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T.Ş. 250.641

TECHNICAL SPECIFICATION OF
COMBINED MARKER&TAIL LAMPS
FOR E5000 TYPE NATIONAL
ELECTRIC MAINLINE LOCOMOTIVE

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1. SUBJECT

This Technical Specification includes the design, manufacturing, application related minimum technical specifications, inspection, delivery and other issues of combined marker and tail lamps for E5000 Type National Electric Mainline Locomotive produced by TÜRASAS considering TSI certification.

All equipment to be used in the electric locomotive shall be designed and manufactured to provide reliable performance under the following environmental conditions:

Table 1 – General Features of the Locomotive

Temperature	-25°C / +45°C
Relative Humidity	Maximum %95 (salty sea air)
Environment	Dusty (coal and iron powder)
Weather Conditions	Snowy and rainy
Altitude	1000 meter
Track Gauge	1435 mm
Maximum Speed	with half worn wheels 140 km/h
Maximum Weight	86 ton (± 2 Ton)
Maximum Axle Load	21, 5 ton (± 0.5 Ton)
Curve Compatibility Capacity	150 meter

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2. DEFINITIONS

The abbreviations and technical terms in the technical specification and annexes shall be interpreted as follows:

Table 2 – Definitions

TCDD	General Directorate of Turkish State Railways
TCDDT	Republic of Turkey State Railways Transportation Inc.
TÜRASAŞ	Turkish Railway Vehicles Industry Inc.
Administration	TÜRASAŞ
Contractor	The company that won the tender
Bidder	The company making a formal offer for the bid
TSI	Technical Specifications for Interoperability
UIC	International Railway Association
IEC	International Electrotechnical Commission
EN	European Standard
ISO	International Organization for Standardization
TSI LOC&PAS	Document of European Commission No 1302/2014/EU (technical specification for interoperability of “locomotives and passenger wagons” in Trans European Railway systems)
NoBo	This organization which was authorized by related commission of European Union according to directive No 2008/57/EC within scope of “interoperability of railway system within union”. It is abbreviation of capital letters of “Notified Body” and it means approved authorized body.
E5000	Electric Mainline Locomotive with 5 MW Power
TCMS	Train Control Management / Monitoring System
AC	Alternating Current
DC	Direct Current
LED	Light Emitting Diode
Electrical and mechanical interface	Installation of the lamps on the locomotive and all electrical and mechanical connections between lamps and other equipment

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3. STANDARDS

Directives, standards and requests which are listed in following order will be obeyed in evaluations to be made by Contractor regarding with conformity in requirements which should be met by the product subject to this technical specification, equipment and subcomponents which comprise this product which are not mentioned in this technical specification but become subject matter of this technical specification.

For the cases when obeying these directives, standards and requests are not possible, requirements of other related international standards, standards of European countries, national standards and TCDD directives and requirements of national legislations can be used.

- Interoperability Directive of TransEuropean Railway System No 2008/57/EC
- TSI LOC&PAS
- Requirements which are requested by TCDDT in articles of technical specification. (Contractor will be responsible to notify TÜRASAS in the event that there is confliction between these requests and national standards of locomotives regarding with design, manufacturing and test.)
- CSM 402/2013/EU
- Technical documents and annexes which are published regarding with related TSI directives.

If there is any gap regarding with standard subjects of which priority order is as mentioned above, this gap will be filled by following standard.

In the event that there is change regarding with standards and norm which are mentioned within scope of this article while work which is subject matter of tender is ongoing, Contractor:

- Will notify Administration within 5(five) business days in writing after change is published and enforced.
- Will determine processes which are necessary for adaptation to new case within maximum 1(one) calendar month following change is published and enforced, processes and will be submitted to Administration for approval.
- Administration will examine processes within 15(fifteen) business day and will notify its decision to Contractor.

Changes in directives, standards and norms will not affect completion of certification.

Contractor is responsible with examining this technical specification and annexes, notify following issues (including recommendations) to Administration in writing if any

- Violation or confliction with international standards.

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- Problems which may occur during implementation,
- Issues for which changing is suitable in technical manner,
- Issues which are not mentioned in technical specification and annexes but necessary/ compulsory for manufacturing of vehicle.

Products, which are complied with latest versions of standards stated below (or equivalents in international scale), shall be selected for the equipment that is demanded additionally for procurement and/or is within the scope of standards mentioned above.

Table 3 - Standards

Standard	Content
EN 50155	Railway applications - Electronic equipment used on rolling stock
EN50121-3-2	Railway applications - Electromagnetic compatibility - Part 3-2: Rolling stock - Apparatus
EN 15153-1	Railway applications - External visible and audible warning devices for trains - Part 1: Head, marker and tail lamps
EN 45545-2	Railway applications - Fire protection on railway vehicles - Part 2: Requirements for fire behavior of materials and components
EN 60529	Degrees of protection provided by enclosures (IP code) (For electrical equipments)
EN 61373	Railway applications - Rolling stock equipment - Shock and Vibration tests

4. TECHNICAL SPECIFICATIONS

4.1. Combined marker&tail lamps will be used at both ends of the electric locomotive with line voltage of 25 kV (19 ~ 29.5 kV) AC, line frequency of 50 Hz and maximum speed of 140 km/h. The lamps shall have the following functions:

- Lower Marker Lamp Full Mode
- Lower Marker Lamp Dimmed Mode
- Tail Lamp

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4.2. Lamps shall provide colour, luminous intensity and other related parameters specified for “lower marker lamps” and “tail lamps” in TSI LOC&PAS and EN 15153-1..

4.3. The lamps shall provide the interface and measurements given in ANNEX-1. Mounting diameter of the lamp shall be 105 mm. Dimension tolerances will be determined by design verification. Final verification will be made by TÜRASAS on the technical drawing and step file to be submitted by the Bidder.

4.4. The lamps shall meet all the relevant requirements specified in the current and valid versions of the standards indicated in Article 3 of this Technical Specification.

4.5. The lamps shall have outputs that allow to show operating modes and fault status. The Contractor shall provide all analog/digital outputs required by the TCMS free of charge.

4.6. The lamps will end with a plug (connector). The counter part of the connector shall also be provided by the Contractor.

4.7. The lamps shall at least comply with the following operating conditions:

Minimum Ambient Temperature: -25°C

Maximum Ambient Temperature: +45°C

Relative Humidity : %95 (salty sea air)

4.8. Electrical specifications shall be as follows:

Input voltage	110 V DC (according to the tolerance range given in EN 50155)
Lamp type	LED
Power consumption	Max 15W

4.9. The lamps shall have at least IP65 protection class in accordance with current and valid EN 60529 standard. The components of lamps shall be mounted using fasteners and sealing elements according to the protection class specified in EN 60529.

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4.10. The lamps and all components belonging to the lamps shall meet all the relevant requirements specified in the current and valid version of EN 45545-2 (OC3:Operation Category 3, HL2:Hazard Level 2) standard.

4.11. The lamps shall be fully compatible with railway applications and have been used in railway applications.

5. CONTROL and ACCEPTANCE

Combined marker and tail lamps will be subjected to the examinations and tests mentioned in this section and will be approved and accepted by TÜRASAS personnel.

5.1. Physical Inspection: All parts of the lamps will be checked for any defects such as broken, cracks, bruises, corrosion etc. Unsuitable lamps will not be accepted.

5.2. Measurement Inspection: The lamps will be inspected according to the interface and dimensions given in ANNEX-1. The lamps that are unsuitable in terms of interface and dimensions will be rejected.

5.3. Document Inspection: The documents specified in the "Acceptance" article of this Technical Specification will be checked.

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7. MARKING AND PACKAGING

7.1. The Contractor shall deliver fully finished lamps which shall be packaged in a way that not effected by the climate and environmental conditions such as rain, wind and snow, wrapped in nylon with the appropriate thickness that will not be damaged during the unloading and stocking. in wooden crates taped with ribbon tapes outside in order to prevent disassembling. The Contractor shall place the lamps into the crates by packing them in a way that not let them damage each other.

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7.2. There will be pallets under the crates that can be transported by forklift. The weight of the crates with the products shall not exceed 400 kg. When selecting the crate material, it shall be considered that 4 crates will be placed on top of each other. The name of the Contractor company, the name of the products, order, classification and drawing number, number of pieces in the crate, charge and order numbers of parts, date of manufacture, contract number, the quantity of the product being packed, and the batch number (if any), etc. shall be indicated on the crates (in a way that will not be affected by climate conditions). The list of these data shall be submitted with the dispatch note and the invoice prepared for each crate.

7.3. In the event that the packaging and/or delivery documents of the products offered to the Acceptance Department are incomplete and/or unsuitable; this situation is recorded with a written report and the products will be returned to the company without performing the check operation. In the event that the returned materials are re-submitted after the delivery time specified in the contract, the delay penalty specified in the contract will be accrued.

8. ACCEPTANCE

The Contractor shall send the following documents for each batch of products. Document control shall be carried out by the Administrative Personnel for each party. According to the control results, TÜRASAŞ has the right to reject the whole party.

8.1. Current and valid TSI Certificate for the lamps

8.2. TSI Declaration of Conformity according to EN/ISO/IEC 17050

8.3. An accredited laboratory or NoBo approved EN 50155 certificate of conformity

8.4. An accredited laboratory or NoBo approved EN 50121-3-2 certificate of conformity

8.5. An accredited laboratory or NoBo approved EN 15153-1 certificate of conformity

8.6. An accredited laboratory or NoBo approved EN 45545-2 (OC3:Operation Category 3, HL2:Hazard Level 2) certificate of conformity

8.7. An accredited laboratory or NoBo approved EN 61373 certificate of conformity

8.8. Document indicating IP Protection Class of the lamps

8.9. Type test/routine test reports of the lamps

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8.10. General Maintenance and User Manuals

8.11. Document containing technical information and dimensions of the lamps

8.12. Wiring diagram with interface described in detail (Connector types, pin assignments etc.)

8.13. 3D CAD / STEP files of the lamps

8.14. ISO 9001 Quality Management System Certificate

8.15. “3.1 Certificate” of the lamps according to EN 10204

The EN documents clearly written in the TSI certificate do not need to be issued separately.

9. GENERAL PROVISIONS

9.1. The Contractor shall have the ability to make changes to be requested by TÜRASAS for the product free of charge.

9.2. All components (mechanical and electrical interfaces) for the manufacture and installation of the lamps shall be provided by the Contractor free of charge.

9.3. The Contractor shall provide the current and valid ISO 9001 Quality Certificate for the manufacture of the lamps.

9.4. If the lamps do not provide the required features and giving an obstacle to the TSI certification of the locomotive, damage and loss as much as product price will be compensated by the Contractor.

9.5. The lamps shall operate without fault and shall not damage other equipment. The Contractor is responsible for any problems that may arise from the lamps and is obliged to provide their solution free of charge.

9.6. The lamps shall meet all the requirements specified for marker lamps and tail lamps in the current and valid version of TSI LOC & PAS and shall have TSI certificate.

9.7. The Contractor is obliged to provide all documentation free of charge, which are required by the Administration and are deemed to be necessary within the scope of the TSI Requirements by NoBo and the Administration.

9.8. The Contractor shall provide the necessary documentation for the “Compatibility Matrix” to be formed by the Nobo company free of charge. The Contractor is obliged to provide these

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documents free of charge and in the desired format if there are documents which are not foreseen at the tender stage but which are requested by NoBo.

9.9. The Contractor shall prepare the TSI Declaration of Conformity for the products to be supplied to TÜRASAS in accordance with EN/ISO/IEC 17050 and submit it to the Administration till the product delivery.

9.10. The Contractor is responsible for the correctness of all information it has given. The Contractor is responsible for any errors that may arise in any stage of production arising from the deficiencies and/or errors in the given information. In such a case, the problems shall be solved as soon as possible by the Contractor so as not to affect the manufacturing process. The Contractor is responsible for all costs caused by such problems. All damages and losses to be incurred by the Administration and/or third parties that may arise from the erroneous works of the Contractor within the scope of the tender will be borne/compensated by the Contractor.

9.11. The responsibility of the Contractor is that the information, documents, components, systems, machinery, software, technology, design provided by the Contractor to the Administration does not violate any brand, patent or property rights of a third party.

9.12. Additional information and documents requested in writing by the Contractor will be shared by TÜRASAS within the scope of "Confidentiality Agreement" if deemed appropriate. A Confidentiality Agreement will be signed between the Contractor and TÜRASAS.

9.13. Intellectual and Industrial Property Matters

All kinds of documents shared with the Contractor within the scope of the subject matter of the tender shall not be used in any way for other purposes.

During the fulfillment of the obligations undertaken by the Contractor during the work subjected to tender, in the event of a violation of the rights and/or interests which are the subject of intellectual and/or industrial property protected in accordance with the provisions of the relevant legislation, any administrative, legal, criminal and financial responsibility arising therefrom is owned by him/her. The Contractor cannot make any request from the Administrator about this subject. However, if the Administration is faced with legal sanctions, it shall recourse to the Contractor without prejudice to other rights. Upon the request of the Administration, the Contractor,

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before the signing of the contract, is obliged to fully inform and document to the Administration whether the service to be undertaken is an intellectual and industrial property subject, if it is within this scope, the rights and obligations of the party and third parties regarding the subject. If the Administration is subject to any loss, risk of harm or loss of right due to the failure to fulfill this duty, the Administrator therefore collects and reimburses any damages incurred by the Contractor, without prejudice to any other rights.

9.14. All usage and ownership rights regarding all design, technical information and technical drawing documents given to the Administration by the Contractor within the scope of the work subject to tender will belong to the Administration without any limitation. Any documents, projects or documents shared with the Contractor within the scope of the work subject to tender will not be used for any other purpose.

9.15. The works to be carried out by the Contractor within the scope of RAMS are given in ANNEX -2: TŞ.400133 E5000 RAMS Requirements Specification and its relevant annexes.

10. DOCUMENTATION

10.1. The Contractor will deliver the technical documentation described below regarding the operation, maintenance and repair of locomotives to the Administration in hard and digital copies upon product delivery. For the parts considered incomplete and inappropriate by the Administration; will renew/update it without charging a separate fee and deliver it to the Administration within 15 days.

Technical Documentation will be prepared in Turkish and English in accordance with the conditions specified by the Administration and the EN 15016 standard.

All documents will have revision numbers placed on them in case of revision.

Technical Documentation will be available in two environments:

- Documentation in Digital Environment
- Documentation in Printed Media
- Product Tree in Digital Environment

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10.2. The Format of Documentation

Generally applicable rules regarding the format of documents are stated below:

- a) The manuals will include the same references, images, diagrams, component codes, part numbers, definitions, descriptions, terminology, etc. throughout the use of the system/equipment in order to avoid inconsistencies between the design documents and the definitions contained in the manual.
- b) The manuals will be in electronic format. After any update, the old version and the new version in the document/software package will be replaced by the Contractor and the final version will be delivered to the Administration as a package.
- c) The documentation package will be submitted to the Administration with the delivery of the first product.
- d) Documents will be in the same format. There will be a cover page that introduces each document with a picture of the locomotive. Administration and manufacturer logos, version numbers, version dates will be visible on all pages. The format of the documents will be submitted to the Administration for approval.
- e) After each update, the changes/additions will be written on the update page. All version information and version date in the document will be updated and submitted to the Administration.
- f) The documents to be printed are listed below as a minimum:
 - i. System and equipment introduction guides
 - ii. Maintenance/repair guides (manuals)
 - iii. User manuals (Machinist operating books)
 - iv. Illustrated parts catalogs
- g) The documentation in electronic format will be in a format that can be rearranged/changed in order to make changes/updates in the future.
- h) PDF format can be used for official documentation delivery (which can be used as official delivery documents for the End User)

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- i) Pictures and photographs will be added, they will not be linked.

10.3. The Content of Technical Documentation

Technical Documentation consists of documents such as manuals, instructions, technical drawings, etc., the explanations of which are given below.

10.3.1. Machinist's Handbook (Manual)

- Brief functional descriptions and block diagrams of each module of the product.
- Location, function and operation of controls, indicators and electrical switches, if any.
- Main electrical circuit diagrams of the product (in principle), if any.
- Electronic circuit diagrams of the product (in principle), if any.
- Product instructions for use.
- Possible malfunctions of the product, notifications regarding these malfunctions, fault diagnosis methods and interventions to be made by the machinist.
- Emergency procedures.
- Product testing procedures, if any.
- Maintenance and repair catalogs for the product.

10.3.2. Maintenance and Repair Manuals

In the manual; daily, weekly, etc. routine maintenance and periodic heavy maintenance required for the product throughout the life cycle of the product will be explained clearly and in detail.

Periodic maintenance times will be determined on km and/or time basis, and periodic maintenance after the first maintenance will be in multiples of the first maintenance period. These intervals will be optimized on the product basis.

A list of tools, equipment, consumables and facilities required for maintenance/overhauls will be provided.

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The manual will also include control points, control conditions, measurements to be taken and the intervals of these measurements, as defined by the Contractor.

In the manual; the codes and definitions of all faults related to the product, the possible causes of these faults and the recommended corrective action in case of this fault will be explained in detail.

Integrated circuit diagrams of all electrical, electronic systems and, if any, cooling systems and interfaces will be provided as a separate section. The diagrams will also include references to higher and lower level details.

The Maintenance and Repair Manual will also include the following information:

- a. Detailed introduction of all modules that make up the product
- b. Detailed introduction of all units and components that make up the modules (with exploded images)
- c. Detailed explanation of the interconnection of the units and components that make up each module (electrical, electronic, mechanical, etc.).
- d. Detailed explanation of how the modules that make up the product are connected to each other (electrical, electronic, mechanical, etc.).
- e. Detailed electrical and electronic circuit diagrams of the product.
- f. Test points of each module, unit and component and the values at these points (voltage, waveform, pressure, current, etc.).
- g. Maintenance requirements and maintenance intervals of the product (service maintenance, preventive maintenance, periodic maintenance, general overhaul, etc.).
- h. For each type of maintenance; control, maintenance and part replacement instructions on a module, unit, component and complete locomotive basis. The activities, procedures and methods to be carried out in order to fulfill the maintenance task will be explained in detail.
- i. Description/explanation of maintenance activities.
- j. Specific torque values and warnings for assembly operations.

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10.3.3. System Manual (Handbook)

The system manual will contain the necessary and descriptive working principle information about the unit or system.

Drawings referenced in any Handbook may be included in the relevant handbook or, if necessary, placed at the end of the handbook. All necessary drawings and values for the mentioned systems will be provided in Turkish, in printed and digital format.

10.3.4. Illustrated Parts Catalogue (Series Book)

Numbered list of all parts of the product with exploded pictures (Series Book and Electronic Catalogue)

Each unit (part, subsystem, system) of the catalogue to be submitted to the Administration by the Contractor will include information specified for maintenance, such as naming, Contractor part number, Contractor references, Contractor name, Contractor part number/code, detailed description of each part of the locomotive, which equipment the part belongs to on the vehicle, numbers, drawings, 2D images.

Original Manufacturer Product Catalogues (Data Sheets) / Technical Specifications, original technical information books issued by the manufacturer of the product will be delivered.

11. BIDDING

The Bidders shall respond all the articles of the technical specification individually.

Bidders shall document at the bidding stage that they are the manufacturer/authorized dealer of the relevant products and that they will provide 10-year service and spare parts supply guarantee, valid from the end of the warranty period.

The Bidders shall specify in their bids the individual and total prices of the products requested and, if any, of the optional products. However, the final bid price will be given clearly as a single price and valuation will be made at this price.

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The Bidders are obliged to submit the following documents in their bids to the Administration:

No	Documents To Be Submitted With the Bid
1	Current and valid TSI certificate for the lamps
2	TSI Declaration of Conformity according to EN/ISO/IEC 17050
3	An accredited laboratory or NoBo approved EN 50155 certificate of conformity
4	An accredited laboratory or NoBo approved EN 50121-3-2 certificate of conformity
5	An accredited laboratory or NoBo approved EN 15153-1 certificate of conformity
6	An accredited laboratory or NoBo approved EN 45545-2 certificate of conformity
7	An accredited laboratory or NoBo approved EN 61373 certificate of conformity
8	Document indicating IP Protection Class of the lamps
9	3.1 Certificate of the lamps according to EN 10204
10	Type test reports of the lamps
11	Document containing technical information and dimensions of the lamps
12	Wiring diagram with interface described in detail (Connector types; pin assignments etc.)
13	3D CAD/STEP files of the lamps
14	ISO 9001 Quality Management System Certificate

A letter of commitment will be accepted stating that the documents, which cannot be obtained during the tender stage, will be given at the stage of delivery.

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12. REQUIREMENTS FOR BIDDERS

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14. WARRANTY

14.1. The Contractor shall provide warranty for 36 (thirty-six) months from the date of delivery for the products delivered, 24 (twenty-four) months from the date on which the lamps are assembled to the locomotive in a complete and trouble-free manner.

14.2. The Contractor will intervene the equipment that fails within the warranty period free of charge within 5 working days after notification of the defect to them in writing and the problem will be solved.

14.3. If malfunctions occur in the same equipment or due to the same equipment, or if the equipment malfunctions for the same reasons and this situation occurs in 3 or more products, these malfunctions will be considered as EPIDEMIC FAILURES.

In addition, if the parts of the main equipment/systems in the locomotive are broken down and therefore the main equipment becomes inactive, this main equipment will also be included in the scope of EPIDEMIC FAILURE.

Spare parts/repairs required for all operations arising from warranty and epidemic malfunctions will be carried out/provided free of charge by the Contractor.

Components that are considered “epidemic faulty” will be replaced with new ones in all locomotives free of charge, without requiring a fault condition. In this case, parts supply, integration, assembly, etc. will be carried out by the Contractor without any charge. In problems considered epidemic, the root cause of the fault will be found and reported to the administration in writing.

If necessary, the Contractor will send its expert(s) to TÜRASAS to fix such malfunctions and prevent them from recurring, with all expenses being borne by the Contractor.

For systems/parts/components within the scope of epidemic failure; the warranty period, after taking the necessary precautions, is limited to 30 months from the delivery of the products to TÜRASAS, is 24 months from the re-commissioning of the locomotives.

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If the epidemic failure does not prevent the locomotive from being safely put into service, the Contractor shall repair the fault in the locomotive and/or replace the faulty part with a new part, at its own expense, within 30 calendar days from the date of receipt of this notice. If the Contractor fails to fulfill its obligations within this period, the Administrative Specifications and Contract Terms shall apply.

14.4. The Contractor shall undertake with the bid to provide 10-year service and spare parts supply guarantee, effective from the end of the warranty period.

All parts used specifically for the supplied product/equipment will be delivered to the Administration together with the offer, in a list (product tree) (all spare parts required for 1 locomotive with part numbers and price information).

If the Administration determines that the list is insufficient, the Contractor will re-prepare the list in the format requested by the Administration. This process will continue until the final document is obtained.

15. PLACE OF DELIVERY

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16. ANNEXES

ANNEX-1: 001EL0200003-000

ANNEX-2: TŞ.400133 E5000 RAMS Requirements Specification (ANNEX-1 and ANNEX-16)