rd and 4th door
- 4) The 8 port Switch - (for validators and interior panel communication with OBC-AVL)

Data communication requirements for the wiring

ITS equipment and devices will be connected by cable through an Ethernet data transmission network suitable for automotive applications, flexible, patch cable, SFTP type, AWG 24/7, CAT5e, LSHF with a section diameter of maximum 8 mm. The cable type which connect the OBC-AVL and driver display will be SFTP 4P CAT 5e AWG24.

The Power supply wiring requirements

The power supply wiring of ITS equipment and devices will use flexible cable suitable for automotive applications, 3 x 14AWG (3 x 1.5mm), LSHF, with a total diameter of maximum 7 mm. The power supply wiring must be connected to a general power switch at the 24Vcc power system and it must be equipped with 24Vcc/10A fuses, curve C (rapid trigger for equipment protection) located in the main fuses panel of the vehicle.

The detailed scheme of the electrical and the data wiring will be established by the purchaser after signing the procurement contract with the wiring tenderer.

1) The existing On board AVL computer (OBC-AVL) specifications:

- Processor: ARM11 32-bit RISC CPU, 533 MHz, 128 MB
- Memory:
 - o Flash / SRAM: 128 MB
 - o SDRAM / Micro SD: 128 MB/-
- Audio: speaker and buzzer
- Interfaces:
 - o Serial I/O: 2xRS232, 2xRS485/RS422 isolated, 2xUSB Host
 - o Ethernet: 4 x LAN 10/100Mbps RJ-45 ports,
 - o CAN: Isolated CAN
 - o Digital I/O: 8 x digital isolated inputs, 8 x digital isolated output
 - o Analog I/O: 4 x analogue inputs, 4 x analogue outputs
 - o Tacho: 3 tachometric inputs (fmax = 65 kHz)
- GPS Receiver: 50 Channels, over 3m CEP accuracy
- Communication:
 - o Mobile: GPRS/3G/CMDA/HSDPA
 - o Wi-Fi: 802.11 b/g
- Operating system: Windows CE 6
- Software upgrade:
 - o Local: via USB or Ethernet
 - o Remote: via GPRS or WIFI
- Power supply:
 - o Extern: 9V .. 36VDC
 - o Intern for back-up: 3V, 560 MA
- Case: Metal/PC – installed in metal box which is inserted in a polycarbonate box
- Dimensions: 125 x 223 x 302 mm
- Protection: IP54
- Operating temperature: -20°C ... + 60°C

Driver display specifications:

- Display TFT LCD, diagonal 7 inch, adjustable brightness
- Touchscreen display: Capacitive protective, anti-vandalism
- Colours: 16,7 M, Resolution: 800 x 480, Back-light: LED-s, light sensor control
- Virtual keyboard
- Interfaces: Jack for headphones and microphone
- RFID Interface: Mifare
- Power supply: 9V .. 36VDC
- Case: polycarbonate
- Dimensions: 137x195x47 mm
- Protection: IP54
- Operating temperature: -20°C ... +60°C

Specifications for the existing interior LED panel for passenger information

- Displaying of the Line number, next Bus stop, date & time and other messages
- Integrated speaker for audio announcement
- The messages are displayed on 1 row, character high is 50 mm
- Dimension 100x650x45 mm
- Resolution 16 x 128
- LED's colour: red, background colour: black
- Case anti-vandalism, steel sheet of 1,5 mm thickness + polycarbonate
- Communication: Ethernet
- Power supply 9-40V, energy consumption: 1,5A/24V

15.2. Dual validator for Mifare contactless cards and paper printed tickets

- Each bus must be equipped with 1 dual validator for Mifare contactless cards and paper printed tickets
- The validators will be placed on the vertical supporting bars near the first door; the tenderer will connect the validators to the power supply and the data communication wiring considering the above wiring specifications.
- The validators must be compatible with the existing Ticketing and AVL Systems used by RATBV; the Purchaser is responsible for the validators integration into the existing systems (installing the software and other configurations);
- Integration of validators with the existing OBC-AVL means that information like: route and vehicle mode, selected by the driver at the touchscreen display, software updates and configuration files will be communicate to the validators via OBC-AVL (3G/4G or WIFI); the data from validators will be downloaded to the existing server via OBC-AVL (3G/GPRS, WIFI)

Technical and functional parameters:

- Reading/writing module for ISO 14443 A, B contactless cards
- Paper ticket thermal printer. The ticket slot must be 30 mm wide; the paper ticket is 28 mm wide (paper thickness: 80..100 g/sqm). The information written on the paper ticket will include: date & time, route and vehicle id.
- Memory:
 - o SDRAM – minimum 128 MB DDR2 SDRAM
 - o FLASH – minimum 256 MB NAND FLASH
 - o EEPROM: 1 x 32 Kbit
- Minimal Interfaces:
 - o 1 x Ethernet 10 Mbps
 - o 1 x RS232
 - o 1 x slot microSD
 - o 1 x slot USB
- Audio:
 - o audio files player
 - o integrated speaker with minimum 2W
- LCD colour touchscreen
 - o Screen size: minimum 7"
 - o Minimum resolution: 800 x 600
 - o Minimum brightness 400 cd/m²
 - o Touch function available for the complete surface of the screen – must allowed configuration of buttons in any point of the screen
 - o Impact-resistant (anti-vandalism)
 - o Display in minimum 262.144 colours

- The screen must display Romanian fonts and numbers from 0 to 9 – minimum 25 character per row
- The screen must allowed the display of graphic images
- RTC - Battery Back up RTC
- Nominal power supply: 24 Vcc (min.18 Vcc, max. 36 Vcc, 1A max)
- Data protection in the event of power failure
- Integrated contactless card reader: ISO 14443A, anti-collision protection
 - Compatible with Mifare 1K, Mifare 4K, Mifare Ultralight cards and EMV/Mifare dual cards
- Minimum 2 SAM security modules
- Validators must be able to validate paper tickets and RF-ID Mifare, Ultralight, Mifare 1K and Mifare 4K cards
- Validators must be able to manage EMV contactless cards transactions without any further modifications on hardware, after implementation of necessary protocols between RATBV and banking institutions
- Validators must be equipped with the following electrical protections:
 - electrical overload protection
 - overvoltage protection
 - reverse polarization protection
- Validators must be installed through a mounting socket on bars with diameter of 30 – 40 mm. The mounting socket must store data on EPROM, related to installation location (IP address, route, vehicle number etc.) in order to simplify the validators replacing procedure
- Working conditions:
 - Working temperature: -25°C ÷ +60°C
 - Storage temperature: -40°C ÷ +70°C
 - Relative humidity: 5÷95% (no condensation)
 - Case protection: IP31
- Inputs: minimum of 2 for general use, 1 for start/stop
- Exits: minimum of 1 x contact relay
- Digital I/O : minimum of 2, configurable
- LED exits: 4 LED signalling for general use
- Automatic start and stop of the operating system installed on validator
- Case without visible mounting parts
- Lock mechanism which allows authorized access using a specific contactless card
- Thermal printer for paper tickets with guiding mechanism for ticket which ensure fast validation (printing) without errors cause by operating conditions (vibrations, motion etc.)

Functional requirements that validators must fulfil after installation of specific software, configuration and integration into the existing ticketing system:

- Validators must display the number of trips validated with the same card
- Validators must be able to display information, on request, about the validity of ticket charged on card
- Validators must display the tickets charged on card together with validity period or card balance
- Validators must register the ticket control sessions conducted by ticket inspectors
- For each ticket control session, validators must register the following data: vehicle number, route, date, hour, minute, type of ticket, number of trips validated etc.
- Validators must be able to write on inspector card the specific data of control session
- When inspector card is present the validator must be set in control mode by requesting the confirmation on screen for this action

- The validator must be able to activate a ticket inspector card (either the validator mode is “commercial” or “control”). The inspector card activation will allow writing of ticket inspection operations on the inspector card.
- The validator must also write on the inspector card the information needed for tickets inspection (route number...)
- In “control” mode the validator will display the information that is for printing on paper tickets

15.3. On board ITS computer

All buses will be provided with an On-board computer for ITS equipment management (OBC-ITS) which will include GPS module, WI-FI and mobile (4G) communication. The OBC-ITS will be installed inside the driver cabin, providing an easy access and maximum visibility for driver.

The On-board computer for ITS equipment (OBC-ITS) must fulfil functionalities like vehicle localization and should integrate the ITS equipment as: LED display panels for exterior passenger information, CAN interface (FMS-STANDARD 2.0 or a similar interface), MDVR, passenger counting system, exterior speaker and voice communication.

Minimal functionalities:

- Data management: routes, bus stops, vehicle information (vehicle id, device serial number, firmware version)
- Obtain and display the location data (latitude, longitude, vehicle speed)
- Determine and display the current bus stop (GPS location + door opening sensors)
- **Exterior LED display management module** (front, side, rear panel): control and monitoring of exterior LED displays, receiving the configuration files from back-office application and send them to the LED panels
- **Audio announcement module** (external speaker): control and play the audio announcements, send audio output to sound amplifier and external speaker, receive and store the audio files sent from back-office application
- **Video surveillance module:** it allow remote access, on request, to live video images and video records download
- **Passenger counting module:** it collects, processes, transfers and displays (on screen, on request) the data received from counting sensors; it concatenate the counting data with the information about route, bus stop and vehicle id and it send it through the mobile communication module to the data server
- **Voice communication module** (Voice over IP - VoIP) provides voice communication between driver and dispatch centres; opening and responding to calls will be conducted through the touchscreen display (CB-ITS will also include headphone and microphone for driver)
- **CAN interface module:** it collects, processes and communicates to back-office the vehicle parameters and the warnings/alarms received from the CAN interface (including fuel consumption); it displays on screen the warnings/alarms sent through CAN interface and also the values of some important parameters
- Monitoring the functional status of the connected subsystems (LED panels, passenger counting etc.)
- Monitoring the functional status of main modules (GPS, 3G/4G, Wi-Fi)
- It allows driver authentication with pin code and route selection from routes list
- OBC-ITS will provide Log-in on 2 level with password request; the user will have at least the following rights:
 - 1) Administrator (authorised personnel)
 - a. Vehicle ID setting
 - b. Monitored parameters view
 - c. Route selection (line number, special trip, towards Garage etc.)
 - 2) User (driver)
 - a. Route selection (line number, special trip, towards Garage etc.)

Connectivity – OBC-ITS must allow data sending and receiving to/from back-office applications through mobile communication 3G/4G, WI-FI (at Depots) or WLAN, USB, Ethernet interfaces. The regular operation will use mobile communication 3G/4G.

The Supplier may propose alternative solution for ITS system integration with OBC-ITS, but only if the proposed solution is justified technically and economically, and only if the functional requirements stipulated in this document are adhered to.

Minimal technical requirements:

- Processor: minimum 533 MHz, memory: minimum 128 MB
- Monitor: LCD/TFT, resistant touchscreen / Projective Capacitive, minimum resolution 480 x 272, minimum diagonal 4,3 inch, adjustable brightness
- keyboard: virtual keyboard
- Case: anti-vandalism from aluminium/ metal/ polycarbonate, passive cooling (no fan), protection IP54;
- GPRS/3G/4G / CDMA / HSDPA;
- Input / output: storage - SD Card, COM port - minimum 2 x RS-232/422/485 (configurable), USB – at least 2 x USB, LAN - 10/100 Mbps minimum 1 x RJ-45 Ethernet;
- Speaker: incorporate, 1W
- GPS: (integrated) GPS 50 channels
- CAN Bus
- Antenna: regular operation, 802.11 Wi-Fi - 2400-2485 MHz, GPS - 1575.42 MHz +/- 2, GPS power gain - minimum 26 dB, operating temperature: -30 ° C to + 80 ° C, installation on vehicle roof, brush washing resistant
- Power supply: 9 ~ 36 VDC, compatibility with SAE J1113 & ISO7637-2 for commercial vehicles, Ignition On / Off, power on delay (by default 2 sec.), power off delay (by default 5 sec)
- - Operating conditions: temperature -20 ° C to +60 ° C , shock – maximum acceleration of 30 G (for 11 msec), vibrations - 5 to 500 Hz 4.5g RMS – random vibrations
- Compatibility with standards: EMC certifications: CE, CE - Safety; E-mark, SAE J1455
- Operating system: Ubuntu Linux or any other similar operating system (e.g. Windows CE, Windows 7, etc.).

It allows without any restrictions the integration and compatibility with OBC-AVL, namely communication of route number selected by driver on OBC-AVL display and also data transfer to/from back-office. The Purchaser is responsible with the integration of CB-ITS with CB-AVL and this development will be considered at a later stage.

An alternative solution to OBC-ITS is also acceptable by upgrading the existing OBC-AVL, but this solution must meet all functional specifications stipulated in this document. In this case, the OBC-AVL will manage all functionalities related to the new ITS systems installed by the Supplier on the delivered buses.

This solution must not create any problem to the existing systems which will be transferred from the old fleet. The Tenderers should consider both software and hardware upgrading of the existing OBC-AVL and also upgrading the back-office infrastructure in order to fulfill the requirements.

15.4. Passenger information system (exterior)

Audio-video passenger information system must include:

- basic audio system
- exterior visual information system
- exterior audio information system

The tenderer is responsible for integration of the information system with the OBC-ITS.

15.4.1 Basic audio system

The audio system must include:

- Audio amplifier unit:
 - The amplifier unit should receive signals from microphone, exterior speaker module, radio and voice communication unit
 - The amplifier unit will manage the source prioritization
 - for passenger area speakers: microphone, radio
 - for driver speaker: voice communication with dispatch, radio
 - The amplifier unit will manage independently the driver speaker, passenger area speakers and the exterior speaker
 - The amplifier unit will allow independent volume control on each type of speakers
 - Sound amplifier with minimum 3 independent channels, 20 W each;
- The number of passengers area speakers will be:
 - a. for 10 m buses: minimum 3 speakers
 - b. for 12 m buses: minimum 4 speakers
 - c. for 18 m buses: minimum 5 speakers
- Driver speaker with 3.5 mm Jack for headphones connection

- Driver microphone will be used for communication with passengers area

The Supplier may propose an alternative solution if this solution is justified by technical and economic reasons, and it complies with functional requirements stipulated in this document.

15.4.2. Exterior passenger information system (destination signs)

Each bus must be equipped with 3 ultra-bright LED destination signs for exterior passenger information:

- Front panel, minimum resolution of 17 x 160 pixels, minimum pitch of 10x10 mm, minimal dimensions (length, width, thick) of 1700x225x35 mm
 - The panel will display: route number (3 alphanumerical characters), departure terminus (the upper row – lower characters) and destination terminus (bottom row, higher characters)
- Right side panel, minimum resolution of 17 x 128 pixels, minimum pitch of 10x10 mm, minimal dimensions (length, width, thick) of 1300x2305x35 mm
 - The panel will display: route number (3 alphanumerical characters), departure terminus (the upper row – lower characters) and destination terminus (bottom row, higher characters)
- Rear panel, minimum resolution of 17 x 32 pixels, minimum pitch of 10x10 mm, minimal dimensions (length, width, thick) of 360x225x35 mm
 - The rear panel will display the route number (3 alphanumerical characters)

Technical specifications for the external passengers information panels:

- font colour: white; background: black
- minimum viewing angle: 120° horizontal, 60° vertical
- automatic brightness adjusting depending on ambient light
- static and scrolling display, on one or two rows, different size of rows and fonts
- font display modes must be selectable by user (normal, extended, compressed, bold or not bold)
- Multiple displaying modes: continuous, intermittent, continuous with time limitation, the possibility of changing text displayed at default time intervals (minimum 5 default time intervals)
- Text alignment options (centre, left, right, scroll).

The information system will include a software application for message configuration (route, origin, destination, vehicle status, other messages), which will be delivered at the same time with the first lot of buses.

Destination signs control and configuration processes will be conducted through OBC-ITS which will automatically send data like selected route, destination of vehicle or predefined messages.

15.4.3. Exterior audio information system

Each bus must be equipped with an external speaker which will be installed above the front door, for visual impairment passenger information about route number and destination of the vehicle.

The audio information system must be integrated with OBC-ITS for communication of route and destination of the bus.

15.5. Exterior/interior video surveillance system

The buses must be equipped with a video surveillance system MDVR and exterior/interior video cameras.

The system will include either 7 or 8 colour digital high resolution cameras (depending on vehicle type), with anti-vandalism case type dome (for interior cameras), installed as follows:

- 1 exterior video camera on the front left side of the vehicle, suitable for traffic accident recording
- 1 exterior camera on the front right side of the vehicle for video surveillance and recording of doors area (images from this camera will be automatically displayed on the screen at doors opening and after doors closing the screen will return to the previous screen mode)
- 2 – 4 interior video cameras will be installed inside the bus, covering the entire passenger area:
 - o a. for 10 m buses: 2 cameras (in the middle, crossing the middle area and covering each end of the passenger area)
 - o b. for 12 m buses: 3 cameras (front, middle and rear)
 - o c. for 18 m buses: 4 cameras (1 in front, 1 in rear and 2 in the middle, on both side of the articulation area)
- 1 camera for driver surveillance (only for 10 m buses and 12 m buses)

- 1 camera installed in front of the vehicle (driver cabin) covering the area in front of the vehicle (for 18 m buses this camera will cover also the driver area)
- 1 camera in the rear side of the vehicle for the area behind the vehicle and for driver assistance on backward running (images from this camera will be automatically display on the screen when the reverse gear is switched on)

The digital video recording unit installed on the bus must include an removable hard disk of at least 1 Tb capacity, mounted through a shock absorbing system appropriate for automotive operation. The video surveillance equipment must be able to record without overwriting for a period of at least 10 days.

The surveillance system must be fitted with an additional electric battery for keeping the system in operation for at least 1 minute in case of power interruption.

The video surveillance equipment will be:

- power supply with nominal voltage of 24 V cc;
- over-voltage protection;
- passive cooling (no fan) or active cooling (with fan);
- Digital equipment may be fitted with Power over Ethernet type of power supply.

The video cameras will be HD (resolution 1280x720), with a large view angle (130 degree) and the video system will allow recording up to 25 frames per second (fps) and different setting of fps for each camera (e.g. 10 fps for interior cameras and 25 fps for exterior cameras). The video cameras from right side of the bus and the rear side camera will have infrared led's for a better night vision. The exterior cameras must be installed with protection for vehicle brush washing.

Images from video cameras will be display in real time on an LCD/TFT with a minimum resolution 800x480, size between 7 – 9", adjustable brightness, hardware or virtual keyboard. The display may be a touchscreen display and will be installed in the driver cabin providing a good visibility for driver. The display must be fitted with buttons/keyboard for viewing management. The keyboard will allow camera selection for viewing and access to others MDVR commands.

The video surveillance system must display automatically the rear side camera when the reverse gear is switched on and the right side camera at doors opening.

The system must detect and alert the driver in case of deliberately covering the cameras with object or paint; the cameras must be capable of rapidly changing contrast in order to offer the best images in any conditions.

In the event of an alarm activation or in case of an accident (detected by the G shock sensor on 3 axes), the video recording will be saved on hard disk without overwriting permission for a period of time between 5 minute before alert activation and 5 minute after.

The tenderer must provide the necessary documentation for the video surveillance system operation and configuration, the related software applications and licenses for operation, system configuration, maintenance and data downloading. The delivered software must also include specific software for video recordings management and analysis.

The Supplier will provide integration between MDVR and OBC-ITS for communication of warnings/alerts (synchronized with GPS data) to back-office dispatch monitoring application together with the other warning/alerts of vehicle systems described in chapter 15.8. (ISEMD).

Connectivity for video images transfer:

- the video surveillance system must allow, on request, live view of cameras images and video recordings download via OBC-ITS mobile communication module (3G/4G)
- The video surveillance system must allow data download though RS 232, USB and WI-FI (in depot, via OBC-ITS – Access Points).

The delivered video surveillance system must comply with specific automotive requirements for urban public transport and with legal regulation regarding electromagnetic emissions for road vehicles.

15.6. Automatic passenger counting system

45 of the buses (15 buses of 10m, 15 buses of 12m and 15 buses of 18m) must be equipped with a passenger counting system (analysing device and 3D sensors). The counting system must be integrated with OBC-ITS and it will allow registration of number of transported passengers on certain time periods, passengers per bus-stop, route, vehicle etc..

Data from the passenger counting system will be structured in several reports after downloading on a server in order to allow an adequate analysis of information.

The 3D sensors must detect only the passengers (not other objects) and prevent counting errors even in a difficult situation (agglomeration when boarding or long line of passengers). The counting system must remain reliable and the counting must be stable for at least 8 years.

The counting precision must be of 98% minimum without software corrections. The system will allow a good calibration of sensors for avoiding of counting the passengers who are in the door area but are not moving. The counting system will only count passengers when doors are opened.

Connections: the necessary software and interfaces must be delivered in the contract. Data will be downloaded on the server in transparent format (csv or txt) allowing data utilization in others applications.

The system equipment must be installed in a way not accessible to passengers, with anti-vandalism protection and must generate alert messages in case of sensor covering, damage or failure. The counting system must be maintenance free, sensor calibration must not be changed in time and will allow easy access for technical personnel.

Equipment delivered must be fitted for automotive use, manufactured according with EC regulation for passenger transport domain and will meet the environmental conditions from Romania mentioned at the beginning of Chapter 15.

The software delivered must meet the following minimal conditions:

- user interface must be in Romanian or English language
- user friendly
- will allow both general and specific reports generation

Software and license will be provided by the tenderer and included in tender price.

15.7. Voice communication system between the bus and dispatch centre

The voice communication system will allow voice communication between driver and RATBV dispatch centres (central dispatch and depot dispatch) through Voice over IP protocol.

The driver will use a dedicated microphone and the speaker installed in driver cabin, with option for headphone utilization.

When a driver wants to communicate with dispatch, the vehicle will send a request to the dispatches through pressing a button. Communication channel opening must be performed by each of the dispatch centres. Communication will be heard in all dispatch centres.

15.8. The integrated system for electronic management and diagnosis (ISEMD) through CAN

The buses must be provided with an **Integrated system for electronic management and diagnosis (ISEMD)** through CAN, which will be compatible with FMS STANDARD, version 2.0 or a similar interface.

The main electric and electronic subsystems, the automation of mechanical systems of the vehicle and auxiliary equipment will be integrated with ISEMD: dashboard, the vehicle on board computer, on board computer for AVL (OBC-AVL), OBC-ITS, the engine, gear box, brake system, suspension system, doors, heating/air conditioning systems, lighting system, signalling system, passenger information systems, video surveillance system, passenger counting system etc.. Integration will allow information exchange, commands or control operations of certain parameters.

Connectivity: ISEMD will provide data transfer to OBC-ITS or other equipment. The Supplier must provide the necessary interfaces (including CAN communication protocols and conversion functions) and standardize connections for data transfer (special connectors, RS232, USB, wireless etc.).

The Tenderer will present the overall IT system architecture. The tenderer will describe the software and hardware functionality for all equipment installed on the vehicle, communication mode for downloading data onto server, maintenance manual, user and operating manual.

The information transmitted from CAN through FMS Standard or a similar interface must be downloaded to a dedicated back-office application which will be installed at RATBV headquarters before the first buses arrival. Communication must be conducted via OBC-ITS, using 3G/4G module for alerts/warnings and main monitored parameters, and also using the depot WI-FI system for other data transfer. The back-office software application must allow visualization of following parameters:

- main alerts/warnings and errors from vehicle subsystems (also speeding over 50km/h, lower level of engine oil and cooling liquid, abnormal fuel consumption, rapid drop of fuel level in the fuel tank, cooling liquid temperature is too high, low pressure of engine oil, fire danger in engine compartment, low pressure in pneumatic system, pressure dropping in brake circuit, overcoming maintenance period, high level of wear for brake plates etc.), including also planned maintenance warnings.

- vehicle speed, engine rotations, cooling liquid temperature, engine oil pressure, instant fuel consumption (L/100 km for moving status, L/hour for stationary status), fuel level in fuel tank, AdBlue level, temperature in passenger area.

The software application must include an interface for querying the data base and an interface for creating the following reports:

- Driving mode report
 - Selection of: period, vehicle type/all vehicles types, vehicle number/all vehicles of the same type, driver/all drivers who worked with the selected bus in the selected period
 - Date/hour/minute, GPS coordinates, route
 - Fast acceleration and braking which overcome a configurable comfort value
 - Fuel consumption of the vehicle in the selected time period
- Top best driver during a selected period
 - Output of all drivers sorted by anticipation time interval (summing of time intervals between each accelerator pedal pressing followed by brake pedal pressing)
- Top worst driver during a selected period
 - Output of drivers who overcome the comfort values for acceleration and braking with mention about the number of times the driver overcome those values
- Fuel consumption report during a selected period
 - Fuel consumption value will be provide in: absolute values (e.g.: litters of fuel consumed in a period of time, from date, hour ...to date, hour...), in average values (e.g.: litters/100 km or litters/hour)
- Distances covered by the bus (during a selected period) between each end of line and between depot and the end of line (integration with OBC-ITS must be provided for terminus/depot identification through GPS data: the report will use the terminus names provided for passengers information system)
- Engine working hours of vehicle (during a selected period) counting also the non-working time intervals less than 10 minutes
- Idle time of the bus (engine running / vehicle not moving) during a selected period, working hours of the air conditioning system and passenger area heating system
- Number of wheelchair ramp utilization per each bus, during a selected period
- Doors operating report per vehicle during a selected period: manoeuvre type: opening/closing doors, GPS coordinates, timestamp
- Speed Gear utilization report (percentage)
- The application will allow editing of others reports based on data structure saved on server.
- The software application must include an interface for remote monitoring and control of the air conditioning and heating system from the passengers compartment. This interface will allow to RATBV staff to monitor in real time the functioning of air conditioning or heating system in the passenger area and to start or stop the systems.

15.9. Back-office software and hardware for ITS

The tender must include the back-office software and hardware infrastructure related to the passenger information system (chapter 15.4), video surveillance system (chapter 15.5), passenger information system (chapter 15.6), voice communication system (chapter 15.7), integrated system for electronic management and diagnosis (ISEMD) through CAN (chapter 15.8).

The requested equipment and software applications must be delivered together with the related licenses and be fully functional at the first delivered buses term.

15.9.1. Hardware solution will include at least the following:

- a) Database server for in rack installation: Intel Xenon Dual-Processor, 32 GB RAM minimum, redundant power supply, HDD RAID 5 with a total capacity of at least 3TB and rotational speed of at least 15.000 rpm;
- b) Applications server for in rack installation: Intel Xenon Dual-Processor, 32 GB RAM minimum, redundant power supply, HDD RAID 1 with a total capacity of at least 1TB and rotational speed of at least 15.000 rpm;

- c) UPS unit for power supply of the system for at least 30 minutes in case of network power outage;
- d) Fully equipped rack for system operation (power plugs, switch etc.).

All servers will be hardware upgradeable at least for RAM and hard disk without having to replace the case, motherboard / controller disk or RAID controller.

15.9.2. Software solution will include:

- a) Operating systems;
- b) Database server;
- c) Software for data back-up;
- d) Software application (accessible from web browser) for OBC-ITS configuration: vehicles management, routes and bus stops management, data upload/download settings (real time data communication), clock settings etc.
- e) Software application for exterior passengers information LED displays
- f) Software application for passenger audio information (exterior speaker)
- g) Back-office software application (accessible from web browser) for passenger counting system: interface for database access, reports and dashboard (view of specific information for management staff)
- h) Back-office software application (accessible from web browser) for the integrated system for electronic management and diagnosis (ISEMD) through CAN: interface for database access, reports, alerts/warnings display interface and dashboard (view of specific information for management staff)
- i) Software application (accessible from web browser) for voice communication system operation

The back-office solution must allow simultaneous access for many users and be able to output reports containing a large volume of data (e.g. for a long period of time).

The tender will include a detailed description of software and hardware architecture, describing the fulfilling method for each of the back-office functional requirements (reports, configurations etc.) and the methods of operation between back-office and the on board equipment.

The Tenderer should consider that the acceptance protocol for the back-office software and hardware will be signed by the Purchaser within 3 months from the date of products delivery and commissioning, in order to be able to conduct any necessary adjustments and additions on the requested software applications for ITS system management.

16. FIRE PROTECTION

All the materials installed in the vehicle have to comply with ECE-UN 118 or 95/28/ECE.

The self-extinction characteristics are extremely important for the materials within the bus.

The vehicle needs to have an automatic alarm device in case of fire, extreme temperatures and smoke in the engine compartment.

The automatic fire extinguisher system has to be installed in the vehicle in the engine area and in the compartment for additional heaters (pre-heaters).

The automatic fire extinguisher system should be compact type, tank fill with under pressure extinguishing liquid, with periodic verification and recharge.

17. ELECTRICAL EQUIPMENT

17.1 Electrical system

The electrical system has to work on 24V

Other requirements regarding electrical system:

- The electrical system has to be designed in a manner in which it will provide the energy surplus when all the consumables are in maximum load and the engine is in the idle speed.
- The communication network in the bus is executed with CAN network.
- All the electronic units from the vehicle have to be connected in view of communicating through this type of connection

The supply of electrical power is performed with 12 V batteries and capacity between 180 -235Ah, laterally assembled on a sliding carriage and adequately protected against corrosion.

17.2 Speedometer

The speedometer installed on the vehicle has to be approved according to the regulations ECE-UN, No. 39 or 76/443/EC. The speed indicator has to be installed or it has to be a component part of the dashboard.

The speedometer must have an LCD display and to display at least the following data:

- date
- hour
- kilometres (instant and total values)
- diagnosis information

17.3 Cable installation (wiring).

All the cables have to be marked with numbers and to comply the basic electric scheme.

All the fuses installed have to be automatic.

18. MANDATORY SPARE PARTS, COMPONENTS AND RELATED EQUIPMENT

The Supplier will provide, included in tender price, the goods that are specified in Chapter B - List of goods and related services and described in Annexes 1.1, 1.2, 1.3 to this document.

The Purchaser will provide the locations/facilities needed for the installation of workshop equipment and spare parts, vehicle components storage.

The Purchaser has 2 Garages that have been authorized by RAR – Registrul Auto Roman for maintenance and repairs operations:

Workshop 1 (Braşov, 49, Hărmanului Street)

Workshop 2 (Braşov, 108, 13 Decembrie Street),

according with Ministry Order no. 2131/2005, with all subsequent amendments, for M3 buses class.

18.1 Tools, devices and test equipment, specific equipment and software – Annex 1.1

The Supplier must deliver the specific **tools, devices and test equipment** needed for the buses (and their systems and components) repairs, testing and setting according with technical documentation for repairs, testing and setting of the delivered buses.

The tenderer will provide the description of a complete set of tools, devices and test equipment according with repairs and maintenance manual, together with the related technical leaflets and booklets. The delivered set of tools will include at least the components stipulated in Annex 1.1.

The Supplier must deliver a complete **diagnosis equipment** (hardware and software) necessary for diagnosis of vehicle systems and components and for setting and adjustment of bus systems and components: number of sets, according with Annex 1.1.

The tenderer must describe the supplied diagnosis equipment for each electronically controlled system and also the bus system/equipment software (kit) for software reinstallation in case of damage, according with the documentation that is provided for service units (dealers).

The Supplier is committed to deliver the original software and the Romanian language version (if available) and also will guarantee the free delivery of any software up-grade during the lifetime of vehicles. The software delivery will be completed at the first delivery of buses.

The supplier will provide at its own cost relevant training related to diagnosis equipment for the purchaser staff (maintenance and operation of the equipment).

All the delivered equipment must be new products, with producer warranty of at least 24 months and must be provided together with user manual and maintenance documentation in Romanian language.

If any other tools, devices and test equipment, specific equipment and software, that is not included in Annex 1.1, is necessary in order to obtain the workshop authorisation from RAR - Registrul Auto Roman authorization, the Supplier must deliver, at its own costs, the necessary equipment and devices.

18.2 Mandatory spare parts and materials – Annex 1.2

The spare parts and materials stipulated in Annex 1.2 which must be delivered by the Supplier to the Purchaser location will constitute a buffer stock needed for minimizing the periods when buses are out of operation. This spare parts stock will be used, with the Purchaser approval, both for part replacements due to warranty faults and also for non-warranty faults (cause by road accidents, vandalism or other fault).

The Supplier commits himself to restore the initial spare parts and materials stock, within the entire warranty period, in maximum 7 days from the Purchaser request. The spare parts and materials restocking will be done at the Purchaser expense if the fault remedy is not a warranty issue or at the Supplier expense if the fault is a warranty issue.

The prices of the additional spare parts and materials to be procured by the Purchaser within the warranty period shall be maintained at the same prices as in the Supplier offer.

18.3. Mandatory components and electronic control units – Annex 1.3

The main components and electronic control units stipulated in Annex 1.3 which must be delivered by the Supplier to the Purchaser location will constitute a buffer stock needed for minimizing the periods when buses are out of operation. This main components and electronic control units stock will be used, with the Purchaser approval, both for part replacements due to warranty faults and also for non-warranty faults (cause by road accidents, vandalism or other fault).

The Supplier commit himself to restore the initial main components and electronic control units stock, within the entire warranty period, in maximum 7 days from the Purchaser request. The main components and electronic control units restocking will be done at the Purchaser expense if the fault remedy is not a warranty issue or at the Supplier expense if the fault is a warranty issue.

The prices of the additional main components and electronic control units to be procured by the Purchaser within the warranty period shall be maintained at the same prices as in the Supplier offer.

19. SERVICES

19.1 Service centre/workshop

During the warranty period the supplier must provide the necessary equipment and operate at the Purchaser depots (using Purchaser trained personnel and under the supervision and quality assurance of an agent nominated by the Supplier) a service unit / workshop. The supplier will perform the necessary actions for obtaining the service unit / workshop authorization RAROM and bus manufacturer.

The service unit / workshop will conduct the planned maintenance operations, small systematic faults and hidden fault and other small faults identified during maintenance process, during entire warranty period. The major hidden faults identified during the warranty period shall not be corrected in the Purchaser depot, but in the Supplier service units which are agreed by the manufacturer. The cost for these repairs, including the buses transport cost to the agreed unit service shall be covered by the Supplier.

The Purchaser service unit / workshop must be equipped by the Supplier with diagnosis and maintenance equipment specified in the supply requirements (List of Goods and Related Services). If any other additional equipment or device is necessary to conduct the maintenance operations and/or for RAR authorization, the Supplier must deliver, at its own costs, the necessary equipment and devices.

The Supplier is responsible with implementation and certification of the service, RAR and manufacturer authorization, at the Purchaser location.

19.2 Personnel training

The supplier shall provide, at its own cost (including the costs related to the transportation and accommodation of the personnel involved in the training process), training about maintenance and repairing operations which would match the warranty conditions provided by the manufacturer, and will be separately highlighted.

The supplier shall provide training for the purchaser's personnel at the level required by RNTR 9 and RAROM requirements for authorization, to perform: diagnosis, maintenance and repairing of mechanical systems (engine, gearbox, braking system, axles, suspension system), electrical and electronic systems, maintenance and repairing of the vehicle body.

The training shall be considered completed when all the purchaser's staff have received the manufacturer and/or RAR certification, as applicable, for the skills acquired, and have sufficient experience to perform the operations required for the diagnostic, maintenance and repairs of the buses offered by the supplier. However, the training programme and the certification of the purchaser staff has to be completed before the buses enter service.

The training programme shall include at minimum the following modules:

1. Training of technical staff with higher qualification:

- overall bus;
- diagnosis and usage of the diagnosis equipment;
- audio/video system and passenger information;

- engine;
- gearbox;
- axles, braking system, suspension;
- electrical and electronic equipment.

All the training will be performed in a location selected by the manufacturer (either in a centre specialized for training of the manufacturer, or at the headquarters of the subsystem manufacturer).

The number of specialists trained will be maximum 5 people.

2.Training for execution technical staff: according to the subjects and schedule:

The number of specialists trained will be maximum 26 people, out of which:

- 12 auto mechanics for the training modules – **technical revisions planed, diagnosis and current repairing;**
- 3 workers for the training module – body works;
- 3 electricians and 3 electronics technician for the training module – **door power and electrical and electronic equipment;**
- 5 trainer drivers for the training module – **training and road safety and cost-efficient driving**

The training courses for revisions, repairing, inspections, body works and training of drivers will take place at the headquarters of the Purchaser.

Theory training for the purchaser's Driver Training Staff

The supplier will conduct 'train the trainer' training to up to 5 drivers appointed by the Purchaser. The training shall include at a minimum instruction about: dashboard, commands of the vehicle systems, the warning signals, the security and operational systems, the safety measures in case of fire.

Practical training for the purchaser's Driver Training Staff

The supplier will conduct a 'Train the Trainer' training course to up to 5 drivers appointed by the purchaser.

The training will be located at the Purchaser headquarters. The training subjects shall include a minimum of: starting the engine, commands of the vehicle, disabled people ramp operation, warning signals, security systems of vehicles and warnings for parking brake operation, periodicity of revisions and repairs.

19.3. Maintenance services

19.3.1. Daily maintenance activity

- a) The daily maintenance activity includes all operations performed by the Purchaser such as daily technical check of normal operation status and replacing of low value but necessary components or consumables (oils, grease, liquids, bulbs, belts, filters) according to Romanian legislation regarding road traffic and public transport;
- b) The daily maintenance activity will be performed in two locations belonging to the Purchaser which will be stipulated in the procurement contract annexes;
- c) The workmanship will be performed by the Purchaser authorised personnel at its own costs but the Supplier representative will supervise these operations;
- d) The Supplier will gradually provide, at its own costs, for the entire contractual period of 36 months, all the consumables necessary to perform the daily maintenance activity (oil refill, antifreeze, bulbs, belts which have a lifetime smaller than the warranty period of the buses, namely 180,000 km).

Note:

- Purchaser's personnel dedicated to this activity will be trained and authorised by the Supplier;
- The Purchaser's personnel is allow to replace damaged parts if this operation is not causing the bus unavailability, parts like: bulbs, belts, oil refill or other consumables replace;
- The Supplier will oblige itself to provide a minimum stock of bus parts and consumables in each of the two locations of the Purchaser for the entire contractual period of 36 months.

19.3.2. Planned maintenance activity

The tender must include the description of planned maintenance processes and details about periodicity, necessary operation, parts to be replaced preventively, consumables needed, working time for each operation. The Supplier will provide planned maintenance services for all the delivered buses, according with the planned maintenance programme stipulated by the bus manufacturer, within a contractual period of 36 months starting from the date of the last delivery of buses at the Purchaser location.

- a) The planned maintenance activity include all operations stipulated in the maintenance plan of the bus according to its mileage and time in operation.
- b) The activity will be performed at the two locations belonging to Purchaser, stipulated in the contract.
- c) All operations will be executed by the designated Purchaser's personnel, trained by the Supplier, and under the supervision of the Supplier's representative person; all costs of the above mentioned operations conducted by the Purchaser's personnel will be cover by the Purchaser.
- d) All consumable materials necessary for the planned maintenance operation will be provide gradually by the Supplier at its own costs during the entire warranty period.
- e) The Supplier will provide in advance parts and consumable materials (bulbs, oil, antifreeze and others lubricants, belts) which can cause buses unavailability in case of warranty faults.

The tender price will include all consumable materials and parts which have to be replaced, including lubricants, filters, bulbs etc., for a period of 180,000 km / bus , including lubricant and refrigerant refills etc.. These parts and materials will be provided by the Supplier during the entire warranty period without any cost for the Purchaser.

The consumable materials and high wear parts include all materials and parts that have a normal utilisation period smaller than the warranty period of 180,000 km (antifreeze, oil, special grease, refrigerant (Freon), distilled water, shock absorbers, brake linings, air cushions, batteries, windshield blades, transmission belts etc.).

The Supplier will provide the necessary spare parts and consumable materials starting with the first delivered buses in order to support an adequate planned maintenance operations throughout the warranty period.

20. TECHNICAL DOCUMENTATION PROVIDED BY THE SUPPLIER

20.1 Documentation to be provide for each bus:

Each bus will be supplied with the following documentation in Romanian language:

- User manual for the driver
- Original software for all vehicle systems and sub-systems on CD-ROM or through access to online resources
- Service records, passport;
- Quality certificate;
- Warranty certificate;
- Certificate of conformity;
- Vehicle registration document issued by RAR;
- User manual for all the auxiliary systems.

20.2 Maintenance documentation for all the buses:

- Certification system for the engine;
- EC Certificate of conformity and certificate of approval, for the main systems and subsystems, aggregates, etc., issued by an institution approved in the EU;
- Schedule of planned technical revisions;
- The planned maintenance manuals (which would include the planned maintenance operations for all the installations and subsystems of the bus, the anchorage points, tests, verifications, filling capacities, periodicity of replacement and types of recommended fluids).
- Repairing manuals which would include the repairing operations, the anchorage point, tests, verifications for all the installations and subsystems of the bus.
- OBD manual which will include the fault codes, their name and the remedy method.
- Catalogue with the rated labour for the planned maintenance activity.

- Catalogue with the rated labour for the repairing activity.
- Catalogue with the spare parts and consumables, for the main systems, updated according to the manufacturer, type and manufacturing group, which can be used on computer, with the different installation software, with the list of the authorized suppliers, including upgrade throughout the entire lifetime. The catalogue of spare parts will present the mentioned components of the bus, in groups, with the identification of the codes for all the parts, including drawings of the overall positioning of the parts.
- Free access for the entire lifetime of the buses, at online sources of technical information provided for the service representatives of the tenderer.
- Overall drawing (supporting structure, exterior coating, internal coating, assembly technology for accidental repairing);
- Diagrams of the electrical power installation;
- Diagrams of the electrical power installation;
- Diagrams of wirings and connectors
- Diagram of the pneumatic installation
- Diagram of the measurement and diagnosis points of the pneumatic installation
- Diagram of the engine cooling installation and saloon heating
- Diagram of the air conditioning installation
- Diagram of the measuring and diagnosis points of the air conditioning installation
- Fuel system Diagram
- Diagram of the measuring and diagnosis points of the power supply installation
- Diagram of the greasing installation and greasing points
- List of quantities, types and specifications of the products used to lubricate all the installations and equipment, the authorized manufacturers, the periodicity of the greasing operations, the necessary filters, etc.
- Instructions manual for programming the route destination panels, including software with user interface in the Romanian language.
- Diagram of the special installation for the reduction of polluting gases.
- Catalogue with all spare parts of the bus, including: name, manufacturer's code, number of the spare part per bus, supplier's code, supplier of original spare part.

The manuals, drawings and diagrams requested will be presented **at the first delivery of buses.**

Documents above mentioned must be supplied on both paper and digital format, in 4 paper copies of each document requested, in Romanian language.

21. MAINTENANCE THROUGHOUT THE WARRANTY PERIOD

The tenderer must provide a detailed description on how it will perform the technical assistance and servicing during the warranty period.

The tenderer will oblige itself through the tender to provide the following warranty:

- Complete warranty for operation without faults for a minimum of 180,000 km or a 3 years period for the entire bus and all its components (other than the below mentioned); The tenderer should consider an annual average mileage of 60,000 km/bus.
- Extended warranty period from the 4th year of operation up to the 10th year of operation or up to a mileage of 800,000 km per bus for the entire bus and all its components. The supplier will oblige itself to provide all necessary materials, parts and components to be replaced due to a normal wear or technical faults according to the repairs and maintenance manual of the bus and to spare parts catalogue.

Warranty exceptions:

- The consumables: oils, filters, batteries, car bulbs
- parts needed for road accidents or vandalism repairs

Warranties that differ from general warranty of buses:

- tires: up to minimum 160,000 km
- batteries: up to minimum 2 year

The main components:

- Engine: up to minimum of 500,000 km
- Gear box: up to minimum of 500,000 km
- Front axle: up to minimum of 500,000 km
- Driven axle: up to minimum of 500,000 km
- Steering: up to minimum of 300,000 km
- Rubber components: up to minimum of 8 years
- Brake disks: up to minimum of 250,000 km

without any warranty obligations.

The service activity, repairs and planned maintenance operations will be conducted at the locations indicated in the contract or at an authorized service. The entire service activity and the Purchaser personnel will be authorised by R.A.R. – Registru Auto Roman. The supplier will provide technical assistance, certified personnel training, tools and documentation needed to obtain the authorization from R.A.R. – Registrul Auto Roman for all service activities related to offered buses (for Purchaser workshop and personnel).

The tenderer will present the technical equipment and the needed personnel for performing the technical assistance and service operations during the warranty period. The tender will include R.A.R. authorisation for the service unit located within a range of 200 km from Brasov city (road distance), agreed by the bus manufacturer to provide warranty for purchased buses.

The Supplier will appoint a person in charge with service operation during the warranty period which will be responsible with coordination and optimisation of the service activity. In this purpose, regular meetings will be organised (twice per month) between Purchaser and Supplier.

The planned maintenance operations, technical revisions and faults warranty repairs will be performed by the Purchaser's personnel. The Supplier will check the operations performed and the quality of these operations, assuming complete responsibility during the warranty period.

The Supplier will appoint a permanent technical agent who will be responsible with service operations coordination and control at the service unit.

The Supplier will provide at its own costs a reserve of spare parts and necessary materials, bus components and consumables needed to perform repairs and maintenance operations during the warranty period. This reserve must comply with the obligation of the Supplier to achieve an availability of the buses in operation of at least 95%.

The technical faults recording and resolving methods during the warranty period is mentioned in the annexes to the contractual documents.

In the case of failure to comply with the buses availability indicator of 95%, during the warranty period, a penalty will be retained from the performance bond guarantee, whose amount is depending on the number of days of unavailability of the buses. The Supplier is obliged to provide on Purchaser request the spare parts for the buses during a period of at least 12 years counting from the last bus delivered day. The Supplier will indicate a list containing the agreed spare parts and components suppliers able to perform the necessary warranties

The Purchaser reserve his right to purchase original parts and components (identical with the parts and components from initially equipment of buses) and to replace them without any risk of cancelling the warranty.

The work procedures checking methods, and document templates will be included in the contract complying with the minimal specifications stipulated in this document.

The Supplier obliges itself to provide at the Purchaser location the necessary quantities of consumables during the entire warranty period. The Supplier will provide the necessary quantities of parts and components for repairs that will be carried out during the warranty period.

21.1 Penalties and faults remedy during the warranty period

The Supplier will provide a signed commitment regarding the remedy time of faults occurred during the warranty period.

The faults identification and declaration will be conducted by the Purchaser's personnel in the presence of the Supplier's nominated agent. If the Supplier's agent is not present for fault identification within 24 hour from first notification, the Purchaser is allow to complete the warranty report and send it by fax to Supplier office. The fault notification will be made by the Purchaser at the fax number or email address stipulated in the contract, immediately after fault identification.

The Purchaser will also notify the Supplier's agent by phone and fax or email. If the bus is out of use more than two days due to the warranty issue, then an extension of the warranty period will applied accordingly with the number of days the bus was out of use. The Supplier will be responsible for covering any direct or indirect accident damages or harms cause by warranty faults according to legal stipulations. In this regard the Supplier will provide a signed commitment.

According with the terms that will be stipulated in the future procurement contract, the Purchaser will be entitled to request the Supplier to cover the direct or indirect income losses due to the inactivity of the buses.

The contract documents include the penalties applied for the inactivity periods of buses and the description of the penalty calculation method for covering the income losses cause by the inactivity of buses. No penalty will be applied if faults are remedied within 5 days from fault notification for the repairs that don't need dismounting the bus components and within 10 days from fault notification for repairs that require the dismount of the bus components.

The Supplier will provide a signed commitment regarding the duration of faults repairing during the warranty period.

In case of failure to achieve the 95% availability of buses the Supplier will pay penalties according to the contract stipulations. The availability of the buses will be calculated as follows:

- The availability of the delivered buses will be calculated annually both for each bus as well for the entire contract.
- Each bus must be technically available for at least 347 days per year and in each day of the year the number of available buses has to be at least 95% from the total number of buses delivered.

The above conditions will not be applied in case of faults cause by road accidents or vandalism, except if the Supplier does not provide the necessary parts and consumables reserve according to contractual terms.

In this case the Supplier will pay penalties.

22. FAULT REPAIRS DURING THE WARRANTY PERIOD

- ✓ The supplier will provide a detailed description of the methods to be applied for technical support and service activity throughout the warranty period.
- ✓ The Supplier will guarantee the execution at its costs of all the repairing, replacements and modifications imposed by technical faults, systematic faults and hidden faults of the buses, as well as the faults identified within the planned revisions when faults are identified throughout the warranty period. Unless otherwise required by the technical nature of the defect, all the repairs shall be executed at the workshop set up at the Purchaser's depot. If the repairs cannot be executed at the workshop set up at Purchaser's depot, the cost and risk associated to the transport to another authorized workshop shall be borne by the Supplier.
- ✓ Throughout the warranty period, the Supplier shall not to refuse to remedy faults and to replace damaged parts from the buses, regardless the parts, except in cases which have been caused by vandalism or road accident.
- ✓ The supplier will appoint a person responsible for the service activity throughout the contractual warranty period which will be liable for the coordination and optimization of the activity.
- ✓ The remedy of faults throughout the warranty period will be executed within 5 working days from the receipt of the notification submitted for simple faults, and up to 10 working days for significant faults, which imply replacing complex components (e.g. axles, engine, and gearbox).

For the purpose of this contract the contractual warranty for the mandatory spare parts, components and related equipment shall be 36 months. However, the expiration of contractual warranty shall not relieve the Supplier and the manufacturer for fulfilling its warranty obligations for the specific parts/subsystems of the goods delivered, as follows:

- The warranty of operation without faults of the bus at least 36 months or 180.000 km from the commissioning date;
- Warranty (bending, cracking, breaking) for chassis and vehicle body: at least 12 years;
- Anticorrosion warranty for chassis and vehicle body: at least 12 years;

- Warranty for floor and floor covering, including soldering: at least 10 years;
- Warranty of the lateral external vehicle body coating: at least 10 years.
- Warranty for paintwork: at least 6 years;
- Tyres: 160.000 km.
- Passenger information system: 5 years.
- Engine: 500.000 km or 5 years;
- Gearbox: 500.000 km or 5 years;
- Front axle: 500.000 km or 5 years;
- Driving axle: 500.000 km or 5 years;
- Steering system: 250,000 km.

The Supplier must provide a manufacturer's warranty certificate for both the goods as a whole as well as for the parts/subsystems of goods indicated above. The warranty certificate must be drafted and contain clauses and information required by the specific legislation in the Purchaser's country (Romania) concerning warranty conditions.

22.1. WARRANTY FAUL REPAIRS THAT WILL BE PERFORMED AT PURCHASER LOCATIONS

- a) The repairs that will be performed at the Purchaser locations include all operations necessary for bringing the bus to normal operating parameters;
- b) These repairs will be performed only at the Purchaser locations indicated in the contract;
- c) The repairs will be executed by the Purchaser personnel on the Supplier expense and responsibility (the workmanship costs for Purchaser personnel will be determined according with Purchaser personnel current costs and will be agreed by both parties at the contract signing).
- d) All parts and consumable materials needed for fault repairs during the warranty period will be provided by the Supplier at its own costs.

The engine air filter and the set of filters for air conditioning system will be replace after a minimum mileage of 30,000 km per bus.

22.2. WARRANTY FAUL REPAIRS THAT CANNOT BE PERFORMED AT PURCHASER LOCATIONS

- a) The complex warranty fault repairs during the warranty period include the necessary operations for bringing the bus to normal operating parameters that cannot be performed at the Purchaser locations;
- b) These activities will be performed only at the Supplier service unit;
- c) These operations will be executed by the Supplier personnel on its own costs and responsibility;
- d) All parts and consumable materials needed for complex fault repairs during the warranty period will be provided by the Supplier at its own costs.

Note: The warranty repairs performed during the warranty period will be conducted accordingly to the conditions and performances declared in the tender, if not the penalties stipulated in this document will be applied.

22.3 NON-WARRANTY FAULT REPAIRS (ROAD ACCIDENTS REPAIRS OR OTHER OPERATIONS REQUESTED BY THE PURCHASER) THAT CANNOT BE PERFORMED BY THE PURCHASER

- a) The non-warranty fault repairs include the necessary operations for bringing the bus to normal operating
- b) parameters that are cause by road accidents or other damages which cannot be attributed to the Supplier and are requested by the Purchaser;
- c) b) These activities will be performed only at the Supplier service unit;
- d) c) These operations will be executed by the Supplier personnel and responsibility on Purchaser expense;
- e) d) All parts and consumable materials needed for these kind of fault repairs will be provided by the Supplier on Purchaser expense.

The Supplier will provide a detailed description of the methods used for fault repairs requested by the Purchaser (cost estimation).

For non-warranty fault repairs during the warranty period the Supplier agree to provide, on Purchaser request, the necessary parts and components at the price values stipulated in the tender. The tender will include the spare parts and components list stipulating the manufacturer code and the unit price for each item.

23. AVAILABILITY

At least 95% of the buses must be available for use every day (calculation will be conducted after delivery of the last bus).

Each bus must be available at least 347 days per year.

Calculation of the availability will be made both for each bus and also for the entire lot of buses delivered.

The following periods will not be considered for availability determination:

- Inspections and revisions;
- Accidents, vandalism or damages produce by the Purchaser or third party;
- Daily care (washing, cleaning, etc.)
- Modifications or assembly of accessories at the Purchaser's request
- Modernization works executed at the purchaser's request

If the availability conditions are not met, this will result in calculating penalties according to the clause "Liquidated Damages".

24. DELIVERY OF SPARE PARTS AFTER THE EXPIRY OF THE WARRANTY PERIOD

The supplier guarantees the availability of the components and spare parts necessary for the operation of the buses for the minimum period of 12 years from the delivery of the last bus from the contracted number of buses.

25. TESTS AND INSPECTIONS OF GOODS

25.1. Inspection

During the buses manufacturing phase, the Purchaser inspection team, which includes up to 4 persons, will conduct two vehicle inspections.

The first inspection will be conducted after completion of chassis operations and will include:

- ✓ Checking the technical conditions imposed by the technical documentation, drawings and technical specifications stipulated in tender documents;
- ✓ Verification of levels, dimensions and features of utilized materials;
- ✓ Checking of technological phases of manufacture process of the chassis and anticorrosive protection.

The second inspection will be conducted at the Purchaser request during the final inspection of buses before delivery and may include:

- ✓ quality inspections regarding the performed works and the compliance with tender document requests;
- ✓ fuel consumption tests conducted in real urban traffic environment;
- ✓ Operation tests and checking the installations, components and devices installed on the bus.

The tests will be conducted randomly for a number of buses set by the Purchaser.

The cost of the above inspections, including transport, accommodation and meals of the Purchaser's representatives, will be covered by the Supplier.

25.2. Checking the features and the quality or parts and materials

Regardless of the manufacture phase of the bus, if the Purchaser request to inspect the features and quality of components and materials, the Supplier will provide the requested documentation within 3 days from the receiving the write request.

25.3. Inspection before delivery

All tests requested by the Purchaser before delivery will be conducted in manufacturer plant.

Operation of all components, installations and devices installed on the bus will be tested upon delivery and all marks requested will be checked.

Regardless of the manufacture phase of the bus, if the Purchaser request to inspect the features and quality of components and materials, the Supplier will provide the requested documentation within 3 days from the receiving the written request.

25.4. Test after delivery – Acceptance Tests

To prove the compliance with the information provided in the offer with regards to fuel consumption and emission of pollutants, the Supplier will be requested to perform a SORT 1 test (which will be conducted in presence of a Purchaser representative) for 3 delivered buses (from each lot of 10m, 12m and 18m buses) which are in operation by the Purchaser for at least 20,000 km and no more than 30,000 km. The buses to be tested will be chosen by the Purchaser.

The testing shall be conducted by a reputable accredited testing centre acceptable both to the purchaser and to the supplier.

The supplier will bear the full cost of testing the buses.

The results and reports of the test shall be sent to the Purchaser within 2 weeks of completion of the test.

If the test result shows a higher fuel consumption and pollutants emissions than the ones indicated in the supplier's technical offer but within maximum 5%, liquidated damages will be imposed to the contract as per the relevant clause of the contract.

The penalties will be proportional with the adjustment formula establishing the evaluated tender price.

25.5 RECEPTION ON DELIVERY

Individual reception of buses will be conducted by the Purchaser according with the conditions mentioned in Annex 5.

26. SYSTEMATIC FAULTS AND HIDDEN FAULTS

If throughout the warranty period, and within 12 consecutive months, a fault or abnormal wear is reported on the same part or on the same subsystem of more than 20% of the buses delivered, this represents a systematic design or manufacturing fault. In this case, the Supplier has to verify, redesign, replace or repair, at their own cost, the respective element on all of the delivered buses.

The replacement shall be done within a maximum of 30 days from the notification to the Supplier from the Purchaser.

The tenderer must provide a detailed description of the corrective actions both for the hidden vices and for other faults regarding materials and/or the conception for the warranty period and post-warranty period.

The supplier is held responsible for the entire life expectancy of the bus for dealing with the hidden vices, whether they are from the materials used, the designing process, the manufacturing of the bus, as a whole or for each and every one of its components.

During the warranty and the post-warranty period the Supplier will replace or repair, on his own expense all the defective items both for the material and for the design faults.

27. MARKING, PRESERVATION, PACKAGING, TRANSPORTATION

27.1 Marking

Each bus will include inside, on the vertical wall, on the right side, a rating plate with the following data in the Romanian language: name of the manufacturing company, vehicle type, manufacturing year incorporated in the VIN code, chassis number incorporated in the VIN code, net weight, total weight, distribution of weights on axles; engine: type, series, power; dimensions (length, width, height), transportation capacity on seats and total.

Each chassis needs to have the VIN code punched.

27.2. Preservation, packaging

The bus will be adequate preserved, packaged and equipped for transportation from the factory to the Purchaser location, whether by railway or by road transport.

ANNEXES

Annex 1 - DELIVERABLES THAT MUST BE INCLUDED IN THE CONTRACT PRICE

Annex 1.1 - TOOLS, DEVICES AND TEST EQUIPMENT, SPECIFIC EQUIPMENT AND SOFTWARE

Annex 1.2 – INITIAL SUPPLYING OF SPARE PARTS AND MATERIALS

Annex 1.3 – INITIAL SUPPLYING OF MAIN COMPONENTS AND ELECTRONIC CONTROL UNITS

ANNEX 1 (to the technical requirements)

DELIVERABLES THAT MUST BE INCLUDED IN THE CONTRACT PRICE

The Tenderer will deliver the following goods, included in tender price:

ANNEX 1.1. - SPECIFIC SDV-s (TOOLS, DEVICES AND TEST EQUIPMENT) ACCORDING WITH THE MAINTENANCE AND REPAIR MANUAL: NUMBER OF SETS THAT WILL BE DELIVERED TO THE PURCHASER LOCATON

a) TOOLS, DEVICES AND TEST EQUIPMENT, SPECIFIC EQUIPMENT AND SOFTWARE FOR MAINTENANCE OPERATIONS AND REPAIRS, BUSES DIAGNOSIS AND SETTING FOR 10 METER BUSES

No.	Name: Tools, devices and test equipment, diagnosis and parameters configuration	Quantity
Specific devices for repairs and interventions performed in traffic (on street):		
1.	Special tool for front wheel screw nuts: tubular tool	2 pcs
2.	Special tool for front wheel nuts: extension tool	2 pcs
3.	Special tool for front wheel nuts: T tool	2 pcs
4.	Torque wrench for front wheel nuts	2 pcs
5.	Special tool for rear wheel screw nuts: tubular tool	2 pcs
6.	Special tool for rear wheel nuts: extension tool	2 pcs
7.	Special tool for rear wheel nuts: T tool	2 pcs
8.	Torque wrench for rear wheel nuts	2 pcs
9.	Special tool for the bolts of axle shaft flange	2 pcs
10.	Torque wrench for the bolts of axle shaft flange	2 pcs
11.	Special tool for the bolts (nuts) of drive shaft flange	2 pcs
12.	Special tool for unlocking the double rear brake cylinders	2 pcs
13.	Quick couplings for introducing compressed air in pneumatic system	4 pcs
14.	NATO plug or similar	4 pcs
15.	Hydraulic device for bus lifting in traffic (car jack)	2 pcs
16.	Fixed support device for safety keeping the bus lifted in traffic	2 pcs
Specific devices needed at the service units for mechanical systems, mounting/dismounting, control check and diagnosis operations:		
17.	Special tool for front axle knuckle nut	4 pcs
18.	Special tool for rear axle knuckle nut	4 pcs
19.	Device for front wheel hub removal	4 pcs
20.	Device for rear wheel hub removal	2 pcs
21.	Device for removal/assembling of front wheel hub bearing	2 pcs
22.	Device for removal/assembling of rear wheel hub bearing	2 pcs
23.	Device for removal/assembling of front wheel hub seal	2 pcs
24.	Device for removal/assembling of rear wheel hub seal	2 pcs
25.	Device for removal/assembling of front wheel brake disc	2 pcs
26.	Device for removal/assembling of front wheel brake linings	2 pcs
27.	Device for removal/assembling of rear wheel brake disc	2 pcs

No.	Name: Tools, devices and test equipment, diagnosis and parameters configuration	Quantity
28.	Device for removal/assembling of front wheel brake linings	2 pcs
29.	Hydraulic device for removal/assembling the wheel ball joint	2 pcs
30.	Device for removal of rod ends	2 pcs
31.	Special tool and torque wrench for rod ends nut bolts	2 pcs
32.	Device for removal/assembling of suspension hinge sleeves	2 pcs
33.	Device for removal/assembling the engine pulley, tension pulley and drive pulley for auxiliary components	2 pcs
34.	Special tool and torque wrench for engine pulley stud bolts	2 pcs
35.	Special tool and torque wrench for engine cylinder head bolts	2 pcs
36.	Device for removal/assembling of engine injector	2 pcs
37.	Special tool set for removal/assembly oil filters, fuel filter etc. (all filters)	2 pcs
38.	Special devices for body interventions (if applicable)	2 pcs
39.	Hydraulic device for bus lifting (crocodile jack)	2 pcs
40.	Industrial vacuum cleaner for radiators maintenance	1 pcs
41.	Pressure washer for radiators maintenance	1 pcs
Pneumatic devices for diagnosis operations of fluid-based systems, performed at the service unit (the pneumatic system, fuelling system, cooling system, air conditioning system)		
Checking and diagnosis with manometer-based devices:		
42.	Manometer device for pneumatic system diagnosis	2 pcs
43.	Manometer device for pneumatic circuits diagnosis for brake, suspension etc.	2 pcs
44.	Manometer device for fuel system diagnosis	2 pcs
45.	Manometer device for cooling system diagnosis	2 pcs
46.	Complete diagnosis and refilling equipment for air conditioning system + detection of refrigerant leakage kit	1 pcs
Common devices for electrical systems diagnosis and repairs performed at service unit location, Tool kit and devices for automotive electricians (complete or components):		
47.	Universal digital multimeter	4 pcs
48.	Universal test lamp for 24 V	4 pcs
49.	Kit for removing and replacing flat multi-pin electrical connectors	2 pcs
50.	Kit for removing and replacing round multi-pin electrical connectors	2 pcs
51.	Universal crimping claw for wires - cables	2 pcs
52.	Tin soldering gun	2 pcs
53.	Gas Soldering Gun	2 pcs
54.	Tin Desoldering Pump	2 pcs
55.	Wires cutting and stripping tool	2 pcs
56.	Electric cables diagonal cutting pliers	2 pcs
57.	Cordless screwdriver kit with rechargeable batteries	2 pcs

No.	Name: Tools, devices and test equipment, diagnosis and parameters configuration	Quantity
58.	Lineman's pliers with insulated handles	2 pcs
59.	Jump starter with rechargeable batteries for helping to start the buses	1 pcs
Specific electronic devices (including: hardware – software) for testing, diagnosis and parameters configurations of electronically managed systems (by software):		
60.	Laptop and multimedia projector for the use of software applications	2 pcs
61.	Desktop computer for data processing at the workshop	1 pcs
62.	Device for overall bus diagnosis (if applicable)	2 pcs
63.	Device for diesel engine diagnosis (if applicable)	2 pcs
64.	Device for gearbox diagnosis (if applicable)	2 pcs
65.	Device for braking system (EBS) diagnosis (if applicable)	2 pcs
66.	Device for pneumatic suspension system diagnosis (if applicable)	2 pcs
67.	Device for heating system diagnosis (if applicable)	2 pcs
68.	Device for air conditioning system diagnosis (if applicable)	2 pcs
69.	Device for doors system diagnosis (if applicable)	2 pcs
70.	Device for passenger information system diagnosis (if applicable)	2 pcs
71.	Device for passengers counting system diagnosis (if applicable)	2 pcs
72.	Device for video surveillance system diagnosis (if applicable)	2 pcs
73.	Device for data communication system diagnosis (if applicable)	2 pcs
Tools, devices and test equipment and other necessary equipment according to buses specifications and recommendations included in the repairs and maintenance manuals:		
74.	Test equipment and tools recommended for maintenance, repairing and diagnosis of systems related with EURO 6 technology (if applicable)	2 pcs
75.	Test equipment and tools recommended for mechanical systems (if applicable)	2 pcs
76.	Test equipment and tools recommended fluid based systems (if applicable)	2 pcs
77.	Test equipment and tools recommended for electrical systems (if applicable)	2 pcs
78.	Test equipment and tools recommended for bus body (if applicable)	2 pcs
79.	Devices and other equipment recommended for electronically managed systems (by software) (if applicable)	2 pcs

Note:

The above list will be supplemented by each tenderer with the necessary specific tools that are not included.

In case that, throughout the contractual period, the Purchaser find that it need others specific test equipment and tools which were not included in the tender, then the Supplier is oblige to provide those equipment and tools at its own costs.

The tenderer will provide all the necessary test equipment and tools for the delivered buses, which is included in the technical documentation for maintenance and repairs.

The Supplier will sign a written commitment regarding the delivery at its own costs of any other specific test equipment and tool that will be requested by RAR – Registrul Auto Roman for Purchaser service unit authorisation.

b) TOOLS, DEVICES AND TEST EQUIPMENT, SPECIFIC EQUIPMENT AND SOFTWARE FOR MAINTENANCE OPERATIONS AND REPAIRS, DIAGNOSIS AND ADJUSTMENT OF BUSES FOR 12 METER BUSES

No.	Name: Tools, devices and test equipment, diagnosis and parameters configuration	Quantity
Specific devices for repairs and interventions performed in traffic (on street):		
1.	Special tool for front wheel screw nuts: tubular tool	2 pcs
2.	Special tool for front wheel nuts: extension tool	2 pcs
3.	Special tool for front wheel nuts: T tool	2 pcs
4.	Torque wrench for front wheel nuts	2 pcs
5.	Special tool for rear wheel screw nuts: tubular tool	2 pcs
6.	Special tool for rear wheel nuts: extension tool	2 pcs
7.	Special tool for rear wheel nuts: T tool	2 pcs
8.	Torque wrench for rear wheel nuts	2 pcs
9.	Special tool for the bolts of axle shaft flange	2 pcs
10.	Torque wrench for the bolts of axle shaft flange	2 pcs
11.	Special tool for the bolts (nuts) of drive shaft flange	2 pcs
12.	Special tool for unlocking the double rear brake cylinders	2 pcs
13.	Quick couplings for introducing compressed air in pneumatic system	4 pcs
14.	NATO plug or similar	4 pcs
15.	Hydraulic device for bus lifting in traffic (car jack)	2 pcs
16.	Fixed support device for safety keeping the bus lifted in traffic	2 pcs
Specific devices needed at the service units for mechanical systems, mounting/dismounting, control check and diagnosis operations:		
17.	Special tool for front axle knuckle nut	4 pcs
18.	Special tool for rear axle knuckle nut	4 pcs
19.	Device for front wheel hub removal	4 pcs
20.	Device for rear wheel hub removal	2 pcs
21.	Device for removal/assembling of front wheel hub bearing	2 pcs
22.	Device for removal/assembling of rear wheel hub bearing	2 pcs
23.	Device for removal/assembling of front wheel hub seal	2 pcs
24.	Device for removal/assembling of rear wheel hub seal	2 pcs
25.	Device for removal/assembling of front wheel brake disc	2 pcs
26.	Device for removal/assembling of front wheel brake linings	2 pcs
27.	Device for removal/assembling of rear wheel brake disc	2 pcs
28.	Device for removal/assembling of front wheel brake linings	2 pcs
29.	Hydraulic device for removal/assembling the wheel ball joint	2 pcs
30.	Device for removal of rod ends	2 pcs
31.	Special tool and torque wrench for rod ends nut bolts	2 pcs
32.	Device for removal/assembling of suspension hinge sleeves	2 pcs

No.	Name: Tools, devices and test equipment, diagnosis and parameters configuration	Quantity
33.	Device for removal/assembling the engine pulley, tension pulley and drive pulley for auxiliary components	2 pcs
34.	Special tool and torque wrench for engine pulley stud bolts	2 pcs
35.	Special tool and torque wrench for engine cylinder head bolts	2 pcs
36.	Device for removal/assembling of engine injector	2 pcs
37.	Special tool set for removal/assembly oil filters, fuel filter etc. (all filters)	2 pcs
38.	Special devices for body interventions (if applicable)	2 pcs
39.	Steering geometry diagnostic and adjusting equipment	1 pcs
40.	Hydraulic device for bus lifting (crocodile jack)	2 pcs
41.	Industrial vacuum cleaner for radiators maintenance	1 pcs
42.	Pressure washer for radiators maintenance	1 pcs
Pneumatic devices for diagnosis operations of fluid-based systems, performed at the service unit (the pneumatic system, fuelling system, cooling system, air conditioning system)		
Checking and diagnosis with manometer-based devices:		
43.	Manometer device for pneumatic system diagnosis	2 pcs
44.	Manometer device for pneumatic circuits diagnosis for brake, suspension etc.	2 pcs
45.	Manometer device for fuel system diagnosis	2 pcs
46.	Manometer device for cooling system diagnosis	2 pcs
47.	Complete diagnosis and refilling equipment for air conditioning system + detection of refrigerant leakage kit	1 pcs
Common devices for electrical systems diagnosis and repairs performed at service unit location, Tool kit and devices for automotive electricians (complete or components):		
48.	Universal digital multimeter	4 pcs
49.	Universal test lamp for 24 V	4 pcs
50.	Kit for removing and replacing flat multi-pin electrical connectors	2 pcs
51.	Kit for removing and replacing round multi-pin electrical connectors	2 pcs
52.	Universal crimping claw for wires - cables	2 pcs
53.	Tin soldering gun	2 pcs
54.	Gas Soldering Gun	2 pcs
55.	Tin Desoldering Pump	2 pcs
56.	Wires cutting and stripping tool	2 pcs
57.	Electric cables diagonal cutting pliers	2 pcs
58.	Cordless screwdriver kit with rechargeable batteries	2 pcs
59.	Lineman's pliers with insulated handles	2 pcs
60.	Jump starter with rechargeable batteries for helping to start the buses	1 pcs

No.	Name: Tools, devices and test equipment, diagnosis and parameters configuration	Quantity
Specific electronic devices (including: hardware – software) for testing, diagnosis and parameters configurations of electronically managed systems (by software):		
61.	Laptop for the use of software applications	2 pcs
62.	Desktop computer for data processing at the workshop	2 pcs
63.	Device for overall bus diagnosis (if applicable)	2 pcs
64.	Device for diesel engine diagnosis (if applicable)	2 pcs
65.	Device for gearbox diagnosis (if applicable)	2 pcs
66.	Device for braking system (EBS) diagnosis (if applicable)	2 pcs
67.	Device for pneumatic suspension system diagnosis (if applicable)	2 pcs
68.	Device for heating system diagnosis (if applicable)	2 pcs
69.	Device for air conditioning system diagnosis (if applicable)	2 pcs
70.	Device for doors system diagnosis (if applicable)	2 pcs
71.	Device for passenger information system diagnosis (if applicable)	2 pcs
72.	Device for passengers counting system diagnosis (if applicable)	2 pcs
73.	Device for video surveillance system diagnosis (if applicable)	2 pcs
74.	Device for data communication system diagnosis (if applicable)	2 pcs
Tools, devices and test equipment and other necessary equipment according to buses specifications and recommendations included in the repairs and maintenance manuals:		
75.	Test equipment and tools recommended for maintenance, repairing and diagnosis of systems related with EURO 6 technology (if applicable)	2 pcs
76.	Test equipment and tools recommended for mechanical systems (if applicable)	2 pcs
77.	Test equipment and tools recommended fluid based systems (if applicable)	2 pcs
78.	Test equipment and tools recommended for electrical systems (if applicable)	2 pcs
79.	Test equipment and tools recommended for bus body (if applicable)	2 pcs
80.	Devices and other equipment recommended for electronically managed systems (by software) (if applicable)	2 pcs

Note:

The above list will be supplemented by each tenderer with the necessary specific tools that are not included. In case that, throughout the contractual period, the Purchaser find that it need others specific test equipment and tools which were not included in the tender, then the Supplier is oblige to provide those equipment and tools at its own costs.

The tenderer will provide all the necessary test equipment and tools for the delivered buses, which is included in the technical documentation for maintenance and repairs.

The Supplier will sign a written commitment regarding the delivery at its own costs of any other specific test equipment and tool that will be requested by RAR – Registrul Auto Roman for Purchaser service unit authorisation.

c) TOOLS, DEVICES AND TEST EQUIPMENT, SPECIFIC EQUIPMENT AND SOFTWARE FOR MAINTENANCE OPERATIONS AND REPAIRS, DIAGNOSIS AND ADJUSTMENT OF BUSES FOR 18 METER BUSES

No.	Name: Tools, devices and test equipment, diagnosis and parameters configuration	Quantity
Specific devices for repairs and interventions performed in traffic (on street):		
1.	Special tool for front wheel screw nuts: tubular tool	2 pcs
2.	Special tool for front wheel nuts: extension tool	2 pcs
3.	Special tool for front wheel nuts: T tool	2 pcs
4.	Torque wrench for front wheel nuts	2 pcs
5.	Special tool for rear wheel screw nuts: tubular tool	2 pcs
6.	Special tool for rear wheel nuts: extension tool	2 pcs
7.	Special tool for rear wheel nuts: T tool	2 pcs
8.	Torque wrench for rear wheel nuts	2 pcs
9.	Special tool for the bolts of axle shaft flange	2 pcs
10.	Torque wrench for the bolts of axle shaft flange	2 pcs
11.	Special tool for the bolts (nuts) of drive shaft flange	2 pcs
12.	Special tool for unlocking the double rear brake cylinders	2 pcs
13.	Quick couplings for introducing compressed air in pneumatic system	4 pcs
14.	NATO plug or similar	4 pcs
15.	Hydraulic device for bus lifting in traffic (car jack)	2 pcs
16.	Fixed support device for safety keeping the bus lifted in traffic	2 pcs
Specific devices needed at the service units for mechanical systems, mounting/dismounting, control check and diagnosis operations:		
17.	Special tool for front axle knuckle nut	4 pcs
18.	Special tool for rear axle knuckle nut	4 pcs
19.	Device for front wheel hub removal	4 pcs
20.	Device for rear wheel hub removal	2 pcs
21.	Device for removal/assembling of front wheel hub bearing	2 pcs
22.	Device for removal/assembling of rear wheel hub bearing	2 pcs
23.	Device for removal/assembling of front wheel hub seal	2 pcs
24.	Device for removal/assembling of rear wheel hub seal	2 pcs
25.	Device for removal/assembling of front wheel brake disc	2 pcs
26.	Device for removal/assembling of front wheel brake linings	2 pcs
27.	Device for removal/assembling of rear wheel brake disc	2 pcs
28.	Device for removal/assembling of front wheel brake linings	2 pcs
29.	Hydraulic device for removal/assembling the wheel ball joint	2 pcs
30.	Device for removal of rod ends	2 pcs
31.	Special tool and torque wrench for rod ends nut bolts	2 pcs
32.	Device for removal/assembling of suspension hinge sleeves	2 pcs

No.	Name: Tools, devices and test equipment, diagnosis and parameters configuration	Quantity
33.	Device for removal/assembling the engine pulley, tension pulley and drive pulley for auxiliary components	2 pcs
34.	Special tool and torque wrench for engine pulley stud bolts	2 pcs
35.	Special tool and torque wrench for engine cylinder head bolts	2 pcs
36.	Device for removal/assembling of engine injector	2 pcs
37.	Special tool set for removal/assembly oil filters, fuel filter etc. (all filters)	2 pcs
38.	Special devices for body interventions (if applicable)	2 pcs
39.	Steering geometry diagnostic and adjusting equipment	1 pcs
40.	Hydraulic device for bus lifting (crocodile jack)	2 pcs
41.	Industrial vacuum cleaner for radiators maintenance	1 pcs
42.	Pressure washer for radiators maintenance	1 pcs
Pneumatic devices for diagnosis operations of fluid-based systems, performed at the service unit (the pneumatic system, fuelling system, cooling system, air conditioning system)		
Checking and diagnosis with manometer-based devices:		
43.	Manometer device for pneumatic system diagnosis	2 pcs
44.	Manometer device for pneumatic circuits diagnosis for brake, suspension etc.	2 pcs
45.	Manometer device for fuel system diagnosis	2 pcs
46.	Manometer device for cooling system diagnosis	2 pcs
47.	Complete diagnosis and refilling equipment for air conditioning system + detection of refrigerant leakage kit	1 pcs
Common devices for electrical systems diagnosis and repairs performed at service unit location, Tool kit and devices for automotive electricians (complete or components):		
48.	Universal digital multimeter	2 pcs
49.	Universal test lamp for 24 V	4 pcs
50.	Kit for removing and replacing flat multi-pin electrical connectors	2 pcs
51.	Kit for removing and replacing round multi-pin electrical connectors	2 pcs
52.	Universal crimping claw for wires - cables	2 pcs
53.	Tin soldering gun	2 pcs
54.	Gas Soldering Gun	2 pcs
55.	Tin Desoldering Pump	2 pcs
56.	Wires cutting and stripping tool	2 pcs
57.	Electric cables diagonal cutting pliers	2 pcs
58.	Cordless screwdriver kit with rechargeable batteries	2 pcs
59.	Lineman's pliers with insulated handles	2 pcs
60.	Jump starter with rechargeable batteries for helping to start the buses	1 pcs

No.	Name: Tools, devices and test equipment, diagnosis and parameters configuration	Quantity
Specific electronic devices (including: hardware – software) for testing, diagnosis and parameters configurations of electronically managed systems (by software):		
61.	Laptop for the use of software applications	2 pcs
62.	Desktop computer for data processing	1 pcs
63.	Device for overall bus diagnosis (if applicable)	2 pcs
64.	Device for diesel engine diagnosis (if applicable)	2 pcs
65.	Device for gearbox diagnosis (if applicable)	2 pcs
66.	Device for braking system (EBS) diagnosis (if applicable)	2 pcs
67.	Device for pneumatic suspension system diagnosis (if applicable)	2 pcs
68.	Device for heating system diagnosis (if applicable)	2 pcs
69.	Device for air conditioning system diagnosis (if applicable)	2 pcs
70.	Device for doors system diagnosis (if applicable)	2 pcs
71.	Device for passenger information system diagnosis (if applicable)	2 pcs
72.	Device for passengers counting system diagnosis (if applicable)	2 pcs
73.	Device for video surveillance system diagnosis (if applicable)	2 pcs
74.	Device for data communication system diagnosis (if applicable)	2 pcs
Tools, devices and test equipment and other necessary equipment according to buses specifications and recommendations included in the repairs and maintenance manuals:		
75.	Test equipment and tools recommended for maintenance, repairing and diagnosis of systems related with EURO 6 technology (if applicable)	2 pcs
76.	Test equipment and tools recommended for mechanical systems (if applicable)	2 pcs
77.	Test equipment and tools recommended fluid based systems (if applicable)	2 pcs
78.	Test equipment and tools recommended for electrical systems (if applicable)	2 pcs
79.	Test equipment and tools recommended for bus body (if applicable)	2 pcs
80.	Devices and other equipment recommended for electronically managed systems (by software) (if applicable)	2 pcs

Note:

The above list will be supplemented by each tenderer with the necessary specific tools that are not included. In case that, throughout the contractual period, the Purchaser find that it need others specific test equipment and tools which were not included in the tender, then the Supplier is oblige to provide those equipment and tools at its own costs.

The tenderer will provide all the necessary test equipment and tools for the delivered buses, which is included in the technical documentation for maintenance and repairs.

The Supplier will sign a written commitment regarding the delivery at its own costs of any other specific test equipment and tool that will be requested by RAR – Registrul Auto Roman for Purchaser service unit authorisation.

LIST OF SOFTWARE APPLICATION THAT MUST BE PROVIDED WITH USER RIGHTS FOR THE PURCHASER INCLUDING THE POSSIBILITY OF PARAMETERS ADJUSTMENT

The below mentioned software, including related software up-grades, is mandatory (eliminating condition)

1. Buses diagnosis and testing software;
2. Diesel engine diagnosis and testing software;
3. Gearbox diagnosis and testing software;
4. Software for testing and use of odometer and writing device on non-volatile "black-box" memory;
5. Passenger information system programming software (audio – video) interior - exterior;
6. Testing software for the electronically controlled pneumatic suspension system;
7. Testing software for the electronically controlled brake system;
8. Testing software for the microprocessor controlled door system;
9. Software for testing and programming of centralized lubrication system (if applicable);
10. Software for testing and programming of data communication wiring and wireless systems;
11. Software for testing and programming of fuel consumption measurement equipment;
12. Software for testing and programming of On Board Computer - Traffic Management
13. Software for testing and programming of additional heating system;
14. Software for testing and programming of air conditioning system;
15. Software for testing and programming of passenger counting system;
16. Software for testing and programming of video surveillance system
17. Server software

NOTE: Each tenderer will further include in the above list any other necessary software, according with the specifications mentioned in maintenance, repair and diagnosis manuals in order to guarantee a good performance of the technological processes.

ANNEX 1.2 (to the technical requirements) - INITIAL SUPPLYING OF SPARE PARTS AND MATERIALS

a. INITIAL SUPPLYING OF PARTS AND MATERIALS FOR 10 M BUSES

The items mentioned in the below lists are a minimum reserve stock of parts and materials needed for minimising the out of use time of buses in case of accidental damages (road accidents, vandalism etc.)

No.	Part name	No. of pieces/sets
Initial supply of parts – safety stock for road accidents		
Body parts		
1.	Front corner body panel (left + right)	2 sets
2.	Rear corner body panel (left + right)	2 sets
3.	Bumper (front + rear);	2 sets
4.	Side covers	2 sets
5.	Front grille and parts	2 pcs
6.	Rear body cover	2 pcs
7.	Lateral protection ornament (left - right, if applicable)	2 sets
8.	Windshield	2 pcs
9.	Front right corner window (if applicable)	2 pcs
10.	Front right corner window (if applicable)	2 pcs
11.	Front destination sign window	2 pcs
12.	Ornamental windows (if applicable) (set)	2 sets
13.	Rear window	2 pcs
14.	Side windows (set)	2 sets
15.	Door windows (set)	2 sets
Rubber gaskets and ornaments (sets)		
16.	Windows gasket (if any) for exterior, doors, covers, etc.	4 sets
17.	Door closing gasket with inner air chamber	4 sets
18.	Exterior rear-view mirrors (kit) – left side	4 sets
19.	Exterior rear-view mirrors (kit) – right side	10 sets
20.	External mirror windows left - right	5 sets
21.	Windshield wipers (arm – blades kit) left - right	5 sets
22.	Joint (linkage) for windshield wipers drive	5 sets
23.	Windshield wiper blades	5 sets
24.	Headlights, left - right	5 sets
25.	Headlight projector - Fog light (if applicable)	5 sets
26.	Front indicator repeater lamp, left - right	5 sets
27.	Main rear indicator repeater lamp, left - right	5 sets
28.	Secondary rear indicator repeater lamp, left - right	5 sets
29.	Side indicator repeater lamp	5 sets
30.	Rear position lamp	5 sets
31.	Main stop lamps (rear)	5 sets
32.	Secondary stop lamps (rear)	5 sets
33.	End-outline marker lamps (set) front - rear	10 sets
34.	Intermediate side and rear marker lamps (set)	10 sets
35.	Interior and exterior stickers (Set)	10 sets
36.	Original paint - kit (11 paint, plus auxiliary materials - paint thinner. basecoat, primer)	10 kits

37.	Fiberglass repair - kit (active substance/resin, catalyst, fiberglass cloth for 0.5 sq.m.)	10 kits
38.	Adhesives and accessories for window mounting	10 kits
Initial supply of spare parts – mechanical and related parts		
39.	Fuel pump set	2 sets
40.	Self-priming pump	2 pcs
41.	Injectors	6 sets
42.	Complete stretch roll	2 sets
Flexible connexion - hoses:		
43.	Fuel system (set)	2 sets
44.	Air conditioning system (set)	2 sets
45.	Pneumatic braking system (set)	2 sets
46.	Pneumatic suspension system (set)	2 sets
47.	Power steering system (set)	2 sets
48.	Engine cooling thermostat	2 pcs
49.	Engine cooling fan clutch	2 sets
50.	Complete exhaust system (set)	2 sets
51.	Fuel tank	2 pcs
Bearings		
52.	Ball joint (pressure bearing)	2 sets
53.	Front axle wheels	2 sets
54.	Rear axle wheels	2 sets
55.	Main transmission	2 sets
56.	Planetary gear reducer (if applicable)	2 sets
57.	Upper semi-axis	2 sets
58.	Lower semi-axis	2 sets
Oil seals (sets):		
59.	Engine (set)	2 sets
60.	Front axle (set)	2 sets
61.	Rear axle (set)	2 sets
62.	Main transmission	2 sets
63.	Power steering	2 sets
64.	Gearbox	2 sets
Sealing gaskets (sets):		
65.	Engine gasket set	2 sets
66.	Gearbox gasket set	2 sets
67.	Cylinder head gasket set	2 sets
68.	Brake caliper gasket - set (front + rear)	2 sets
69.	Suspension bellows (sets): - front axle	2 sets
70.	Suspension bellows (sets): - rear axle	2 sets
71.	Suspension shock absorber: - front axle	2 sets
72.	Suspension shock absorber: - rear axle	2 sets
73.	Wheel bolts with nuts : - front axle (set)	10 sets
74.	Wheel bolts with nuts : - rear axle (set)	20 sets
75.	Front stub axle nut	10 pcs
76.	Rear stub axle nut	10 pcs
77.	Ball joint and replacement kit - set (bushings, needle bearings,)	2 sets
78.	Tie rod assembly (set)	2 sets

79.	Tie rod ends (set)	4 sets
80.	Driveshaft	2 pcs
81.	Yoke coupling	2 pcs
82.	CV axle shaft - right	2 pcs
83.	CV axle shaft - left	2 pcs
84.	Pneumatic suspension control valves (set)	2 pcs
85.	Valves block for pneumatic suspension	2 sets
86.	EBS valves (ABS/ASR)	2 sets
87.	Rapid discharge valve – front axle (set)	2 pcs
88.	Rapid discharge valve – rear axle (set)	2 pcs
89.	One-way valves from pneumatic system (set)	2 pcs
90.	Pneumatic door cylinder	4 sets
91.	Door solenoid valves	5 pcs
92.	Air pressure regulator	4 pcs
Initial supply of spare parts – electrical and related		
Transducers and sensors (sets): crankshaft position sensor, water temperature sensor, oil pressure sensor, oil temperature, gearbox, air pressure, air pressure in braking system, wheel EBS sensors, level sensors, door sensors, air conditioning system sensors etc.		
93.	Engine transducers (set)	2 sets
94.	Engine sensors (set)	2 sets
95.	Gearbox transducers (set)	2 sets
96.	Gearbox sensors (set)	2 sets
97.	Level sensors (set)	2 sets
98.	Air pressure sensors (set)	2 sets
99.	Brake circuit pressure sensors	2 sets
100.	EBS transducers (set)	3 sets
102.	EBS sensors (set)	3 sets
103.	Door sensors (set)	4 sets
104.	Air conditioning system sensors (set)	2 sets
105.	Voltage regulator relay	4 pcs
106.	Repeater relay	4 pcs
107.	Protection relay (set)	4 pcs
108.	Automated fuses	4 pcs
109.	On-board switch (set): - signal switch, headlight switch, windshield wiper switch, etc.	2 sets
110.	Doors switch block	4 sets
111.	Gearbox keyboard	4 pcs
112.	Transmission solenoids (sets)	2 sets
113.	Gearbox cables	2 sets
114.	On-board indicator devices (set)	2 sets
115.	On-board command buttons - set	2 sets
116.	Passenger area light elements - set	5 sets
117.	Power inverter (for fluorescent tubes) – if applicable	5 pcs
118.	Connectors set (pin connectors, delivered separately)	2 sets
119.	CAN connectors set	2 sets

Note:

Side window include both fixed windows and sliding windows;

(set) = all related elements for one bus;

b. INITIAL SUPPLYING OF PARTS AND MATERIALS FOR 12 M BUSES

The items mentioned in the below lists are a minimum reserve stock of parts and materials needed for minimising the out of use time of buses in case of accidental damages (road accidents, vandalism etc.)

No.	Part name	No. of pieces/sets
Initial supply of parts – safety stock for road accidents		
Body parts		
1.	Front corner body panel (left + right)	2 sets
2.	Rear corner body panel (left + right)	2 sets
3.	Bumper (front + rear);	2 sets
4.	Side covers	2 sets
5.	Front grille and parts	2 pcs
6.	Rear body cover	2 pcs
7.	Lateral protection ornament (left - right, if applicable)	2 sets
8.	Windshield	2 pcs
9.	Front right corner window (if applicable)	2 pcs
10.	Front right corner window (if applicable)	2 pcs
11.	Front destination sign window	2 pcs
12.	Ornamental windows (if applicable) (set)	2 sets
13.	Rear window	2 pcs
14.	Side windows (set)	2 sets
15.	Door windows (set)	2 sets
Rubber gaskets and ornaments (sets)		
16.	Windows gasket (if any) for exterior, doors, covers, etc.	4 sets
17.	Door closing gasket with inner air chamber	4 sets
18.	Exterior rear-view mirrors (kit) – left side	4 sets
19.	Exterior rear-view mirrors (kit) – right side	10 sets
20.	External mirror windows left - right	5 sets
21.	Windshield wipers (arm – blades kit) left - right	5 sets
22.	Joint (linkage) for windshield wipers drive	5 sets
23.	Windshield wiper blades	5 sets
24.	Headlights, left - right	5 sets
25.	Headlight projector - Fog light (if applicable)	5 sets
26.	Front indicator repeater lamp, left - right	5 sets
27.	Main rear indicator repeater lamp, left - right	5 sets
28.	Secondary rear indicator repeater lamp, left - right	5 sets
29.	Side indicator repeater lamp	5 sets
30.	Rear position lamp	5 sets
31.	Main stop lamps (rear)	5 sets
32.	Secondary stop lamps (rear)	5 sets
33.	End-outline marker lamps (set) front - rear	10 sets
34.	Intermediate side and rear marker lamps (set)	10 sets
35.	Interior and exterior stickers (Set)	10 sets
36.	Original paint - kit (1l paint, plus auxiliary materials - paint thinner, basecoat, primer)	10 kits

37.	Fiberglass repair - kit (active substance/resin, catalyst, fiberglass cloth for 0.5 sq.m.)	10 kits
38.	Adhesives and accessories for window mounting	10 kits
Initial supply of spare parts – mechanical and related parts		
39.	Fuel pump set	2 sets
40.	Self-priming pump	2 pcs
41.	Injectors	6 sets
42.	Complete stretch roll	2 sets
Flexible connexion - hoses:		
43.	Fuel system (set)	2 sets
44.	Air conditioning system (set)	2 sets
45.	Pneumatic braking system (set)	2 sets .
46.	Pneumatic suspension system (set)	2 sets
47.	Power steering system (set)	2 sets
48.	Engine cooling thermostat	2 pcs
49.	Engine cooling fan clutch	2 sets
50.	Complete exhaust system (set)	2 sets
51.	Fuel tank	2 pcs
Bearings		
52.	Ball joint (pressure bearing)	2 sets
53.	Front axle wheels	2 sets
54.	Rear axle wheels	2 sets
55.	Main transmission	2 sets
56.	Planetary gear reducer (if applicable)	2 sets
57.	Upper semi-axis	2 sets
58.	Lower semi-axis	2 sets
Oil seals (sets):		
59.	Engine (set)	2 sets
60.	Front axle (set)	2 sets
61.	Rear axle (set)	2 sets
62.	Main transmission	2 sets
63.	Power steering	2 sets
64.	Gearbox	2 sets
Sealing gaskets (sets):		
65.	Engine gasket set	2 sets
66.	Gearbox gasket ser	2 sets
67.	Cylinder head gasket set	2 sets
68.	Brake caliper gasket - set (front + rear)	2 sets
69.	Suspension bellows (sets): - front axle	2 sets
70.	Suspension bellows (sets): - rear axle	2 sets
71.	Suspension shock absorber: - front axle	2 sets
72.	Suspension shock absorber: - rear axle	2 sets
73.	Wheel bolts with nuts : - front axle (set)	10 sets
74.	Wheel bolts with nuts : - rear axle (set)	20 sets
75.	Front stub axle nut	10 pcs
76.	Rear stub axle nut	10 pcs
77.	Ball joint and replacement kit - set (bushings, needle bearings,)	2 sets

78.	Tie rod assembly (set)	2 sets
79.	Tie rod ends (set)	4 sets
80.	Driveshaft	2 pcs
81.	Yoke coupling	2 pcs
82.	CV axle shaft - right	2 pcs
83.	CV axle shaft - left	2 pcs
84.	Pneumatic suspension control valves (set)	2 pcs
85.	Valves block for pneumatic suspension	2 sets
86.	EBS valves (ABS/ASR)	2 sets
87.	Rapid discharge valve – front axle (set)	2 pcs
88.	Rapid discharge valve – rear axle (set)	2 pcs
89.	One-way valves from pneumatic system (set)	2 pcs
90.	Pneumatic door cylinder	4 sets
91.	Door solenoid valves	5 pcs
92.	Air pressure regulator	4 pcs
Initial supply of spare parts – electrical and related		
Transducers and sensors (sets): crankshaft position sensor, water temperature sensor, oil pressure sensor, oil temperature, gearbox, air pressure, air pressure in braking system, wheel EBS sensors, level sensors, door sensors, air conditioning system sensors etc.		
93.	Engine transducers (set)	2 sets
94.	Engine sensors (set)	2 sets
95.	Gearbox transducers (set)	2 sets
96.	Gearbox sensors (set)	2 sets
97.	Level sensors (set)	2 sets
98.	Air pressure sensors (set)	2 sets
99.	Brake circuit pressure sensors	2 sets
100.	EBS transducers (set)	3 sets
102.	EBS sensors (set)	3 sets
103.	Door sensors (set)	4 sets
104.	Air conditioning system sensors (set)	2 sets
105.	Voltage regulator relay	4 pcs
106.	Repeater relay	4 pcs
107.	Protection relay (set)	4 pcs
108.	Automated fuses	4 pcs
109.	On-board switch (set):- signal switch, headlight switch, windshield wiper switch, etc.	2 sets
110.	Doors switch block	4 sets
111.	Gearbox keyboard	4 pcs
112.	Transmission solenoids (sets)	2 sets
113.	Gearbox cables	2 sets
114.	On-board indicator devices (set)	2 sets
115.	On-board command buttons - set	2 sets
116.	Passenger area light elements - set	5 sets
117.	Power inverter (for fluorescent tubes) – if applicable	5 pcs
118.	Connectors set (pin connectors, delivered separately)	2 sets
119.	CAN connectors set	2 sets

Note:

Side window include both fixed windows and sliding windows;

(set) = all related elements for one bus;

c. INITIAL SUPPLYING OF PARTS AND MATERIALS FOR 18 M BUSES

The items mentioned in the below lists are a minimum reserve stock of parts and materials needed for minimising the out of use time of buses in case of accidental damages (road accidents, vandalism etc.)

No.	Part name	No. of pieces/sets
Initial supply of parts – safety stock for road accidents		
Body parts		
1.	Front corner body panel (left + right)	2 sets
2.	Rear corner body panel (left + right)	2 sets
3.	Bumper (front + rear);	2 sets
4.	Side covers	2 sets
5.	Front grille and parts	2 pcs
6.	Rear body cover	2 pcs
7.	Lateral protection ornament (left - right, if applicable)	2 sets
8.	Windshield	2 pcs
9.	Front right corner window (if applicable)	2 pcs
10.	Front right corner window (if applicable)	2 pcs
11.	Front destination sign window	2 pcs
12.	Ornamental windows (if applicable) (set)	2 sets
13.	Rear window	2 pcs
14.	Side windows (set)	2 sets
15.	Door windows (set)	2 sets
Rubber gaskets and ornaments (sets)		
16.	Windows gasket (if any) for exterior, doors, covers, etc.	4 sets
17.	Door closing gasket with inner air chamber	4 sets
18.	Exterior rear-view mirrors (kit) – left side	4 sets
19.	Exterior rear-view mirrors (kit) – right side	10 sets
20.	External mirror windows left - right	5 sets
21.	Windshield wipers (arm – blades kit) left - right	5 sets
22.	Joint (linkage) for windshield wipers drive	5 sets
23.	Windshield wiper blades	5 sets
24.	Headlights, left - right	5 sets
25.	Headlight projector - Fog light (if applicable)	5 sets
26.	Front indicator repeater lamp, left - right	5 sets
27.	Main rear indicator repeater lamp, left - right	5 sets
28.	Secondary rear indicator repeater lamp, left - right	5 sets
29.	Side indicator repeater lamp	5 sets
30.	Rear position lamp	5 sets
31.	Main stop lamps (rear)	5 sets
32.	Secondary stop lamps (rear)	5 sets
33.	End-outline marker lamps (set) front - rear	10 sets
34.	Intermediate side and rear marker lamps (set)	10 sets
35.	Interior and exterior stickers (Set)	10 sets
36.	Original paint - kit (1litre paint, plus auxiliary materials - paint thinner. basecoat, primer)	10 kits

37.	Fiberglass repair - kit (active substance/resin, catalyst, fiberglass cloth for 0.5 sq.m.)	10 kits
38.	Adhesives and accessories for window mounting	10 kits
Initial supply of spare parts – mechanical and related parts		
39.	Fuel pump set	2 sets
40.	Self-priming pump	2 pcs
41.	Injectors	6 sets
42.	Complete stretch roll	2 sets
Flexible connexion - hoses:		
43.	Fuel system (set)	2 sets
44.	Air conditioning system (set)	2 sets
45.	Pneumatic braking system (set)	2 sets .
46.	Pneumatic suspension system (set)	2 sets
47.	Power steering system (set)	2 sets
48.	Engine cooling thermostat	2 pcs
49.	Engine cooling fan clutch	2 sets
50.	Complete exhaust system (set)	2 sets
51.	Fuel tank	2 pcs
Bearings		
52.	Ball joint (pressure bearing)	2 sets
53.	Front axle wheels	2 sets
54.	Rear axle wheels	2 sets
55.	Main transmission	2 sets
56.	Planetary gear reducer (if applicable)	2 sets
57.	Upper semi-axis	2 sets
58.	Lower semi-axis	2 sets
Oil seals (sets):		
59.	Engine (set)	2 sets
60.	Front axle (set)	2 sets
61.	Rear axle (set)	2 sets
62.	Main transmission	2 sets
63.	Power steering	2 sets
64.	Gearbox	2 sets
Sealing gaskets (sets):		
65.	Engine gasket set	2 sets
66.	Gearbox gasket ser	2 sets
67.	Cylinder head gasket set	2 sets
68.	Brake caliper gasket - set (front + rear)	2 sets
69.	Suspension bellows (sets): - front axle	2 sets
70.	Suspension bellows (sets): - rear axle	2 sets
71.	Suspension shock absorber: - front axle	2 sets
72.	Suspension shock absorber: - rear axle	2 sets
73.	Wheel bolts with nuts : - front and midle axle (set)	2x10 sets
74.	Wheel bolts with nuts : - rear axle (set)	20 sets
75.	Front stub axle nut	10 pcs
76.	Rear stub axle nut	10 pcs
77.	Ball joint and replacement kit - set (bushings, needle bearings,)	2 sets

78.	Tie rod assembly (set)	2 sets
79.	Tie rod ends (set)	4 sets
80.	Driveshaft	2 pcs
81.	Yoke coupling	2 pcs
82.	CV axle shaft - right	2 pcs
83.	CV axle shaft - left	2 pcs
84.	Pneumatic suspension control valves (set)	2 pcs
85.	Valves block for pneumatic suspension	2 sets
86.	EBS valves (ABS/ASR)	2 sets
87.	Rapid discharge valve – front axle (set)	2 pcs
88.	Rapid discharge valve – rear axle (set)	2 pcs
89.	One-way valves from pneumatic system (set)	2 pcs
90.	Pneumatic door cylinder	4 sets
91.	Door solenoid valves	5 pcs
92.	Air pressure regulator	4 pcs
Initial supply of spare parts – electrical and related		
Transducers and sensors (sets): crankshaft position sensor, water temperature sensor, oil pressure sensor, oil temperature, gearbox, air pressure, air pressure in braking system, wheel EBS sensors, level sensors, door sensors, air conditioning system sensors etc.		
93.	Engine transducers (set)	2 sets
94.	Engine sensors (set)	2 sets
95.	Gearbox transducers (set)	2 sets
96.	Gearbox sensors (set)	2 sets
97.	Level sensors (set)	2 sets
98.	Air pressure sensors (set)	2 sets
99.	Brake circuit pressure sensors	2 sets
100.	EBS transducers (set)	3 sets
102.	EBS sensors (set)	3 sets
103.	Door sensors (set)	4 sets
104.	Air conditioning system sensors (set)	2 sets
105.	Voltage regulator relay	4 pcs
106.	Repeater relay	4 pcs
107.	Protection relay (set)	4 pcs
108.	Automated fuses	4 pcs
109.	On-board switch (set):- signal switch, headlight switch, windshield wiper switch, etc.	2 sets
110.	Doors switch block	4 sets
111.	Gearbox keyboard	4 pcs
112.	Transmission solenoids (sets)	2 sets
113.	Gearbox cables	2 sets
114.	On-board indicator devices (set)	2 sets
115.	On-board command buttons - set	2 sets
116.	Passenger area light elements - set	5 sets
117.	Power inverter (for fluorescent tubes) – if applicable	5 pcs
118.	Connectors set (pin connectors, delivered separately)	2 sets
119.	CAN connectors set	2 sets

Note:

Side window include both fixed windows and sliding windows;

(set) = all related elements for one bus;

ANNEX 1.3 (to the technical requirements) - INITIAL SUPPLYING OF MAIN COMPONENTS AND ELECTRONIC COMMAND UNITS

a) INITIAL SUPPLYING OF MAIN COMPONENTS AND ELECTRONIC COMMAND UNITS FOR 10M BUSES

No.	Name of component / electronic command unit (ECU)	Quantity
1.	Front axle knuckle – left	1 pcs
2.	Front axle knuckle – right	1 pcs
3.	Rear axle knuckle – left	1 pcs
4.	Rear axle knuckle – right	1 pcs
5.	Front wheel hub	1 pcs
6.	Rear wheel hub	1 pcs
7.	Main transmission assembly (differential)	1 pcs
8.	Front right brake calliper (assembly)	1 pcs
9.	Front left brake calliper (assembly)	1 pcs
10.	Rear right brake calliper (assembly)	1 pcs
11.	Rear left brake calliper (assembly)	1 pcs
12.	Front axle brake chamber (mono-chamber/pneumatic brake cylinder)	2 pcs
13.	Rear axle double brake cylinder	2 pcs
14.	Water pump	3 pcs
15.	Steering gear	2 pcs
16.	Steering inverter bearing	2 pcs
17.	Power steering pump	2 pcs
18.	Air compressor	2 pcs
19.	Air dryer	2 pcs
20.	Main breaking valve	2 pcs
21.	Parking brake valve	2 pcs
22.	Gas pedal (assembly)	3 pcs
23.	Electromotor	3 pcs
24.	Alternator	3 pcs
25.	Injector pump	2 sets
26.	Turbocharger	2 pcs
27.	Engine Cooling Fan clutch (pump and fan clutch assembly)	2 pcs
28.	Driver cabin heater (windshield demisting)	2 pcs
39.	Passenger area heaters (set)	2 sets
30.	Exhaust fan	2 pcs
31.	Air conditioning system compressor	2 pcs
32.	Air conditioning system condenser and evaporator	2 sets
33.	Preheater	2 pcs
34.	Vehicle on board computer with display (dashboard equipment)	2 pcs
35.	On board computer for ITS management	2 sets
36.	Fuel injection ECU (Engine control unit)	2 pcs
38.	Gearbox ECU	2 pcs
39.	Suspension system ECU	2 pcs
40.	EBS ECU	2 pcs
41.	Doors ECU	2 pcs
42.	Heating system ECU	2 pcs
43.	Air conditioning system ECU	2 pcs

Note: The tenderer will replace the above components that are not applicable for the delivered buses with similar components or the tenderer will provide a technical statement to justify the functional system.

b) INITIAL SUPPLYING OF MAIN COMPONENTS AND ELECTRONIC COMMAND UNITS FOR 12M BUSES

No.	Name of component / electronic command unit (ECU)	Quantity
1.	Front axle knuckle – left	1 pcs
2.	Front axle knuckle - right	1 pcs
3.	Rear axle knuckle – left	1 pcs
4.	Rear axle knuckle - right	1 pcs
5.	Front wheel hub	1 pcs
6.	Rear wheel hub	1 pcs
7.	Main transmission assembly (differential)	1 pcs
8.	Front right brake calliper (assembly)	1 pcs
9.	Front left brake calliper (assembly)	1 pcs
10.	Rear right brake calliper (assembly)	1 pcs
11.	Rear left brake calliper (assembly)	1 pcs
12.	Front axle brake chamber (mono-chamber/pneumatic brake cylinder)	2 pcs
13.	Rear axle double brake cylinder	2 pcs
14.	Water pump	3 pcs
15.	Steering gear	2 pcs
16.	Steering inverter bearing	2 pcs
17.	Power steering pump	2 pcs
18.	Air compressor	2 pcs
19.	Air dryer	2 pcs
20.	Main breaking valve	2 pcs
21.	Parking brake valve	2 pcs
22.	Gas pedal (assembly)	3 pcs
23.	Electromotor	3 pcs
24.	Alternator	3 pcs
25.	Injector pump	2 sets
26.	Turbocharger	2 pcs
27.	Engine Cooling Fan clutch (pump and fan clutch assembly)	2 pcs
28.	Driver cabin heater (windshield demisting)	2 pcs
39.	Passenger area heaters (set)	2 sets
30.	Exhaust fan ^	2 pcs
31.	Air conditioning system compressor	2 pcs
32.	Air conditioning system condenser and evaporator	2 sets
33.	Preheater	2 pcs
34.	Vehicle on board computer with display (dashboard equipment)	2 pcs
35.	On board computer for ITS management	2 sets
36.	Fuel injection ECU (Engine control unit)	2 pcs
38.	Gearbox ECU	2 pcs
39.	Suspension system ECU	2 pcs
40.	EBS ECU	2 pcs
41.	Doors ECU	2 pcs
42.	Heating system ECU	2 pcs
43.	Air conditioning system ECU	2 pcs

Note: The tenderer will replace the above components that are not applicable for the delivered buses with similar components or the tenderer will provide a technical statement to justify the functional system.

c) INITIAL SUPPLYING OF MAIN COMPONENTS AND ELECTRONIC COMMAND UNITS FOR 18M BUSES

No.	Name of component / electronic command unit (ECU)	Quantity
1.	Front axle knuckle - left	1 pcs
2.	Front axle knuckle - right	1 pcs
3.	Rear axle knuckle - left	1 pcs
4.	Rear axle knuckle - right	1 pcs
5.	Front wheel hub	1 pcs
6.	Rear wheel hub	1 pcs
7.	Main transmission assembly (differential)	1 pcs
8.	Front right brake calliper (assembly)	1 pcs
9.	Front left brake calliper (assembly)	1 pcs
10.	Rear right brake calliper (assembly)	1 pcs
11.	Rear left brake calliper (assembly)	1 pcs
12.	Front axle brake chamber (mono-chamber/pneumatic brake cylinder)	2 pcs
13.	Rear axle double brake cylinder	2 pcs
14.	Water pump	3 pcs
15.	Steering gear	2 pcs
16.	Steering inverter bearing	2 pcs
17.	Power steering pump	2 pcs
18.	Air compressor	2 pcs
19.	Air dryer	2 pcs
20.	Main breaking valve	2 pcs
21.	Parking brake valve	2 pcs
22.	Gas pedal (assembly)	3 pcs
23.	Electromotor	3 pcs
24.	Alternator	3 pcs
25.	Injector pump	2 sets
26.	Turbocharger	2 pcs
27.	Engine Cooling Fan clutch (pump and fan clutch assembly)	2 pcs
28.	Driver cabin heater (windshield demisting)	2 pcs
39.	Passenger area heaters (set)	2 sets
30.	Exhaust fan	2 pcs
31.	Air conditioning system compressor	2 pcs
32.	Air conditioning system condenser and evaporator	2 sets
33.	Preheater	2 pcs
34.	Vehicle on board computer with display (dashboard equipment)	2 pcs
35.	On board computer for ITS management	2 sets
36.	Fuel injection ECU (Engine control unit)	2 pcs
38.	Gearbox ECU	2 pcs
39.	Suspension system ECU	2 pcs
40.	EBS ECU	2 pcs
41.	Doors ECU	2 pcs
42.	Heating system ECU	2 pcs
43.	Air conditioning system ECU	2 pcs

Note: The tenderer will replace the above components that are not applicable for the delivered buses with similar components or the tenderer will provide a technical statement to justify the functional system.