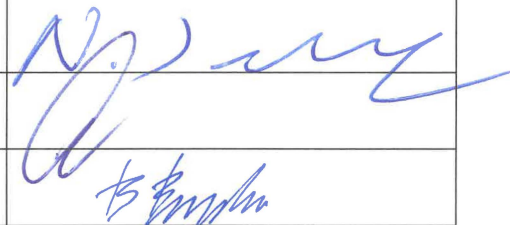


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T.Ş. 050.022

TECHNICAL SPECIFICATION FOR FORGING OF STEEL PARTS IN TLM16V185 TYPE DIESEL ENGINES

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1. SUBJECT AND SCOPE

This technical specification covers the requirements and specifications, checks and tests, delivery and other issues related to the forging and manufacturing of bearing carriers used in TLM16V185 type 16 cylinder diesel engines and their related parts, piston rods which are manufactured and repaired in TÜRASAS (Turkey Locomotive and Engine Industry Inc.).

2. REQUIREMENTS AND SPECIFICATIONS:

2.1. Material:

Main journal carriers and related parts shall be made of Ck45 material and Piston rod shall be made of 34CrMo4 material.

2.2. Chemical Properties:

MATERIAL	DIN Norm	CHEMICAL COMPOSITION							
		%C	%Si	%Mn	%P	%S	%Cr	%Ni	%Mo
Ck 45	10083-2	0,42-0,50	0,15-0,35	0,50-0,80	≤ 0,035	≤ 0,035	-	-	-
34CrMo4	10083-3	0,30-0,37	0,15-0,40	0,60-0,90	≤ 0,025	≤ 0,035	0,90-1,20	-	0,15-0,30

2.3. Mechanical Properties of Materials:

MATERIAL	DIN Norm	MECHANICAL PROPERTIES				
		Tensile Strength (kg/mm ²)	Yield Strength (kg/mm ²)	Elongation L= 5d %	Notch Strength (J)	Hardness (HB)
Ck 45 (QT)	10083-2	Values shall be taken in accordance with EN 10083-2.				
Ck 45 (Normalization)	10083-2					
34CrMo4 (QT)	10083-3	Values shall be taken in accordance with EN 10083-3.				
34CrMo4 (Normalization)	10083-3					

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2.4. Microstructure:

The microstructure of the parts shall be fine-grained and uniform, and the grain size shall be 5-8 according to ASTM E 112 (in case normalization is required).

2.5. Manufacture:

The parts shall conform to the forging drawings given in the annex of this specification. For dimensions where tolerance is not specified in the forging drawings, the values given in DIN norms (7522 to 7528) shall be taken as basis. If forging drawings are not provided, the manufacturer shall determine required tolerances on the basis of the machining drawings. The parts shall be forged in the forging die conforming the forging techniques. The deformation coefficient from the ingot shall be at least 4. The burrs of the parts shall be cut properly and the excess burrs shall be removed by grinding if necessary. There shall be no burrs, gaps, layers, flaking, crushing, cracking etc. in the parts. The surfaces shall be clean and shall be cleared by sand blasting or shot peening when necessary. No filler or welding will be performed to cover manufacturing defects.

2.6. Heat Treatment:

Forged parts shall be subjected to normalization annealing.

3. INSPECTION, CONTROLS and EXPERIMENTS:

3.1. Visual Inspection:

All forged parts (100%) shall be subjected to visual inspection by the contractor company before submitted to delivery and all related reports shall be submitted to TÜRASAS.

TÜRASAS will respect sampling method TS ISO 2859-1 when performing the inspection of the parts submitted by the contractor.

3.2. Geometric Control:

All the forged parts submitted to the delivery shall be subjected to the measurement and tolerance control by the contractor company. The submitted parts will be checked by the TÜRASAS control team according to the sample procedure (TS ISO 2859-1 General inspection level 2). The submitted parts will be checked for compliance with the dimensions and tolerance values specified in the technical drawings given in the annex.

3.3. Fracture Control:

All of the forging parts submitted to delivery will be subjected to crack control by the contractor. TÜRASAS control team will carry out crack control according to the specified sample procedure

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(TS ISO 2859-1 General examination level 2). The control of the products submitted must be in accordance with TS EN 10228-1 and the acceptance level must be in accordance with quality level 4.

3.4. Chemical Analysis:

Among the parts submitted to delivery, TÜRASAS Quality Control Department shall carry out chemical analysis on the required number of parts to check the conformity with the analysis values specified in Article 2.2.

3.5. Mechanical Experiments:

Among the parts submitted to delivery, 2 samples of cut bars from the lot will be checked the conformity for mechanical properties specified in Article 2.3.

3.6. Evaluation of Results:

In the checks and tests carried out, it shall be checked whether the forged parts meet the requirements specified in 2.1, 2.2, 2.3, 2.4, 2.5 and 2.6, and whether they comply with 3.1, 3.2, 3.3, 3.4 and 3.5. Parts which do not meet the specifications specified in 3.1 and 3.2 shall be rejected. In case parts that do not comply with 3.3, 3.4 and 3.5, the whole relative lot will be rejected. The rejected parts shall be replaced by the contractor within maximum 30 working days without any additional charge.

The contractor shall replace the parts destroyed during the tests without any charge.

TÜRASAS, if required, may have the control and tests carried out by another organization, all costs belonging to the contractor.

The contractor will send the quality control reports of forged parts (3.1 certificate, Heat treatment report, if required MT and VT reports) to TÜRASAS with delivery.

4. PROTOTYPE:

4.1. The manufacturing time of the prototype shall be specified in the bid. The contractor will deliver 2 prototypes from each part to TÜRASAS and the control and test results to be made after delivery shall be notified to the company as soon as possible. After the prototypes have been accepted by TÜRASAS, the contractor will continue to manufacture other lots. However, the acceptance of prototypes does not mean that all production will be accepted. TÜRASAS can terminate the contract if the prototype is not accepted.

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4.2. For the manufacturers who has previously delivered conforming final parts, the prototype may not be requested

5. MARKING:

The contractor shall place the serial number and the brand of the manufacturer in a legible manner, as shown in the illustrations, the last two digits of the month and of the year in which the parts are manufactured on as shown on the technical drawings or on a suitable location that does not affect the function of the parts.

6. PACKAGING:

Forging parts shall be packed in accordance with TB 2163 Article 2.2.

7. WARRANTY:

The contractor shall give a guarantee for defects caused by manufacturing and defects not seen during delivery, 12 months starting from the delivery. The contractor shall deliver the replacement of the defective parts within the scope of the warranty to TÜRASAŞ maximum within 30 working days from the notification date of TÜRASAŞ to the contractor, all costs belonging to contractor.

8. VALIDITY OF THE SPECIFICATION:

This technical specification constitutes an integrity with the attached specification sheets, the attached drawings, the administrative specification and the sources and documents pointed out by them.

The contractor shall submit the ISO Certificate or TSE Certificate in the annex to the proposal and send the quality control reports together with the lot.

9. GENERAL PROVISIONS:

9.1. TÜRASAŞ can see the companies participating in the tender and inspect the companies' facilities during production.

9.2. The manufacturer may request original sample parts to assist in its manufacture and to be returned in full.

9.3. The Contractor shall take back the rejected parts and the parts found to be defective during the warranty period from TÜRASAŞ within 10 (ten) working days following the notification of rejection and take them out of the TÜRASAŞ site. Materials not received within 10 working days will be returned to the Contractor

9.4. All transportation costs belong to the Contractor.

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9.5. The materials will be delivered along with the dispatch list and invoice.

10. DELIVERY LOCATION:

The place of delivery of forged parts is TÜRASAS Eskişehir Regional Directorates Acceptance and Transfer Division Management.

ANNEX

ANNEX-1: LIST OF FORGED PARTS IN TLM16V185 TYPE DIESEL ENGINES

ANNEX-2: TB 2163

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ANNEX-1: FORGING PARTS IN TLM16V185 TYPE DIESEL ENGINES

ITEM NO	PART NAME	GROUP NO	TECHNICAL DRAWING NO	FORGING DRAWING NO	MATERIAL	1 Engine Weight kg	Quantity in engine	EXPLANATION
1	LOWER HALF BEARING	4J	103463	103464-5	Ck45			
2	END LOWER HALF BEARING	5J	103462	103464-5	Ck45			
3	LOCKING BOW (Normal Main Journal)	4J	204249	204249-5 204250-5	Ck45			
4	LOCKING BOW (Flywheel End Main Journal)	5J	204250	204249-5 204250-5	Ck45			
5	BEARING CAP (Fit Main Journal)	5J	206423	206425-5	Ck45			
6	BEARING CAP (Normal Main Journal)	4J	206424	206425-5	Ck45			
7	PISTON CONNECTING ROD		103908	103908	34CrMo4			
8								
9								
10								
11								