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T.S. 250.370

TECHNICAL SPECIFICATION OF SPHERO AXLE BOX AND COVER FOR TSI CERTIFIED

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Revision			
Rev	Date	Explanation	Rev. by
H	05.10.2017	Note is added for item 2.2	
J	13.11.2017	Item 2.9 is added	
K	13.02.2018	Item 2.1 and 2.9 are updated	
L	20.03.2019	Item 2.1 is updated	
M	02.11.2021	İDARE expressions were changed to TÜRASAS and the cover was prepared again.	
N	31.10.2022	Article 9 has been revised based on the letter of the Purchasing Department dated 20.01.2022 and numbered E4678	Mine YILDIZ
O	21.02.2023	Article 2.9 has been revised based on the letter of the Purchasing Department dated 16.02.2023 and numbered E104387	Metin Burak EREN
P	14.04.2023	Technical Specification has been updated within the scope of CIRCULAR no. 31.	Ahmet SÖNMEZ

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1. SUBJECT

This specification includes requirements and specifications, control and tests, delivery and other issues for supply of Journal box (Axle box body) , cover and all other components (excluding bearings) which is made of machined spherical graphite castings that is used in TSI Certified railway cars manufactured in TÜRASAS.

2. REQUIREMENT AND SPECIFICATIONS

2.1. Journal box, Journal box cover and all other components shall be **BA182** type.

In annex, an example BA182 type Journal box drawing is given.

The tenderers shall submit a declaration which is prepared according to TS EN ISO/IEC 17050-2 stating that the products supplied to TÜRASAS are BA182 type Journal box. The tenderers shall submit that declaration with their offers.

Also, the bidders shall prepare and submit a declaration in accordance with TS EN ISO/IEC 17050-2 that the products they will submit to TÜRASAS in their bids comply with the current and valid WAG TSI Regulation and EN 12082:2007+A1 standard.

In addition, the contractor company will deliver the documents requested within the scope of the current WAG TSI Regulation, the performance test report made within the scope of EN 12082:2007+A1 or the NoBo approved strength and fatigue analysis report (FEA) according to the loading condition given in the EN 13749 standard of the BA182 type Buatagres they will submit to TÜRASAS with the delivery of the product.

The Supplier is obliged to provide all test, inspection and control reports and documents requested by TÜRASAS.

After signing the contract, the supplier shall submit to Administration the main complete technical drawing of the Journal Box to be given to TÜRASAS.

There shall be no incomplete casting, wrong size and shape in the casting components. There shall be no defects on the components which may damage the use.

2.2. The casting components shall have the physical properties of the material specified in the Table 1 and documents. In order to increase the fatigue strength and clean the scaling on the surfaces; shot peening shall be made, runners shall be cut, no repair shall be made on casting components at any stage, burrs shall be cleaned.

Table-1: Mechanical Properties

Thickness t mm	0,2% Yield Strength MPa ≥	Tensile Strength MPa ≥	At -20°C V Notched Bar Impact Energy J *	Elongati on at Break %	TS EN 1563	
					Symbol	Number
t<30 30<t<60 60<t<200	240 230 220	400 380 360	12 12 10	18 15 12	EN-GJS- 400-18-LT	5.3103
t<30 30<t<60 60<t<200	250 250 240	400 390 370		15 14 11	EN-GJS- 400-15	5.3106

* The average result of three tests should not be less than 2/3 of the average value for each test.

Note: Material **EN-GJS-400-18-LT** can be use both for journal box and journal box cover but material **EN-GJS-400-15-LT** can be use just for journal box cover.

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2.3. While the Company manufactures the components by casting method, it shall use the dimensional tolerances and machining allowances EN ISO 8062-3 for the molding part.

2.4. If the shot peening method is used, the definition of casting equipment and tensile values of spherical graphitic cast iron obtained shall comply with EN 12890 standard. For other methods, the relevant standards should be used.

2.5. The components should be heat treated in accordance with Article 10.4 of TS EN 1563 standard.

2.6. The Company shall not start welding process before TÜRASAS confirms the Welding Procedure Specification (WPS) to be used for Pipe Welding with Journal box and Manganese plate welding with Journal box.

2.7. The Contractor Company is obliged to supply all required documents requested in TB2321. These documents shall be delivered to TÜRASAS together with the delivery of product.

2.8. The Contractor Company shall supply EN15085 CL1 certificate of their or their subcontractor before starting with the welding manufacturing for welding operations. Welding operations shall be carried out in accordance with the welding details in the technical drawing given in Annex-1(2/2). (It shall be complied with welding method, welding wire, welding scale, etc. given under this scope)

3. CONTROL AND TESTS

3.1. The Company shall make all control, inspection and analyses, and certify TS EN 1024 inspection certificate according to 3.1. If the company does not have an authorized inspection agent working independent from manufacturing unit, the controls and inspections may be carried out by an impartial expert institution or a qualified state organization. The quality control documents indicating the results which is signed by the inspection authority shall be submitted to TÜRASAS. All quality control documents signed by TÜRASAS shall be checked.

3.2. After the company completes the controls, it shall notify TÜRASAS at least 3 days before the shipment. TÜRASAS may send the authorized personnel and make the final control on the company site before painting the components whose manufacturing is completed. TÜRASAS authorized personnel shall take specimens according to Table-2 and verify the control documents in Article 3.1. In case there is a missing document, the entire lot can be rejected. In case any non-conformance in Table-3 and Table-4 is detected during visual verification controls by TÜRASAS authorized personnel, the component can be rejected. No repairs shall be applied to the machined components.

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Table-2 Sampling Table for Mass Production

Inspection or Test	Quantity
Visual Control	%100
Measurement and Geometric Control	%100
Tensile Test	2 test bars for each batch
Notch Impact Test	3 test bars for each batch
Brinell Hardness Test	At the end of test pieces of tensile test
Microscopic Analysis	One analysis for each batch
Liquid Penetrant Control	%100 of Manganese Plate Welding ⁽¹⁾
Magnetic Particle Control	%100 of Journal box Bodies ⁽²⁾
Radiographic Control	%10 of Journal box Bodies for each batch ⁽³⁾

(1) Manganese plates welding.

(2) Excluding Manganese plates welding.

(3) The regions to be inspected are given in Appendix-5.

Region Number*	Region Definition	Max. Failure in the Regions	Maximum failure depth	Maximum failure dimension
1	O-ring bearing area	Failures at O-ring levels are not acceptable. Failures are not accepted from surface to groove		
2	Cover resistance surface (radial & axial)	2	1.5 mm	4 mm ²
3	Bearing inner diameter	2	1.5 mm	10 mm ²
4	Other diameters	4	2 mm	12 mm ²
5	Bump stop	4	2 mm	16 mm ²
6	Suspension surface: each plate	3	2 mm	12 mm ²
7	Hole housing	1	2 mm	Length 2mm

Table-3 Journal box Refusal Criteria

*Component parts corresponding to the numbers of regions are given in Appendix-4.

Region number*	Region definition	Max. Failure in the Regions	Maximum failure depth	Maximum failure dimension
All Regions	All regions	4	2 mm	16 mm ²

Table-4 Journal box Cover Refusal Criteria

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Note: The failures with diameter less than 2 mm can be accepted. If the diameter depth is higher than 2 mm, they will be refused.

3.3. Visual Control:

The Contractor shall control the casting components visually according to TS EN 1370. The roughness classes for the surfaces of Journal box in the state taken from casting shall be minimum 1S1-2S1 in the critical areas (Machined and RT made areas), minimum 3S1 in other areas according to BNIF system. In addition, failures with diameter of maximum 3 mm and depth of maximum 2 mm may be allowed in the area of 110mmx160mm except critical areas. The roughness class shall be minimum 2S2 for the grinding surfaces (deburred) according to BNIF system. In Journal box covers, the rough surface quality shall be 3S1, deburred surface quality shall be 3S2 according to BNIF system. The deburring process shall be done carefully so as not to alter the final image of machined surfaces and component. There shall be no adherent sand, scale, cracks, hot tear defects on the surface.

The discontinuity classes specified in EN1379 Table 4, shall be used for the other surface discontinuities according to the severity levels specified in Table 5.

Surface Discontinuities	Severity Levels	
	Critical Region	Out of Critical Region
Inclusions	VC1	VC2
Gas porosity	VC1	VC2
Laps	VC2	VC2
Scales	Unacceptable	VC3
Spherical Inclusions	Unacceptable	VC3
Welds	Unacceptable	Unacceptable

Table-5 Severity levels of surface discontinuities

3.4. Geometrical Control: The manufacturer shall prepare a measurement control sheet containing the critical measurements (CTQ) specified in Annex-1 until the prototype delivery. This measurement control sheet shall be approved by TÜRASAS Prototype control board. Critical measurements in the prepared control sheet will be checked 100% and this measurement control sheet will be given to TÜRASAS together with product delivery.

A number of specimens specified in Table 2, shall be taken from the components submitted for acceptance, and they shall be controlled whether they comply with measurement and tolerance values stated in the contract appendix, technical specification and technical drawings.

3.5. Destructive Testing: The yield, tensile, breaking, hardness, impact resistance, metallographic (internal structure) tests shall be applied to the casting components. The Contractor company shall provide 2 pc. tensile bars made of the same batch numbered material which are offered for acceptance, to TÜRASAS. Otherwise, one of the offered component shall be used for tests, the company shall provide a new one instead of the destructed one, free of charge (Tensile test is performed according to TS EN ISO 6892-1, Notched impact test is performed according to TS EN ISO 148-1, Hardness test is performed according to TS EN ISO 6506-1). Chemical analyses of the components shall be made and

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the documents shall be supplied to TÜRASAS. The Contractor shall provide a chill specimen as a witness specimen in compliance with TSE EN ISO 1484 standard.

3.6. Non-destructive Testing:

3.6.1. The Contractor shall control the manganese plates welds %100 by liquid penetrant method according to TSE EN ISO 3452-1. The acceptance level required for the control shall be 2 according to ISO 23277. The testing should be performed by a personnel in at least level 2, in compliance with EN 473 or ISO 9712 and report should be approved.

3.6.2. The Contractor shall make the magnetic particle control to the Journal box %100 according to EN 1369. The quality level required for the control shall be LM_1 and SM_1. The testing should be performed by a personnel in at least level 2, in compliance with EN 473 or ISO 9712 and report should be approved.

3.6.3. The Contractor shall make radiographic testing to the Journal box in the marked parts in the image given in Appendix-5 according to EN 12681 and at the rate of 10%. The acceptable limits for radiographic testing shall be maximum 2. The failure types are defined in the standard ASTM E 446-84.

3.7. Metallographic (Internal Structure) Control:

Microscopic control is performed to determine whether heat treatment of components is well performed or not and whether micro structure is appropriate. The internal structure of material should comply with Figure VI type of Part A of EN ISO 945 standard and dimensions of graphitic components shall comply with 6 value.

3.8. Test Specimens

As specified in EN 1563, test specimens to be machined for mechanical test shall be made of the same SG iron but casted independently at the same time.

3.9. Controls Required for Prototype

The Contractor shall prepare at least two prototypes using the same processes and tools used for normal production. All surfaces of prepared specimens shall be controlled visually. The prototype components shall be subject to magnetic particle test %100.

- The Contractor shall subject the prototypes to %100 dimension and shape controls.
- The Contractor shall prove the robustness of the prototypes by radiographic controls.
- The Contractor shall make mechanical tests, hardness tests, microscopic tests to 2 test specimens and notched impact test to 3 test specimens in accordance with the standards. The Contractor shall submit all test documents to TÜRASAS.

3.10. Evaluation of Results

The components which do not conform to the dimensions and tolerances specified in technical drawings and Article 2, are refused. If any nonconformity is detected in the control, test and experiments specified in Article 3, entire lot shall be refused. TÜRASAS has the right to perform any tests requested on the lot offered.

The components are not allowed to be repaired with welding for any reasons.

4. PAINTING

After the components are accepted by TÜRASAS authorities, painting shall be applied. The details of painting are given in the technical drawing no. T2002711. The Contractor company may offer an alternative painting plan for painting. In case it is deemed appropriate by TÜRASAS, process shall be performed according to the painting plan proposed by the contractor company.

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5. GUARANTEE

The manufacturer guarantees the components for 2(two) calendar years from the date of delivery due to the defects caused by manufacturing failures and not seen during acceptance. If any faults that prevents use of components or shortens the life span are detected, these components are refused. The refused components are returned to the manufacturer for replacement. The company has to replace the refused components with new ones within 20 working days.

6. PROTOTYPE

The manufacturing period of prototype shall be maximum 30 (thirty) calendar days. The prototype products shall be subject to the control and tests specified in Article 3. Two prototypes for each ordered component shall be delivered to TÜRASAS, together with documents of all control and test reports which are mentioned in Article 3.9 of the specification.

The delivered prototype products and documents shall be evaluated by Control Committee of TÜRASAS and a compliance report shall be issued if appropriate. The Contractor shall make the other manufacturing based on the prototype after the compliance report is published. If the prototype is not accepted, TÜRASAS may request another prototype provided detected defects are corrected. In case the prototype fails, an additional period of maximum 15 (fifteen) days may be given to the contractor company for repair. The acceptance of prototype does not mean the acceptance of all order or lots.

7. MARKING

Casting components manufactured by the company shall be marked as permanent, at a suitable place which does not damage the function of the component. How to make the marking is mentioned in the technical drawings.

8. DELIVERY TYPE

8.1. After acceptance of prototype, the contractor company shall start delivery of remaining products.

8.2. The delivery of product shall be made in accordance with the delivery table of Gear and Wheel Manufacturing Factory.

8.3. Corrosion Protection

Unpainted machined parts of castings should be covered by Anticorit DFW90 or equivalent. Greasing or lubrication should not be applied to the places where casings have threaded, flat or guided holes.

8.4. Packaging

The packing boxes of materials supplied for receipt, should be made of resistant materials with suitable quality and thickness, such as wood, oil derivatives and so on. While choosing a box material, it should considered that 5 boxes will be placed on top of each other. The boxes shall not affect from the weather and environment conditions such as rain, wind, snow; they shall be manufactured in such a way that they will not be damaged during loading, unloading and stocking. The boxes should be bonded from outside with resistant tape strips to prevent dispersing.

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There will be pallets under the boxes as to be loaded and unloaded by the forklift. The weight of box materials shall be 400-500 kg. The name of contractor company name of materials, order and image number, number of items in the box, batch and serial number of components, manufacturing date information shall be determined on the boxes (not affected by the climate conditions). The list including both these information and marking information shall be delivered with dispatch note or invoice separately for each box.

The materials shall be put into boxes as not to be affected from climate and environment conditions such rain, wind, snow; not to be damaged during loading, unloading and stocking; wrapped by air balloon nylon of appropriate thickness, as not contacting machined surfaces to each other.

In case packing and/or acceptance documents of the products presented for acceptance are missing and/or inappropriate; this situation shall be recorded with minutes, they shall be returned to the company without performing acceptance.

9. GENERAL PROVISIONS

9.1. All kinds of information and/or drawings annexed to this contract belong to TÜRASAS; they can not be misused and shared with unauthorized person.

9.2. The Contractor shall subject the first product to the First Product Approval process according to TB No. 2263 document before and during the production.

9.3. For the issues not specified in the technical specification, the administrative specification shall be adhered.

APPENDICES

Appendix-1: Specimen BA182 Journal box Complete Technical Drawing (2 pages)

Appendix -2: TB2321

Appendix -3: T2002711 No. TSI Journal box Painting Plan

Appendix -4: Location of region numbers for Journal box and covers

Appendix -5: Journal box test sections, film layout and arrangement

Appendix -6: TB2263