TÜRASAŞ
SAKARYA REGIONAL DIRECTORATE

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National 225 km/h EMU Project Metal-Elastic Elements Technical Specification

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II. LIST OF ACRONYMS & ABBREVIATIONS

DeBo	Designated Body
EMU	Electrical Multiple Unit
EN	European Norm
FAI	First Article Inspection
IEC	International Electro technical Commission
ISO	International Organization of Standardization
LRU	Line Replaceable Unit
N/A	Not Applicable
NoBo	Notified Body
PRM	Person with Reduced Mobility
RAMS	Reliability, Availability, Maintainability and Safety
SI	International System
TBC	To be confirmed
TBD	To be defined
TOR	Top of Rail
UIC	Union International Chemin de Fer

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1 INTRODUCTION

1.1 SUBJECT

This document describes the technical requirements for the procurement of the metal-elastic elements to be installed on the bogies of Electrical Multiple Units (hereafter called EMU) produced by Turkish Railway Vehicles Industry Inc. (hereafter called TÜRASAŞ).

The bidder shall offer a solution totally compliant with the requirements of this specification.

After signing the contract, possible deviations from this specification or from other specifications and norms mentioned in this document, shall be validated by written agreements between TÜRASAŞ and the Supplier.

The Bidder shall submit their answers and statements to the present technical specification and the documents which are requested in the technical specification together with their offer.

This technical specification and its annexes are already prepared in Turkish and English language. The Turkish language shall be prevailing in case of any discrepancy among them.

IMPORTANT NOTE:

The present document shall be examined by the Bidder, together with following document:

TŞ-01.133- National 225 km/h EMU Project General Technical Specification

in order to know general applicable requirements established at train level.

1.2 DEFINITIONS

Within this technical system specification, the following definitions are applied to the words reported below:

- "the Administration" means the Turkish Railway Vehicles Industry Co. (hereafter called TÜRASAŞ)
- "the End Client" means final user of the train set
- "the Designer" means BLUE Engineering that is the company responsible for the design EMU set
- "the Supplier" means the company who wins the tender to supply the good which is object of this specification
- ''the Bidder" means the company who want to join to the tender to supply the good which is object of this specification

1.3 DOCUMENTS AND STANDARDS

The EMU shall be designed, assembled and tested according to the following international reference standards:

European standards: TSI, EN;

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International standards: UIC; ISO; IEC;
System of units shall be SI.

Table 1 reports the applicable standards for the scope of supply.

Standard	Year	Title
TSI LOC&PAS	2023	COMMISSION REGULATION concerning a technical specification for interoperability relating to the 'rolling stock locomotives and passenger rolling stock' subsystem of the rail system in the European Union.
EN 45545-2	2020	Railway applications - Fire protection on railway vehicles - Part 2: Requirements for fire behaviour of materials and components
EN 13913	2003	Rubber Suspension Components – Elastomer-based mechanical parts.
ISO 2230	2016	Rubber products. Guidelines for storage.
EN ISO 286-1	2010	ISO system of tolerance and coupling. Fundamental principles for tolerance, gaps and coupling.
EN ISO 2081	2018	Metallic and other inorganic coatings - Electroplated coatings of zinc with supplementary treatments on iron or steel.
EN 50126-1-2	2017	Railway applications - The Specification and Demonstration of Reliability, Availability, Maintainability and Safety (RAMS)

Table 1 – Applicable standards

The Bidder shall also declare if its system/equipment is compliant with other national/international or railroad administration standards not mentioned in the above list.

1.4 EMU TRAIN-SET CONFIGURATION

The Electrical Multiple Unit (EMU) is built in one configuration of 8 cars:

SKA1+OA1+OA1+OA4+OA1+OA2+OA3+SKA2

SKA1 = Leading car with driver cab and standard toilet
SKA2 = Leading car (enlarged passengers seats) with the driver cab and standard toilet
OA1 = Intermediate car with a "alaturka" toilet
OA2 = Intermediate car with a standard toilet and a "bistro" point
OA3 = Intermediate car with universal toilet, a food vending machine point, a Person with Reduced Mobility (PRM) area and two PRM lift devices nearby
OA4 = Intermediate car with a standard toilet

The EMU train-set is a fixed configuration train and therefore the position and orientation of the different type of cars is fixed as well.

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1.5 EMU TRAIN-SET MULTIPLE CONFIGURATION

Refer to TŞ-01.133 - National EMU Project 225 km/h General Technical Specification.

1.6 EMU TRAIN-SET WEIGHT

Refer to TŞ-01.133 - National EMU Project 225 km/h General Technical Specification.

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2 SCOPE OF SUPPLY

2.1 HARDWARE

The Supplier shall provide all relevant components related to manufacturing and assembly of the metal-elastic elements.

The quantity of the metal-elastic elements for one trainset are reported in the following table;

Part	Draft Drawing No	Per car						Per 8 Car Train Set
		SKA1	OA1	OA2	OA3	OA4	SKA2	
Elastic Element for Axlebox	FT90.24.00.00007	8	8	8	8	8	8	**64**
Trailing Rod	EM20.24.10.30000	4	4	4	4	4	4	**32**
Rocker Arm Elastic Element	EM20.24.10.20002	2	2	2	2	2	2	**16**
Shock Absorber	EM20.24.13.30000	4	4	4	4	4	4	**32**

Table 2 – Metal-elastic elements quantity

2.2 SOFTWARE

N/A

2.3 SPECIAL TOOLS AND EQUIPMENT

The Bidder shall supply special tools and equipment list according to TD-FT00.B00.101.0015 as mentioned in annexes.

2.4 CONFORMITY TO THE PROJECT REQUIREMENTS

The EMU train set shall be certified according to TSI PAS/LOC, TSI NOI, TSI PRM, TSI SRT and TSI CCS by Notified Body (NoBo) / Designated Body (DeBo). The Supplier shall provide whole calculations, drawings, analysis, test reports and other kind of documentation which is requested by TSIs for the present scope of supply.

2.5 EC CERTIFICATION OF CONFORMITY AS INTEROPERABILITY CONSTITUENT

N/A

2.6 PROJECT MANAGEMENT

2.6.1 Introduction to Project Management

The design responsibility of the EMU train-set belongs to BLUE Engineering Co. Therefore the Supplier shall share all the technical information with TÜRASAŞ and BLUE Engineering Co.

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The Supplier and its sub-suppliers shall be responsible for the components and systems delivered. TÜRASAŞ has the right to request different solutions and/or modifications of a system or components in case they are necessary for reasons related to installation, operation, interfacing or other equivalent reasons. Such written requests shall be realized by the Supplier.

During the meetings, the minutes shall be drawn up and countersigned by the representatives of the parts participating the meeting.

Present document is a part of the contract between the Supplier and TÜRASAŞ. The Supplier is not entitled to distribute this document or any part of it to a third party.

All generic information requests and answers shall be communicated in written form or through e-mail, if an official form is required, and in the case the exchanged communication preludes to any kind of action.

2.6.2 Project Management and Planning

The Supplier shall submit a project plan within two weeks of contract award.

This project plan reports the schedule for all main activities and key events, including submission of all information identified in this specification and delivery of all parts and documentation. The plan shall be subject to approval of TÜRASAŞ, every time it is issued.

The Supplier shall attend regularly to the project progress meetings according to the established schedule proposed by TÜRASAŞ.

2.6.3 Modifications

All engineering changes made prior to FAI (First Article Inspection) shall be controlled by the Supplier's quality management system. Any engineering change made after FAI shall be supported by all relevant documentation and subject to written approval of TÜRASAŞ. Engineering changes shall be subject to all requirements of this specification and any supporting specifications.

The Supplier shall take maximum care to refrain from any modifications/changes that will affect interface with other parts. In case it is necessary to carry out such a modification, TÜRASAŞ will be notified immediately.

The Supplier shall agree with TÜRASAŞ a modification implementation plan detailing timescales and locations where the work shall be carried out. This shall include modifications to any relevant spare parts.

The Supplier shall, on the day of completing any modification, provide TÜRASAŞ with the date of modification, serial number of component modified, new modification level of component and location of component. In addition, the status of the modification level on the component shall be updated.

Modifications made to improve the product or production without any effect on performance or spare part exchange can be decided by the Supplier. Traceability of modifications shall be given by the Supplier to TÜRASAŞ.

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In case of modifications due to Supplier design inaccuracy or whatever cause under its responsibility, the subsequent recovering modifications and actions shall be done by the Supplier free of charge.

2.6.4 Authorization to Start Manufacturing

TÜRASAŞ will release to the Supplier the authorization to start the manufacturing according to the following steps.

2.6.4.1 Design freezing

After signing the contract, a dedicated meeting shall be held for freezing the design of the scope of supply between the Supplier, the Administration and the Designer and/or End Client. The date and place of the meeting shall be agreed mutually. The design freeze also means that the Supplier can start manufacturing the products to be used for type tests (according to item 4.4.1.1).

In case the dedicated meeting cannot be held because of unseen reasons like epidemic etc., the dedicated documentation shall be signed and shared by parties.

2.6.4.2 Authorization to start serial production

After successful completion of the tests defined in clause 4.4.1.1 and 4.4.1.3, TÜRASAŞ will release to the Supplier the authorization to start the serial production.

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3 TECHNICAL REQUIREMENTS

3.1 INTRODUCTION

Elastic element for axlebox:

The elastic element for axlebox is a rubber/metal elastic joint. It forms the primary suspension with the spring group and it is assembled on axlebox link arm. The elastic element for axlebox is shown in the drawing FT90.24.00.00007. Its installation is shown in the drawing EM20.24.04.41000.

Trailing rod:

The trailing rod consists of a rod with two rubber/metal elastic elements that join the rocker arm to the bogie frame. The trailing rod elastic is shown in the drawing EM20.24.10.30000. Its installation is shown in the drawing EM20.24.10.10000.

Rocker arm elastic element:

The rocker arm elastic element is a rubber/metal elastic joint, as shown in the drawing EM20.24.10.20002. Its installation is shown in the drawing EM20.24.10.20000.

Shock absorber:

The shock absorber, like shown in the drawing cod EM20.24.13.30000, forms the secondary suspension with air springs and dampers. The max working stroke is 40 mm. The shock absorber with metallic element having surface creeping cemented and designed according to EN 13913. Its installation is shown in the drawing EM20.24.13.10000

3.1.1 Stiffness

See drawings FT90.24.00.00007, EM20.24.10.30000, EM20.24.10.20002 and EM20.24.13.30000.

3.1.2 Service and Exceptional Load

See drawings FT90.24.00.00007, EM20.24.10.30000, EM20.24.10.20002 and EM20.24.13.30000.

3.1.3 Primary Suspension Displacement

In the following the primary suspension displacements are reported:

Vertical displacements:

- + 30 mm
- - 27 mm

Transversal displacements:

- + 10 mm
- - 10 mm

Longitudinal displacements:

- + 5 mm
- - 5 mm

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3.1.4 Secondary Suspension Displacement

In the following the primary suspension displacements are reported:

Vertical displacements:

- + 30 mm
- - 55 mm

Lateral displacements:

- + 50 mm
- - 50 mm

Longitudinal displacements:

- + 10 mm
- - 10 mm

3.1.5 Assembly

The elastic joint couplings shall be carried out cold.

For rocker arm elastic elements, elastic element for axlebox and traction motor elastic joint, the housing diameter tolerance (according to EN ISO 286-1:2010) and finished surface shall be defined by the Administration. For trailing rod, they shall be defined by the Supplier.

3.2 WEIGHT

The Supplier shall be committed to the process of weight management required in order to meet target weights as the train design develops.

The target weights for metal-elastic elements mass shall be:

- elastic element for axlebox $\leq$ 20 kg
- trailing rod $\leq$ 22 kg
- rocker arm elastic element $\leq$ 4 kg
- shock absorber $\leq$ 6,5 kg

3.3 MANUFACTURING

N/A

3.4 PAINTING

The Bidder can propose its own painting specification to TÜRASAŞ. This specification is subject to approval of TÜRASAŞ.

Concerning resistance to corrosion, design and processes shall take in account the effect of potential galvanic corrosion.

The colour code will be RAL 9005.

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3.5 INTERFACE SPECIFICATION

3.5.1 Mechanical Interface

See drawings FT90.24.00.00007, EM20.24.10.30000, EM20.24.10.20002 and EM20.24.13.30000.

3.5.2 Pneumatic Interface

N/A

3.5.3 Electrical Interface

N/A

3.5.4 Digital and/or Analogue Inputs/Outputs

N/A

3.5.5 Earthing

N/A

3.6 ENVIRONMENTAL CONDITIONS

3.6.1 Climatic Condition

The system which is object of the present specification shall work properly in the specified climatic conditions (temperature, rain, snow, ice, dust, wind and so on) in particular ice and snow shall not cause of malfunction.

General climatic conditions are reported in the mentioned TŞ-01.133 General Technical Specification.

3.6.2 Noise, Vibration and Shock

N/A

3.6.3 Protection (IP)

N/A

3.6.4 Electromagnetic Compatibility (EMC)

N/A

3.7 SYSTEM AND COMPONENTS LIFE

The component will be designed and manufactured so as to ensure that the stiffness and damping remain within the limits of maximum decline of 25% of the nominal value throughout its lifetime.

Life time for rubber parts: 3.000.000 Km of service or 7 years; for metal parts: 30 years.

3.8 MATERIAL REQUIREMENT

N/A

3.8.1 General Requirements

Materials shall be suitable to allow the normal maintenance activities without need to adopt special protections including welding, cuts and so on. They shall be suitable for the waste disposal without need of particular care.

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All information about safety and health shall be provided, especially for consumables like lubricants and cleaning agents.

The choice of materials shall be done to prevent corrosion in every usage condition.

3.8.2 Fire Resistance Behavior

The train set has been classified into Category A for rolling stock fire safety, according to TSI LOC&PAS for interoperability operation.

The supplied system/equipment/components including all their elements therefore shall be compliant to the applicable sections of EN 45545 family norms (-1, -2, -3, -4, -5, -6).

In particular according to EN 45545-1 and -2 the train-set is ranked as 2N (or N2) where:

- 2; indicates the operation category
- N; indicates the design category

The fire performance requirements established for materials are given by means of R(n) index reported by the EN 45545-2 "table 5".

These performances requirements of materials and components depend not only on their intrinsic nature but also on the location, the shape, the layout, the surface exposure, the relative mass and the thickness of considered material. In "table 2" of the EN 45545-2 are listed different products and their location on the train-set to identify the relevant R(x) requirements.

The Supplier shall follow the instruction of paragraph 4.2 "General" and paragraph 4.3 "Grouping rules" with the flowchart of Figure 1 "Assessment Process – grouping rules" of EN 45545-2 not only to identify all the material eventually not mentioned hereafter or not mentioned at all in the "table 2", but also to verify if the requirements are applicable or not (i.e. in case of small quantity, small mass, small exposed areas and so on).

To complete the punctual requirements identification in EN 45545-2 "table 5", the Hazard Level "HL2" shall be used. This hazard level has been determined on the basis train-set classification 2N and it identifies the relevant tests pass-no-pass condition.

Concerning the materials used for the scope of supply of present technical specification following requirements have been identified.

Applicable Product Type (No)	Definition	Details	Requirement
M1	Flexible metal/rubber unit	Flexible metal/rubber unit including elements in bogies	R9

Table 3 – Material fire requirements

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The Supplier shall adopt materials with required characteristic and also identify other materials not mentioned above. The above R(x) list is not definitive; the Supplier shall complete it according the materials used in the scope of supply.

The Supplier shall give the list of the inflammable materials used with material type, quantity and fire resistance behavior tests.

The documentation presented by the Supplier relevant fire performance will be examined for approval by the Notified Body/Designated Body in charge of TSI certification of the National 225 km/h EMU Project nominated by the TÜRASAŞ. The Supplier shall be responsible to perform all necessary activities which are required by Notified Body/Designated Body.

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4 GENERAL REQUIREMENT

4.1 RELIABILITY, AVAILABILITY, MAINTENABILITY & SAFETY (RAMS)

The Supplier shall make RAMS analysis according to TD-FT00.B00.101.0015 as mentioned in Annex-1.

4.2 MAINTENANCE MANUAL

4.2.1 Main Feature of the Manual

The Supplier shall prepare integrated manual for the operation and maintenance of its scope of supply equipment.

The manuals shall contain:

- supplied system/equipment description;
- preventive maintenance tasks description;
- corrective maintenance tasks description (repair instructions included).
- information in order to carry out the overhaul of the system/equipment and the heavy repair (if it is repairable and off train).

The manual will be used as the basis for train operation and maintenance by the End Client staff. The manual shall be prepared in electronic editable format and the language UK English and Turkish.

If the Supplier submit the manuals in their own format, the documents shall be in editable format.

4.2.2 Content of the Manual

The manual shall contain as minimum the following information/instructions:

Description and operation

- General description and operation of system/equipment
- Functional description and operation of all LRU's and components
- Mechanical and electrical data sheets for all LRU's and components.

Maintenance activities

- Preventive maintenance plan including the maintenance periodicity (frequency) table for system/equipment.
- Reported information shall be the same of those described by the preventive maintenance analysis and be linked with detailed maintenance instructions.
- Preventive maintenance plan shall report reference to specific/special tools needed for the maintenance works (if used).

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- Maintenance instructions shall report step by step detailed description of each task of the maintenance plan in order to include all information necessary for carrying out the relevant work.
- The preventive maintenance plan shall include all activities foreseen for the system/equipment from daily inspection up to major repair/overhaul.

Preventive maintenance card/instruction

Each maintenance instruction shall include:

- task periodicity
- safety warnings
- cleaning materials
- recommended lubricants
- torque values
- special tools (if any): as special tool is intended either a tool (hardware and/or software) that is exclusively produced by the Supplier and is essential for system/equipment maintenance, either a tool available on market but expensive, sophisticated, with long lead time and so on
- step by step activity description with necessary schemes, drawings and illustrations, including:
  - scheduled activities (greasing, topping up, visual check, etc)
  - removal and refitting
  - off-train overhaul
  - final functional check

The Supplier is responsible to update the maintenance instructions until the end of the general warranty period of the last supplied equipment.

Corrective maintenance card/instruction

Each maintenance instruction shall include:

- trouble shooting
- safety warnings
- torque values
- special tools (if any).

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- step by step activity description with necessary schemes, drawings and illustrations, including:
  - removal and refitting
  - off-train repair
  - failure diagnosis
  - final functional check

The Supplier is responsible to update the maintenance instructions until the end of the general warranty period of the last supplied equipment.

Special tools

The use of special tools shall be avoided, nevertheless if they are essential for maintenance (upon Supplier and TÜRASAŞ agreement), following information shall be supplied in a dedicated section of the maintenance manual:

- descriptions and technical data (including SW if present)
- drawings
- use instructions
- list of tasks where the tools usage is mandatory (maintenance cards shall refer to the relevant special tools when is needed).
- all the information for purchasing it correctly (technical data, builder, price, and so on) if the special tool is available on the market.

4.2.3 Format of the Manual

The format of the maintenance manual can vary according to the Administration and the End Client requirements, therefore here following are reported some rules generally applicable.

Specific requests shall be communicated when available.

- The manual shall report/contain the same references, drawings, schemes, component codes, part numbers, definitions, descriptions, terminology and so on used in the system/equipment configuration and design documentation to guarantee a perfect correspondence and to avoid mismatching during tasks performance.
- It is highlight the importance for a correct identification of LRUs/components by utilizing the same identification name reported by the technical drawings.
- The manual shall be transmitted by electronic means (CD copy) and in the final version a paper copy is also requested for each release.

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- The documentation in electronic format shall be in a completely editable form (Office Word version TBD)
- The PDF format can be used as formal delivery of the documentation (in order to be used as official delivery towards the End Client)
- Pictures and photos shall be inserted and not simply linked.
- Photos should be only JPEG format.
- Pictures should be only TIFF format.

Derogations from above listed issues can be discussed and agreed between TÜRASAŞ and the Suppliers pending the respect of the End Client requirements.

4.3 TRAINING

N/A

4.4 TEST

4.4.1 Introduction to Test and Inspection

The Supplier shall perform the tests and the inspection in accordance with the approved test procedure and the approved inspection specification.

TÜRASAŞ and/or the End Client have the right to witness any of these tests and inspections at any stage of test and inspection procedure.

All test and inspection specifications and reports including all repair activities and checklists shall be submitted and approved by TÜRASAŞ.

If the supplied component is a proven system, in the tender phase, the Supplier for the system shall give a certificate of conformity indicating in which it has proven itself before and in which projects it has been used. If requested by TÜRASAŞ, the Supplier will show the existing test reports and certificates to TÜRASAŞ and the Notified Body (NoBo)/the Designated Body (DeBo).

4.4.1.1 Type tests

Type tests are required to verify that the components of the system object of the scope of supply, operate in accordance with the approved design data.

TÜRASAŞ's attendance to type tests does not end the responsibility of supplier from any inconsistencies.

The Supplier shall perform type tests, in accordance with a test procedure approved by TÜRASAŞ. TÜRASAŞ and/or the End Client have right to attend or not attend the tests.

The Supplier has the responsibility for the success of mentioned type tests.

During testing, the criteria shall be observed and recorded in a logbook and necessary alterations, adjustments and maintenance works shall be carried out.

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4.4.1.2 Routine tests

Routine tests are required to verify that the components of the system object of the scope of supply have been built in such a way that it satisfies the requirements of the approved design data as verified by the type test.

During tests, the criteria shall be observed and recorded in a logbook and necessary alterations, adjustments and maintenance works shall be carried out.

Records from routine tests shall be kept by the Supplier and made available timely for TÜRASAŞ inspection.

Additional copies of records of all tests/inspections results shall also be kept at the Supplier's work to be made available to TÜRASAŞ or their representative on demand.

This test shall include functional test, visual inspection and dimensional inspection, as a minimum. The test details shall be approved.

4.4.1.3 First article inspection

The Supplier shall perform a First Article Inspection (FAI) of the components at the Supplier's factory with TÜRASAŞ and/or End Client participation in accordance with an inspection specification issued by Supplier and approved by TÜRASAŞ, prior to serial production in order to confirm that the component fully complies with the design criteria and manufacturing process. The supplier shall submit FAI test procedure and invitation to TURASAŞ at least 6 weeks before FAI. If any changes are requested by TURASAŞ, supplier shall comply with these requests.

At the FAI, the Supplier shall make available all pertinent design and manufacturing process documentation, test records, material certifications, etc. If all the requirements of the FAI not be met, then the inspection shall be considered at a hardware review.

The component shall meet or exceed the quality standards set at the FAI and shall incorporate any comments made by TÜRASAŞ and /or the End Client at the FAI.

4.4.1.4 Characteristic of test

The respect of any single requirement reported in this technical specification (i.e. dimension, mechanical resistance, etc.) shall be demonstrated and supported with documentation by the Supplier through tests (i.e. type tests on the component, type tests on vehicle) and computational reports.

The Supplier is obliged to provide copy of the whole documentation regarding tests (reports and specifications) upon request.

The Bidder shall include in the offer the tests list. The absence of the tests list means that a test shall be run for each single requirement.

The Administration approval of the test specification does not imply that the Supplier is released from the responsibility regarding the correct behavior and the compliance of the supplied product.

It is agreed that costs related to both type and routine tests shall be at the Supplier's charge.

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The Supplier shall perform at least the tests (X) reported in the following table, according to EN 13913.

CHARACTERISTIC	SUB-CLAUSE	TYPE TEST	ROUTINE TEST
General test condition			
Functional test at normal and low temperature	7.1.1.2	X	-
Resistance to environmental conditions			
Oil and petroleum products	7.2.5	X	-
Chemical product	7.2.6	X	-
Corrosion	7.2.9	X	-
Resistance to operating conditions			
Fatigue resistance (axial and radial) **	7.3.1	X	-
Performance test	7.3.1.4	X	-
Static creep	7.3.2	X	-
Physical characteristics			
Material	7.4.1	X	-
Mass	7.4.2	X	X
Geometrical and dimensional characteristics			
Space envelope	7.5.1	X	-
Dimensions	7.5.2	X	X
FUNCTIONAL CHARACTERISTIC			
Characteristics "force as a function of displacement at constant velocity			
New condition	7.6.3.2	X	X
After test	7.6.3.3	X	-
Test program	Annex B**	X	

Table 4 – Tests required

(**) The Supplier shall perform fatigue resistance test according to Annex B of EN 13913, considering the normal loads indicated on par. 3.1. of this TS.

If the test cycle results too long, the Supplier can propose an alternative test cycles to short the test time. As indicated on par. **Hata! Başvuru kaynağı bulunamadı.**, the test proposed shall be approved by the Administration.

4.4.2 Supplier Technical Assistance

If requested by the Administration, the Supplier shall provide all the technical assistance necessary for the first installation and commissioning of the equipment at TÜRASAŞ.

Installation procedures and check lists shall be provided during this operation in order to be verified and validated. Details will be discussed during evolution of the project.

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4.5 WARRANTY

4.5.1 Warranty Condition

Supplier shall guarantee the quality of products within the scope of this specification against malfunctions, failures and assembly and workmanship defects.
While the warranty period is limited to 30 months starting with the date of delivery of the products to TÜRASAŞ, it is 24 months starting with the commercial commissioning of the EMU set.

The responsibility of preventive maintenance on the normally used parts and of corrective maintenance in cases where it is evidently clear that failure cause is not the own malfunctions of the unit, shall belong to TÜRASAŞ.

Throughout the warranty period, following the notification by TÜRASAŞ of any malfunction, the Supplier shall respond to that malfunction within three (3) working days. The Supplier shall take all required actions to repair or replace related equipment.

The Supplier shall make available in Türkiye throughout the warranty period the required service facilities in order to respond to the possible malfunctions and an enough spare parts within this time period.

4.5.2 Systematic Fault

Systematic faults are considered the identical failure on a part/component which occurs on identical parts/components with the same function on the EMU's fleet with the following occurrence:

- Number of part/component in each train 1 to 4 = 10%
- Number of part/component in each train 5 to 10 = 8%
- Number of part/component in each train >10 = 4%

The records of failure are done within 24 months starting from the commercial commissioning of the EMU set, after an initial period of fault debugging (infant mortality period). The fleet is assumed to be composed by 10 trains.

In case of confirmed systematic faults, proper investigations shall be done in order to define a proper technical solution or modification including spare parts modification or replacement.

4.6 ACCEPTANCE

After successful delivery of the all products under scope of supply and required documentation, the final acceptance report shall be issued by TÜRASAŞ.

4.7 PACKAGING, LABELLING AND STORAGE

4.7.1 Packaging

System/equipment/components shall be delivered in suitable packages with adequate strength to be resistant against shocks and transportation damages including effects of dust, rain, snow, solar, wind etc. in the climatic conditions foreseen by the TŞ-01.133 General Technical Specification.

Packing boxes shall be convenient for stacking one on another and shall allow easy lifting by fork-lift truck (where reasonably applicable) or travelling bridge-crane.

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Following information shall be reported on the package (in a legible, non-erasable and non-removable mean).

- Name, address and registered logo of the manufacturer
- Part number and tech. specification number
- Date of manufacturing and serial number (if applicable)
- Date and number of the contract

Furthermore, if the content of a box consists of more than one component, a components list shall be added inside and outside of the box and each individual component shall be labelled. Determination of the content of these boxes shall be performed with the participations of TÜRASAŞ. Lists of the boxes shall be finalized after approval of the lists by TÜRASAŞ. A copy of each list shall be sent to TÜRASAŞ at the beginning of the shipment.

4.7.2 Labels/Marking

All marking of individual component shall be agreed to the requirements of their technical specification.

In particular the parts supplied, including all replaceable parts, shall be identified by a label showing:

- Serial number
- Date of manufacture
- Supplier's part number (if any)
- Revision level
- TÜRASAŞ's part number (if any)

Format and positioning of all labels/marking shall be subject to approval by TÜRASAŞ. Wherever possible, the position shall be such that labels can be viewed when the relevant part is installed within the vehicle.

Any company information, logo and brand etc. so located to products shall not be visible by passengers.

All labels shall be permanent and indelible.

4.7.3 Storage Conditions

The Supplier shall provide any useful information it is deemed necessary for the correct storage of the goods delivered.

4.7.4 Mounting and Handling

All the components shall be supplied mounted and ready for installation. Special care is requested to the Supplier to list all the necessary tools for mounting and maintenance, if foreseen.

4.8 DOCUMENTATION TO BE SUPPLIED TO TÜRASAŞ

The following tables report the list of requested documents (with schedule) to be supplied to TÜRASAŞ.

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Table 5 shows the documentation which shall be given by the Bidders in the offer phase.

Table 6 and **Table 7** show the documentation which shall be provided by the Supplier for the preliminary technical review and the detail technical review respectively.

Id.	Stage 1 -Offer Phase	Time Schedule	Language
1.1	The answers and the statements to the present technical specification	With offer	Turkish and English
1.2	Preliminary 3D and 2D models and installation drawings showing the main external space envelope		English
1.3	List of tests (routine, type, FAI, commissioning and homologation) that shall be performed on components and systems		English
1.4	IRIS certification of the Bidder (If the Bidder is an agency of the manufacturer, the Bidder shall show the manufacturer's certificate)		Turkish or English
1.5	Detailed price list (should include at least the price of the component, test, engineering, training, RAMS, etc.)		Turkish or English
1.6	Conformity certification of the component (if is deemed proven by the Supplier, please see clause 4.4.1)		English
1.7	List of special tools and test equipment with their prices (If not submitted, it is interpreted that no special tool and equipment are needed)		Turkish and English
1.8	Design schedule, in line with project milestones		Turkish and English

Table 5 – Stage 1 Offer Phase: list of requested documents and due date

Id.	Stage 2 - Preliminary Review	Time Schedule	Language
2.1	First level drawings with weight and center of gravity indications in 3D and 2D formats	Within one month after signing the contract	English
2.2	Certificates of the fire smoke behavior of non-metal materials		English
2.3	Preliminary applicable analysis reports (movement scenario analysis, performance, consumptions, structural strength, etc.)		English

Table 6 – Stage 2 list of requested documents and due date

Id.	Stage 3 - DETAIL Review	Time Schedule	Language
3.1	Definitive drawings with weight and center of gravity indications in 3D and 2D format.	Within one	English

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Id.	Stage 3 - DETAIL Review	Time Schedule	Language
3.2	All the technical documentation and information requested during the project (including final version of documents of previous stages)	month after FAI	Turkish and English
3.3	Reports of tests (routine, type, FAI, commissioning and homologation) performed on components and systems		English
3.4	RAMS and LCC documentation: see dedicated paragraphs		Turkish and English
3.5	User manuals		Turkish and English
3.6	Maintenance manuals		Turkish and English
3.7	Calculations, tests and analysis report requested by TSI		Turkish and English

Table 7 – Stage 3 list of requested documents and due date

The Bidder shall review and confirm the above lists of documents for all the phases of the project. Any deviation shall be submitted to TÜRASAŞ for approval.

Notes:

- 3D models of parts shall be provided in stp format.
- 2D drawings shall be provided in pdf and dwg/dxf format.
- Other documents shall be provided in an editable format and in pdf format.
- In the documentation, the Turkish version shall prevail in case of utilization both Turkish and English languages.
- All documents in stage 1 shall be provided as hardcopy and softcopy in "CD"

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5 ANNEX

Annexed documents

TŞ-01.133	National 225 km/h EMU Project General Technical Specification
TD-FT00.B00.101.0015	RAMS Analysis Requirements for Metal-Elastic Elements

Reference documents

FT20.04.00.00000	SKA1 and SKA2 Trailer Bogie Complete
FT20.24.00.00000	SKA1 and SKA2 Motor Bogie Complete
FT90.24.00.00007	Elastic Element for Axlebox
EM20.24.10.30000	Trailing Rod
EM20.24.10.20002	Rocker Arm Elastic Element
EM20.24.13.30000	Shock Absorber
EM20.24.04.41000	Axlebox Assembly
EM20.24.10.20000	Rocker Arm Assembly
EM20.24.13.10000	Secondary Suspension Installation

END of DOCUMENT

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